Universität Hamburg

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Broadening Views on Adolescents' Personalities: Investigating Construct Clarity, Intertwined Developments, and (Mal)adjustment

Dissertation

zur Erlangung des Doktorgrades

an der Universität Hamburg,

Fakultät für Psychologie und Bewegungswissenschaft,

Institut für Psychologie

vorgelegt von

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Hamburg, 2025

Date of thesis defense: 03.09.2025

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Danksagung

[Die Danksagung ist aus datenschutzrechtlichen Gründen nicht Teil dieser Veröffentlichung.]

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Summary

Adolescence is characterized by profound biological, psychological, and social changes that come with increased opportunities for personal growth but also potential vulnerabilities. Against this backdrop, different personality characteristics and their developments may provide valuable insights into how adolescents differ in their adjustment to these changes. People's personalities—the entirety of characteristics that make up someone's style of thinking, feeling, and behaving—have long been recognized as a key factor in understanding human development and functioning. Over the years, most researchers have adopted a dynamic perspective, viewing personality as a complex, evolving system that is not only influenced by genetic and environmental influences but is also inherently shaped by interactions among its components. This perspective raises important questions about how personality is organized, how different personality characteristics develop compared to and in relation to one another, and how they might complement each other in contributing to people's psychosocial (mal)adjustment. Given that adolescence is a central period of personality (re-)organization, it provides a unique developmental context to investigate these questions. Building on theoretical considerations from the fields of developmental, personality, and clinical psychology and integrating them under three overarching principles from lifespan psychology, this dissertation aimed to explore how the simultaneous consideration of different personality characteristics informs three global research aims: First, to increase our understanding of less established personality characteristics by localizing them in the nomological network of other, more widely studied characteristics (*multidimensionality*). Second, to investigate the developments of different personality characteristics on their own and in relation to each other (*multidirectionality*). And third, to assess how personality characteristics might complement each other in their predictive effects on psychosocial (mal)adjustment across different life domains (*multifunctionality*). To address these aims, this cumulative dissertation comprises three preregistered studies, drawing on data from four adolescent samples (individuals aged between 14 and the early twenties) that provide insights into the development of three groups of personality characteristics and different indicators of psychosocial (mal)adjustment. All studies focused on one of the following personality characteristics or a combination of them: The Big Five personality traits, general self-esteem, or multidimensional perfectionism.

Aiming for construct clarity of a newly proposed conceptualization of perfectionistic strivings, Study I focused on the nomological networks of striving toward perfection vs. excellence in adolescence. Using structural equation modeling, this study investigated differential cross-sectional associations of striving toward perfection vs. excellence with the

Big Five traits and self-esteem. Study II focused on the intertwined developments among personality characteristics, specifically between each Big Five trait and self-esteem, while also examining their respective interindividual stabilities. I used continuous time modeling to investigate rank-order stabilities and the developmental interplay between each Big Five trait with self-esteem in a time-sensitive manner. Further, this study extended rater-perspectives and compared results from adolescents' personality self-reports to results derived from other-reports. Finally, Study III adopted a longitudinal perspective on striving toward perfection vs. excellence, using latent-growth curve modeling and cross-lagged panel modeling, to examine stability and change of the different strivings and investigate their longitudinal interplays with indicators of psychosocial maladjustment across three central life domains (i.e., school, social relationships, and mental health). Moreover, this study aimed to investigate potential mediating processes within these interplays by considering the role of perfectionistic concerns.

Together, the three studies offer nuanced insights into the development and functioning of adolescents' personalities. The findings support the conceptual distinction between striving toward perfection and striving toward excellence and demonstrate their differential associations with the Big Five and self-esteem. Further, personality characteristics exhibit moderate to high rank-order stability during adolescence, yet also change and interact in meaningful, temporally sensitive ways. Specifically, reciprocal associations were found between certain Big Five traits and adolescents' self-esteem, underscoring the dynamic interplay of different personality characteristics during this time of life. Finally, no longitudinal effects of striving toward perfection or excellence across different indicators of psychosocial maladjustment were observed. Theoretically, the key findings from this dissertation extend the multidimensional, multidirectional, and multifunctional principles of lifespan psychology by specifying how specific personality characteristics develop and function during adolescence. This dissertation further emphasizes the need to incorporate (developmental) timing and the intertwinement of personality characteristics to broaden our understanding of personality in adolescent (mal)adjustment. Methodologically, the use of continuous time modeling and multi-informant data highlights the value of fine-grained, temporally sensitive, and cross-perspective approaches. Future research should integrate multiscale, person-centered designs to explore how short-term personality dynamics accumulate into long-term developmental outcomes.

1. Theoretical Background

Among different life phases, adolescence stands out as a time that is marked by profound biological, psychological, and social developments (Damon & Lerner, 2008; Steinberg, 2023). While it was once labelled as a period of „storm and stress“ (Hall, 1904), most contemporary perspectives regard adolescence as a time of normative changes and challenges (e.g., Hollenstein & Lougheed, 2013). Accordingly, when navigated successfully, adolescence can be experienced as a life phase that is characterized by heightened exploration and expanding opportunities (Buchanan et al., 2023). Nevertheless, there are considerable interindividual differences in adolescents' *psychosocial adjustment*—their capacity to respond adequately to environmental demands, reach personal goals, be socially integrated, and maintain a sense of personal well-being (Madariaga et al., 2014). Specifically, adolescence marks the peak-onset age for many mental disorders (Kessler et al., 2007; Solmi et al., 2022), highlighting the importance of understanding the factors that shape adolescents' varying experiences. Against this backdrop, personality characteristics and their developments may offer valuable insights into how adolescents navigate and adjust to the changes and challenges during this life phase.

Over the past three decades, psychological research has compellingly demonstrated that people's *personalities*—their distinctive styles of thinking, feeling, and behaving (Roberts & Mroczek, 2008)—can change across the entire lifespan (Bleidorn et al., 2022; Roberts et al., 2006). Different personality characteristics, in turn, have been linked to individuals' psychosocial (mal)adjustment[1] (Beck & Jackson, 2022; Ozer & Benet-Martínez, 2006). In parallel, a growing number of researchers has adopted a *complex systems* perspective on personality (e.g., Cramer et al., 2012; DeYoung, 2015; Fajkowska, 2018; Mayer, 2015; Mischel & Shoda, 1995). While theoretical accounts differ in their respective foci, they converge on the idea that personality evolves through interactions among its components. Such a perspective raises important questions about the organization of and the developmental interplay between different personality characteristics. Along these lines, the life phase of adolescence offers a unique developmental context to investigate these questions as it constitutes a vital phase of personality (re-)organization (Hill & Edmonds, 2017; Mõttus et al., 2019; Soto & Tackett, 2015). However, gaps remain in our understanding of how different personality characteristics

[1] Across the three empirical studies that are comprised within this dissertation, I investigate both positive and negative indicators of adolescents' psychosocial adjustment. To highlight this dual perspective, I use the term "psychosocial (mal)adjustment", whenever I collectively refer to differently poled (i.e., positive and negative) indicators of psychosocial adjustment at the same time. I recognize that a categorization of behaviors or experiences as indicators of "maladjustment" can sometimes pose an oversimplification of adolescents' motivations and the potential importance of these behaviors and experiences in certain subgroups or contexts.

co-develop and interact during adolescence, especially in relation to psychosocial (mal)adjustment. Given that humans are further embedded into a configuration of surrounding *environmental systems* (Bronfenbrenner, 1979), their developments are thought to result from dynamic transactions between individual and environmental characteristics (e.g., Baltes, 1987; Magnusson & Stattin, 2007; Roberts & Nickel, 2021). These transactions can take various forms in adolescence, for example, through the influence of differing school environments or gender roles. Moreover, cross-temporal developments, such as living in increasingly performance-oriented societies might give rise to the importance of personality characteristics that relate to internalized performance standards (T. Curran & Hill, 2019). Building on these considerations, the study of associations between adolescents' personalities and their psychosocial (mal)adjustment across different areas of life call for an interdisciplinary and multimethodological approach that can foster a broader understanding of the intertwined structure, developments, and functioning of different personality characteristics during this period.

To address the identified research gaps, this dissertation investigates different characteristics of the personality system, aiming to deepen our understanding of individual characteristics while also contributing to a more holistic understanding of their intertwined developments and complementary roles in adolescents' psychosocial (mal)adjustment. To achieve this, I adopted a multimethodological approach, focusing on the Big Five traits, general self-esteem, and multidimensional perfectionism between mid- and late adolescence. The first chapter is structured as follows: First, to set the stage, I describe the developmental phase of adolescence and present central developmental tasks, focusing on the role of self-concept formation. Second, I introduce this dissertation's three main groups of personality constructs and review their links with adolescents' psychosocial (mal)adjustment in those domains that are of special importance during this phase of life. Third, I present three principles from lifespan psychology that address the complexity of human development—namely, (1) multidimensionality, (2) multidirectionality, and (3) multifunctionality. I then use these principles as guiding theoretical pillars, illustrating how they inform a multi-angled understanding of personality development and psychosocial (mal)adjustment in adolescence. To do so, I integrate and enrich the three developmental principles with theoretical notions from different psychological fields. Finally, bringing together theoretical considerations and empirical findings, I conclude the chapter by formulating the research objectives and providing an overview of the three empirical studies that are comprised within this dissertation.

1.1. Setting the Stage: Self-Concept Formation as a Central Developmental Task in Adolescence

Adolescence constitutes the transitional period between childhood and adulthood. It is considered to start with the onset of puberty and end with the adoption of adult social roles, such as entering work life or starting a family (Dahl et al., 2018; Lerner & Steinberg, 2009). Among different developmental phases, adolescence stands out for its many profound internal and external changes that occur within a relatively short period of time. To capture this multitude of biological, cognitive, and social changes, developmental literature (e.g., Lerner & Steinberg, 2009; Smetana et al., 2006) typically subdivides adolescence into three stages: early adolescence (ages 10 to 13), mid-adolescence (ages 14 to 16), and late adolescence (ages 17 to 19). However, considering the interindividual differences in starting puberty and transitioning into more adult social roles, such age-based distinctions should be regarded as approximations (Lehmiller, 2023; Steinberg, 2023). Moreover, delayed timing of role transitions across industrialized countries (e.g., prolonged durations of educational pathways) has expanded definitions of late adolescence up to the mid-20s (Sawyer et al., 2018).[2] The empirical studies in this dissertation focus on mid- to late adolescence. In the upcoming paragraphs, I draw on developmental literature to identify central developmental tasks that characterize this life phase to illustrate the broader developmental context in which personality characteristics develop and function during this time. In a second step, I focus on the specific developmental task of self-concept formation as it provides the core foundation for studying adolescents' (self-reported) personalities.

Based on the idea that psychosocial development emerges from the successful mastering of sequentially occurring demands, Havighurst (1948) proposed the concept of *developmental tasks*. Accordingly, each life stage is characterized by age-graded developmental tasks that arise from the interaction of physical developments, individual attributes, and societal expectations. Solving developmental tasks is thought to contribute to a positive development (Havighurst, 1948, 1956). Whereas some of the originally proposed tasks are considered to be universal across adolescents (e.g., developing a gender identity or building closer social bonds with peers), additional tasks have been suggested (Eschenbeck & Knauf, 2018) that are tied more strongly to historical developments (e.g., acquiring responsible digital media practices) or varying cultural norms (e.g., adhering to specific religious customs). In line with Havighurst's

[2] Some researchers propose a fourth stage, referred to as emerging adulthood that spans the early to mid-20s and accounts for changing societal roles and demands (Arnett, 2000; Arnett & Mitra, 2020). However, this stage may not universally apply across all cultural and societal settings (Côté & Bynner, 2008; Kloep & Hendry, 2014).

(1948) original conceptualization, mastering developmental tasks is thought to be closely related to psychosocial (mal)adjustment (e.g., Iannattone et al., 2024; Pinquart & Pfeiffer, 2020; Seiffge-Krenke & Gelhaar, 2008). Accordingly, apart from general well-being and mental health, psychosocial (mal)adjustment in adolescence most commonly refers to the adaptability and functioning across those developmental task domains that are of particular importance during this life stage (Madariaga et al., 2014). Three often-stated universal task domains are related to adolescents' identity and self-concept formation (Crocetti et al., 2008; Erikson, 1950; Klimstra & van Doeselaar, 2017), the navigation of social relationships (Collins & Steinberg, 2007; Newman et al., 2007), and the tackling of academic demands (Havighurst, 1948; Masten et al., 2008).

The formation of a coherent and ideally positive self-concept is considered to be a hallmark of adolescence and constitutes a special focus of this dissertation (Crone et al., 2022). At its core, people's *self-concept* can be defined as the knowledge and beliefs they have about their attributes and qualities (Harter, 2012). As such, self-concept formation constitutes an important prerequisite for personality self-reports. This is because someone's self-concept includes their *personality self-concept* (Asendorpf et al., 2002) which is their perception of their own typical patterns of thinking, feeling, and behaving. Given that adolescents are still in the midst of self-concept formation (Crone et al., 2022; Pfeifer & Peake, 2012; Sebastian et al., 2008), certain (socio-)cognitive processes warrant particular attention as they contribute to the unique ways in which adolescents perceive and evaluate themselves during this time in life. Specifically, adolescence is marked by improving abstract thinking, enhancing reflective processes, and growing perspective-taking abilities (Crone & Steinbeis, 2017; Dumontheil et al., 2010). Together, these processes contribute to adolescents' increasingly realistic and more differentiated self-evaluations (Crone et al., 2022). Along these lines, empirical findings point to a growing differentiation among personality characteristics from childhood to adolescence (Soto et al., 2008; Tackett et al., 2008) as well as growing between-person variance in personality ratings (Mõttus et al., 2019; Mõttus et al., 2017), underlining the increasingly individualized ways in which adolescents perceive and express themselves. The growing ability to adopt others' perspectives, accompanied by the increasing tendency to engage in social comparisons (Buunk et al., 2020), further contribute to more differentiated, however, potentially also more critical self-perceptions as adolescents become more attuned to external expectations and evaluations (Crone et al., 2022; Somerville, 2013; van der Aar et al., 2018). Correspondingly, self-evaluations tend to become less positive and more realistic between the ages of 9 and 25 (Harter, 2012). At the same time, the period between late childhood and early

adolescence is regarded to be the lower bound for obtaining psychometrically sound personality self-reports (Shiner et al., 2021), with varying but substantial agreement between personality self- and other-reports across different personality characteristics in adolescence (e.g., Göllner et al., 2017; Luan et al., 2017; Rohrer et al., 2018). Nevertheless, other-reports from family and friends can still be of special interest as they provide a complementary perspective on adolescents' developing personalities (Roberts & Nickel, 2021; Roberts & Wood, 2006). To sum up: On the one hand, the presented developmental processes underscore the growing validity of adolescents' self-reported personality ratings. On the other hand, they illustrate the unique developmental lens through which adolescents perceive and evaluate themselves. Along these lines, recognizing developmental influences is crucial when studying and interpreting personality in adolescence.

1.2. Entering the Scene: Adolescents' Personality Characteristics and their Links with Psychosocial (Mal)adjustment

As outlined in the previous section, adolescence represents a unique context in which personality development links to a person's psychosocial (mal)adjustment. In the following subsections, I introduce the three central groups of personality characteristics of this dissertation—the Big Five personality traits, global self-esteem, and perfectionism—review existing research on their developments during adolescence, and finally present selective findings on their links with psychosocial (mal)adjustment.

1.2.1 The Big Five Personality Traits: A Broad View on Basic Tendencies

Among the many characteristics that are used to describe individual differences, the *Big Five personality traits* are the most widely accepted taxonomy to study personality (John & Srivastava, 1999). Their development can be traced back to the works of Allport and Odbert (1936), who—based on the idea that personality characteristics should be encoded in everyday language (i.e., the lexical hypothesis; Galton, 1884)—used a seminal lexical approach to identify terms that describe individual differences in people's personalities. Decades later, semantic and empirical clustering procedures converged on The Five Factor Model (Goldberg, 1990; McCrae & Costa, 1987). The *Five Factor Model* proposes that personality can be organized hierarchically, ranging from five overarching traits to a higher number of more specific characteristics. At the highest level are the "Big Five": extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience that further encompass a number of more specific facets (Costa & McCrae, 2008; Soto & John, 2017). *Extraversion* describes the tendency to seek social interactions, be willing to express personal opinions, and experience

positive emotions, while *agreeableness* involves being actively concerned for others' well-being, hold positive beliefs about people, and behave politely. *Conscientiousness* is characterized by a preference for order and structure, being persistent in following goals, as well as being committed to duties and obligations. *Neuroticism* is the tendency to experience anxiety and fear, be prone to feelings of sadness, and have more volatile emotions. Finally, *openness to experience* describes the tendency to enjoy intellectual engagement, be creative, and responsive to beauty and art. The Big Five have proven useful to study personality across different cultures (e.g., Schmitt et al., 2007; Yamagata et al., 2006)[3] and age groups (e.g., Brandt et al., 2020; Soto et al., 2008). Over the years, other well-established frameworks (e.g., Ashton & Lee, 2007; DeYoung, 2015; van der Linden et al., 2010) have emerged, proposing varying numbers of higher-order personality factors that contribute uniquely to our understanding of humans' personalities. However, the Big Five continue to dominate personality research and are also central constructs in this dissertation.

When measuring the Big Five, research indicates both similarities and differences between adolescent and adult samples (Soto & Tackett, 2015). Notably, the same questionnaires can be used to measure the Big Five reliably across both age groups (Brandt et al., 2020; De Fruyt et al., 2000; Soto et al., 2008). Furthermore, the Big Five's hierarchical structure is evident in adults as well as adolescents (Soto & John, 2014; Tackett et al., 2012). However, a key difference is the stronger interrelatedness of certain traits in early adolescence (Soto et al., 2008; Tackett et al., 2008; van der Linden et al., 2010), suggesting that personality becomes more differentiated as adolescents get older.

Looking at the development of the Big Five, research most often focuses on rank-order stability and mean-level changes (Bleidorn et al., 2022; Roberts & DelVecchio, 2000; Roberts et al., 2006). *Rank-order stability* indicates how much individuals change in their relative position on a certain characteristic over time. *Mean-level changes* describe the direction and absolute difference in a certain characteristic over time, averaged over all individuals. Overall, the Big Five exhibit the lowest rank-order stabilities in adolescence, apart from childhood, with increasing stability up to middle adulthood (Bleidorn et al., 2022; Roberts & DelVecchio, 2000). Specifically, most studies report stabilities of self-rated Big Five traits in adolescence that range between .40 and .80 (e.g., Borghuis et al., 2017; Göllner et al., 2017; Klimstra et al., 2009; Vecchione et al., 2012). The values differ based on factors, such as the time span between assessments (i.e., higher for shorter time intervals), inventory type (i.e., higher for more

[3] Of note, this does not imply that Big-Five-related descriptions are fully available in all languages or that the Big Five are functionally universal across cultures (Thalmayer et al. 2022); nevertheless, they can provide a useful framework to study personality across different contexts.

comprehensive inventories), or the specific Big Five trait under consideration, with comparably higher values for conscientiousness than for agreeableness or openness to experience (Borghuis et al., 2017; Pullmann et al., 2006). Investigations of mean-level changes generally show less consistent trends. Whereas some studies point to increases in agreeableness, conscientiousness, or emotional stability (reversed neuroticism) that have been interpreted to reflect adolescent maturation processes (Branje et al., 2007; Klimstra et al., 2009), other studies find only slight mean-level changes (De Fruyt et al., 2006; Hill et al., 2013). Further, many (e.g., Borghuis et al., 2017; Gillespie et al., 2024; Luan et al., 2017) but not all (e.g., Brandes et al., 2021) longitudinal studies point to temporal dips (i.e., *disruptions*) during early or mid-adolescence in those traits that are associated with greater social maturity, suggesting a transitory shift toward harshness and irresponsibility (Soto & Tackett, 2015). Overall, lower levels of rank-order stabilities of the Big Five compared to later phases in life highlight adolescence as a crucial period of Big Five development. However, looking at rather inconsistent and mostly modest mean-level changes suggests that these developments may not occur consistently across individuals and samples (Hill & Edmonds, 2017).

1.2.2 General Self-Esteem: A Personality Characteristic and Psychosocial Adjustment Indicator

Alongside the Big Five, *self-esteem*—the subjective evaluation of one's general value as a person (Baumeister & Leary, 1995)—constitutes one of the most-widely studied personality characteristics in psychological research.[4] Contemporary understandings of self-esteem are rooted in early psychological theories that highlight the strong intertwinement between people's self-esteem and their social worlds, with the quality of social relationships as one major source and/or outcome of individual differences in people's self-esteem (e.g., M. A. Harris & Orth, 2020; Leary & Baumeister, 2000).

Given that adolescence is marked by increasing processes of identity exploration and self-concept development (Branje et al., 2021; Erikson, 1950), it is of special interest to understand how adolescents feel about themselves while they are grappling with questions of who they are or want to become. Along these lines, self-esteem is regarded as the evaluative component of people's self-concept (Greenwald et al., 1988; Harter, 1990; Weber et al., 2023),

[4] Self-esteem can be considered both at a general and a domain-specific (e.g., academic or relational self-esteem) level (Harter, 2012; von Soest et al., 2016). While the developmental pathways between general and domain-specific self-esteem are not fully understood (Dapp et al., 2023; Sorjonen & Melin, 2024), empirical findings indicate that general self-esteem is more than the simple sum or average of self-esteem across different domains (Rentzsch & Schröder-Abé, 2021; von Soest et al., 2016). In this dissertation, I focus on general self-esteem and simply refer to it as "self-esteem".

with higher levels of self-esteem being indicative of a more positive self-concept. Similar to the Big Five, adolescent self-esteem exhibits both similarities to and important differences from adult self-esteem. Adolescents, like adults, can provide valid self-reports regarding their self-esteem. So, whereas young children's self-esteem has to be inferred from their behaviors (i.e., behaviorally presented self-esteem), older children and young adolescents are thought to become increasingly able to report on their self-esteem (Harter, 2012).

However, certain developmental aspects differ between adults and adolescents. Notably, rank-order stability of self-esteem is still comparably lower in adolescence than in adulthood (Trzesniewski et al., 2003). Mean-level changes in self-esteem are rather modest in adolescence. While some older studies point to temporal dips of self-esteem in early adolescence (e.g., Robins et al., 2002; Young & Mroczek, 2003), meta-analytical results of longitudinal studies point to more stability or stagnation of self-esteem during this life phase (Orth et al., 2018). However, as for the development of the Big Five, it has to be highlighted that these are average values across individuals, with studies pointing to significant interindividual differences in developmental trajectories between adolescents (e.g., Birkeland et al., 2012; Morin et al., 2013).

1.2.3. Multidimensional Perfectionism: From Clinical Phenomenon to Multidimensional Personality Characteristic

Perfectionism has been described in psychological literature for many decades (e.g., Adler, 1938; Freud, 1926; Hamachek, 1978; Horney, 1950). Originating from clinical work, it has long been regarded as a unidimensional disposition with links to different psychopathologies (Burns, 1980; Garner et al., 1983). A vital step occurred during the early 1990's, when the first multidimensional measures of perfectionism were developed (Frost et al., 1990; Hewitt et al., 1991). Since then, a unifying element across different conceptualizations has been the notion that perfectionism is a multidimensional personality characteristic that is defined by two dimensions: the pursuit of excessively high standards—referred to as *perfectionistic strivings*—and accompanying critical self-evaluations, recurring worries, and concerns—referred to as *perfectionistic concerns* (Stoeber, 2018). Despite this common ground, perfectionism has been conceptualized (Flett & Hewitt, 2020; Smith et al., 2022) and operationalized (Lo et al., 2020) in various ways. Accordingly, empirical findings vary depending on the conceptualization and measure researchers applied.

Both past (Adler, 1938; Hamachek, 1978) and current (Blasberg et al., 2016; Gaudreau, 2019; Osenk et al., 2020) works have further called for the conceptual, theoretical, and empirical differentiation between "true" strivings toward perfection on the one hand and

"merely" ambitious strivings toward excellence on the other hand, arguing that their conflation might have obscured harmful aspects of striving toward perfection in past studies. Whereas *striving toward perfection* describes the tendency to strive toward unrealistically high standards in a relentless manner, *striving toward excellence* describes the tendency to strive toward high but attainable standards in a determined yet flexible manner (Gaudreau, 2019, 2021). The differentiation between the two types of striving and their potentially diverging effects on psychosocial (mal)adjustment have been formalized in the *Model of Excellencism and Perfectionism* (MEP; Gaudreau, 2019, 2021; Gaudreau et al., 2022). The MEP differentiates between striving toward perfection and striving toward excellence, regarding striving toward perfection as the "core definitional feature" (Gaudreau, 2021, p. 2) of perfectionism that is empirically related to striving toward excellence but conceptually distinct from it. First results from adult samples (Gaudreau et al., 2022, Study I and 2) and a mixed adolescent sample of Australian secondary school and university students (Tape et al., 2024) support the differentiation between the two types of striving. However, it remains unclear whether the differentiation between striving toward perfection and striving toward excellence transfers to more diverse samples of adolescents from different cultural backgrounds outside the Core Anglosphere.

Adolescence has been highlighted as a particularly sensitive time for the development of perfectionism (Flett & Hewitt, 2022; Morris & Lomax, 2014). This sensitivity likely stems from the simultaneous elevation of internal and external pressures (Damian et al., 2022): Internal pressures arise because adolescents become more aware of others' expectations and evaluative feedback (Andrews et al., 2021; Somerville, 2013). External pressures increase with the emphasis on performance (e.g., at school or sports; Fuligni, 2019). Cross-temporal analyses further indicate that living in increasingly performance-oriented societies might be driving rising levels of perfectionism among young people. Specifically, later generations of adolescents and young adults tend to report higher levels of perfectionism than earlier generations did when they were young (T. Curran & Hill, 2019). Despite growing scientific interest in the study of perfectionism over the last three decades, there are no longitudinal studies that have focused on rank-order stability and mean-level change of perfectionism across the lifespan that would allow a comparison between different life phases (Flett & Hewitt, 2020; Smith et al., 2022). Similarly, relatively few studies have investigated rank-order stability and mean-level changes of perfectionism during adolescence. Available findings mainly come from studies that focused on antecedents, correlates, or outcomes of adolescents' perfectionism and are challenging to integrate as they refer to different age groups, time spans, and perfectionism

dimensions. However, they point to moderate rank-order stabilities of perfectionism in mid-adolescence (i.e., *r* around .50) and indicate slightly decreasing (Damian et al., 2022) or stable (Vecchione et al., 2023) mean levels during adolescence, with considerable interindividual differences in developmental trajectories.

1.2.4. Personality and Psychosocial (Mal)adjustment in Adolescence

In the following, I review research on how the three central groups of personality characteristics examined in this dissertation relate to psychosocial (mal)adjustment during adolescence, focusing on social relationships, academics, and mental health. I then introduce the four specific indicators of psychosocial (mal)adjustment that are investigated across the three empirical papers of this dissertation: self-esteem, loneliness, procrastination, and depressive symptoms.

The Big Five, Self-Esteem, and Perfectionism and their Interrelations with Psychosocial (Mal)adjustment

The Big Five traits have received considerable attention for their robust links with different indicators of psychosocial (mal)adjustment (Beck & Jackson, 2022; Bleidorn et al., 2020; Ozer & Benet-Martínez, 2006). Although most empirical studies have focused on predictive effects in adults, there is a growing number of studies that examine associations between the Big Five and psychosocial (mal)adjustment in adolescence (De Fruyt et al., 2017; Soto & Tackett, 2015). Among the Big Five, extraversion, agreeableness, and neuroticism are the traits that are most consistently associated with interpersonal outcomes (e.g., Branje et al., 2004; Buecker et al., 2020; K. Harris & Vazire, 2016). Higher extraversion and agreeableness are beneficial for adolescents' peer relationships and relate to being liked by others (Jensen-Campbell et al., 2002; Selfhout et al., 2010), whereas neuroticism has been linked to shyness (Baardstu et al., 2020; Kwiatkowska & Rogoza, 2019) and more interpersonal conflicts (Bleckmann et al., 2024). Further, conscientiousness and openness to experience stand out for their consistent associations with school-related outcomes (Mammadov, 2022; Poropat, 2009). Higher levels of conscientiousness in adolescence have been linked to better grades (Brandt et al., 2021; Spengler et al., 2013), whereas openness to experience has been associated with stronger academic interests (Ziegler et al., 2012) and better performances in standardized tests (Spengler et al., 2013). Finally, most Big Five traits have been linked to higher psychopathology (i.e., mainly neuroticism), on the one hand, or to lower psychopathology and positive mental health (i.e., extraversion, agreeableness, and conscientiousness), on the other hand (Lamers et al., 2012; Mann et al., 2020). Synthesizing and extending available results on the Big Five and

psychosocial (mal)adjustment, Bleidorn et al. (2020) proposed a specific configuration of Big Five facets to describe the "psychologically healthy" individual. However, it has been noted that such global evaluations might be too short-sighted to account for the complex relationship between individual characteristics and psychosocial (mal)adjustment across people, specific contexts, or different outcomes (e.g., Arshad & Chung, 2022; Klimstra & McLean, 2025).

Self-esteem has been proposed as a central variable for a number of key life outcomes (Orth et al., 2012; Steiger et al., 2014; Trzesniewski et al., 2006). Meta-analytical findings underscore the reciprocal interplay between self-esteem and positively perceived social relationships across the entire life span, including the developmental phase of adolescence (M. A. Harris & Orth, 2020). In contrast, findings on the associations between adolescents' self-esteem and school-related variables are mixed. While there are some tentative hints on predictive effects from self-esteem on later academic achievement (Wagner, Brandt, et al., 2024), other studies indicate that self-esteem might rather be an outcome than a precedent of academic achievement (Tetzner et al., 2016). Finally, empirical findings mostly support links between adolescents' self-esteem and their mental health (e.g., D. Chen et al., 2024; Mcgee & Williams, 2000). Specifically, both lower levels as well as decreases in adolescents' self-esteem have been shown to predict later depressive symptoms (Birkeland et al., 2012; Orth et al., 2008; Steiger et al., 2014).

Given that the study of perfectionism is rooted in clinical psychology, the question of its (mal)adaptivity has always been at the core of perfectionism research. Egan et al. (2011) proposed that perfectionism might qualify as a transdiagnostic process (Harvey et al., 2004) or proximal risk factor (Nolen-Hoeksema & Watkins, 2011) that contributes to the development or aggravation of different psychopathologies and maladjustment across life domains. Along these lines, perfectionistic concerns have been found to be a robust predictor of lower academic achievement (Madigan, 2019; Osenk et al., 2020), interpersonal problems (Gilman et al., 2011; Magson et al., 2019), and different mental disorders (Lunn et al., 2023; Vacca et al., 2021) in adolescence and beyond. In contrast, findings for perfectionistic strivings have been mixed as they relate to both indicators of psychosocial adjustment (Damian et al., 2021; Madigan, 2019) and maladjustment (Boone et al., 2010; Smith et al., 2018). Accordingly, the (mal)adaptiveness of perfectionistic strivings has remained at the center of scientific disagreement. To address this issue, researchers have called for the differentiation between striving toward perfection and striving toward excellence, arguing that their conflation might have obscured harmful aspects of striving toward perfection in past studies (Blasberg et al., 2016; Gaudreau, 2019; Osenk et al., 2020). As such, the MEP proposes striving toward excellence as a benchmark to evaluate if

striving toward perfection beyond excellence yields any positive returns (Gaudreau et al., 2023).[5] As for the role of perfectionistic concerns, they are regarded as a signature expression of perfectionism that follow from striving toward perfection but not excellence and act as a mediating mechanism between striving toward perfection and psychosocial (mal)adjustment (Gaudreau, 2019). First empirical results point to differential effects from striving toward perfection vs. excellence on different indicators of psychosocial (mal)adjustment (Gaudreau et al., 2022, Studies 3 to 5; Goulet-Pelletier et al., 2022; Tape et al., 2024; With et al., 2024). However, it remains unclear if these diverging effects generalize to adolescence. Also, most studies on the MEP so far have been cross-sectional and therefore unsuitable to test predictive effects, the mediating role of perfectionistic concerns, or separate within-person (i.e., how changes in an individual's striving relate to changes in their (mal)adjustment over time) from between-person effects (i.e., how adolescents who differ in their typical level of striving differ in their overall adjustment).

To sum up, a large body of literature illustrates the robust links of adolescents' Big Five and their self-esteem with indicators of psychosocial (mal)adjustment across the social, the academic, and the mental health domain. In contrast, research on adolescents' striving toward perfection vs. excellence has remained sparse, so far.

Central Indicators of Psychosocial (Mal)adjustment in Adolescence

Referring to the strong association between developmental tasks and psychosocial (mal)adjustment (e.g., Iannattone et al., 2024; Pinquart & Pfeiffer, 2020; Seiffge-Krenke & Gelhaar, 2008), the four specific indicators of psychosocial (mal)adjustment that are examined in this dissertation—self-esteem, loneliness, procrastination, and depressive symptoms—are mapped more closely or loosely onto specific developmental task domains. Together, they tap into the most universal developmental task domains of the adolescent life phase (i.e., self-concept formation, forming social relationships, and tackling academic demands).

Self-esteem is examined in this dissertation in two ways. On the one hand, it is regarded as a personality characteristic and situated alongside the Big Five and perfectionism (see Subsection 1.2.2.). On the other hand, due to its robust associations with a wide range of beneficial psychological and health-related outcomes (Orth & Robins, 2014; Orth et al., 2014), researchers further often treat self-esteem as a general indicator of well-being or psychosocial

[5] To avoid confusion, I use the terms "striving toward perfection" and "striving toward excellence" when I refer to the respective characteristics on their own account (e.g., when looking at their longitudinal trajectories separately) and "striving toward perfection vs. excellence" when I refer to their associations with other variables in a multivariate framework as proposed by the MEP (e.g., when examining the predictive effect from striving toward perfection beyond excellence on an outcome variable).

adjustment (e.g., Gonzalez Avilés et al., 2021; Israel et al., 2022; Wantchekon & Umaña-Taylor, 2021). Along these lines, I also regard self-esteem as a personality characteristic and an indicator of psychosocial adjustment in the developmental task domain of self-concept formation (see Section 1.1.).

Loneliness describes the distressing feeling that accompanies the perceived discrepancy between the desired and actual quality or quantity of social relationships (de Jong Gierveld et al., 2018; Hawkley & Cacioppo, 2010). During adolescence, significant changes in social networks (Rubin et al., 2008; Wagner et al., 2014; Wrzus et al., 2013) can contribute to actual or perceived social disconnection, making adolescents particularly prone to feelings of loneliness (Laursen & Hartl, 2013). Furthermore, cross-temporal analyses indicate that loneliness has been increasing among younger generations of adolescents and young adults (Buecker et al., 2021; Twenge et al., 2021). While temporal feelings of loneliness are considered to be a fundamental part of being human, chronic loneliness can have detrimental effects on people's mental and physical health (Buecker & Neuber, 2024; Hawkley & Capitanio, 2015). Accordingly, loneliness serves as an indicator of psychosocial maladjustment in the developmental task domain of forming social relationships.

Procrastination refers to the irrational delay of things one intends to do and is common in, albeit not limited to, academic contexts (Klingsieck, 2013). It is a short-term strategy to avoid aversive experiences related to certain tasks by postponing their confrontation (Klingsieck, 2013; Sirois & Pychyl, 2013; Steel, 2007). Given their ongoing development of self-regulatory capacities (McClelland et al., 2018) and the growing complexity of academic demands after the transition into secondary school (Klassen et al., 2008), adolescents are thought to be especially prone to procrastination (Beutel et al., 2016).[6] Higher levels of procrastination are related to lower academic achievements as well as higher stress, depression, and anxiety levels (Beutel et al., 2016; Steel, 2007). As such, procrastination serves as an indicator of psychosocial maladjustment in the developmental task domain of tackling academic demands.

Depression is characterized by a variety of symptoms, such as anhedonia, sadness, guilt, suicidality, hopelessness, poor concentration, or feelings of worthlessness (American Psychiatric Association, 2013). If such symptoms reach a certain threshold, people may fulfill the criteria for a (categorical) depressive disorder. However, depression is also conceptualized

[6] So far, the only representative study to examine procrastination across the lifespan is a cross-sectional cohort study (Beutel et al., 2016). It thus remains unclear, if higher levels of procrastination in adolescents and young adults compared to middle-aged and older adults are due to general age-related developments or mainly influenced by cohort differences (e.g., younger cohorts nowadays might be more strongly influenced by internet availability).

as a dimensional variable that captures interindividual differences in depressive symptoms ranging from subclinical to clinical levels (Kotov et al., 2017; Markon et al., 2011). While the prevalence of depression is considered to be low in children, it rises in adolescence, with symptoms being likely to prevail into adulthood (Solmi et al., 2022). Whereas depressive symptoms cannot be closely mapped onto one specific developmental task domain, they are regarded as a general indicator of psychosocial maladjustment.

1.3. Looking From Different Angles: Integrating Theoretical Considerations on Adolescents' Personality (Development) and Summarizing Empirical Findings

In the previous section, I introduced this dissertation's three central groups of personality characteristics (i.e., the Big Five, self-esteem, and perfectionism), focusing on their normative developments during adolescence and their associations with psychosocial (mal)adjustment during this phase. While the separate consideration of each personality characteristic provides valuable insights into their respective development and associations with psychosocial (mal)adjustment, it does not address how the different characteristics relate to and complement each other in these regards. In line with the conceptualization of personality as a complex system (e.g., Cramer et al., 2012; DeYoung, 2015; Fajkowska, 2018; Mayer, 2015; Mischel & Shoda, 1995), personality is thought to evolve through interactions among its components. Against this backdrop, a more integrative theoretical perspective is necessary to reflect on the links among different personality characteristics between and within adolescents. *Lifespan psychology* offers such an integrative perspective (Baltes, 1987; Baltes et al., 2006). In essence, lifespan psychology highlights the importance of considering ongoing developments across all stages of life, as each stage uniquely contributes to the organization of human ontogenesis. However, because development unfolds sequentially, earlier life phases (e.g., childhood or adolescence) are particularly important as experiences and developments early in life can set the foundation for or constrain future opportunities and pathways (Baltes et al., 2006). To account for the complexity of human development, lifespan psychology further formulates a number of different developmental principles. Among these principles are the propositions that development is (1) multidimensional, (2) multidirectional, and (3) multifunctional (Baltes, 1987; Baltes et al., 2006).

In the following, I transfer these principles to the field of adolescent personality (development) and use the three principles as guiding theoretical pillars that foster a multi-angled perspective on adolescents' personality (development). I will further enrich these three rather broad developmental principles with theoretical considerations from different

psychological fields, summarize empirical evidence, and identify gaps in the scientific literature.

1.3.1. Multidimensionality of Adolescents' Personality: Need for Construct Clarity

Multidimensionality implies that multiple interacting characteristics contribute to human development. For example, social, cognitive, and physiological changes all contribute to adolescents' development (Collins & Steinberg, 2007; Lerner & Walls, 1999). Given that personality refers to the entirety of characteristics that make up someone's style of thinking, feeling, and behaving (Roberts & Mroczek, 2008), it is by definition considered to be multidimensional. In line with this, different personality models propose a varying selection of characteristics to describe peoples' personalities (e.g., Ashton & Lee, 2007; McAdams & Pals, 2006; McCrae & Costa, 2008; Roberts & Wood, 2006). Nevertheless, most personality researchers agree on the necessity for a limited number of key characteristics to economically describe individual differences in central aspects of peoples' personalities (Kandler et al., 2014; Wagner et al., 2020).

Along these lines, the localization of personality characteristics within their *nomological network*—that is, their representation of associated constructs, observable manifestations, and interrelationships (Cronbach & Meehl, 1955)—holds particular importance when introducing new personality constructs. This is because integrating newly proposed personality characteristics, such as differentiated striving toward perfection and striving toward excellence, into an established nomological network of more established personality characteristics is one way to enhance *construct clarity.* Thereby, it prevents conceptual redundancies and ultimately strengthening the overall coherence of personality models (Lawson & Robins, 2021; Ziegler et al., 2013). While different personality models typically propose some sort of structural organization of personality characteristics, suggesting a hierarchical (e.g., McCrae & Costa, 2008), layered (e.g., McAdams & Olson, 2010; McAdams & Pals, 2006), or horizontal structure (e.g., Roberts & Nickel, 2021; Roberts & Wood, 2006), they rarely specify how different personality characteristics relate to each other. This, however, is particularly interesting in adolescence, as the differentiation between different personality characteristics is still considered to be ongoing during this phase of life (Soto et al., 2008; van der Linden et al., 2010).

Empirical Evidence

Looking at the Big Five and self-esteem as the most widely studied personality characteristics in psychological research, several lines of evidence point to robust cross-

sectional associations between them (e.g., Amirazodi & Amirazodi, 2011; Israel et al., 2022; Robins et al., 2001; Zeigler-Hill et al., 2015). Specifically, higher levels of self-esteem are most strongly associated with higher levels of extraversion and lower levels of neuroticism, and to a lesser degree positively associated with conscientiousness, agreeableness, and openness to experience in adolescence and adulthood. Factor analytical findings further indicate that, while there are significant overlaps between the Big Five and self-esteem, they are still considered conceptually distinguishable (Erdle et al., 2009).

Similarly, it has long been debated whether perfectionism can be uniquely distinguished from other personality characteristics or whether it should be regarded as a high or neurotic form of conscientiousness (for a review, see Flett & Hewitt, 2020). Meta-analytic findings (Smith et al., 2019; Stricker, Buecker, et al., 2019) point to moderately high associations between striving toward perfection and conscientiousness. This link has been attributed to shared aspects between conscientiousness and striving toward perfection, such as high goal setting, dutifulness, or self-discipline (Dunkley et al., 2012; Stoeber et al., 2017). As for the associations with the remaining Big Five, different measures of striving toward perfection exhibit small to moderate positive correlations with openness to experience, extraversion, and neuroticism, as well as small negative to moderately positive correlations with agreeableness. Interestingly, the link between striving toward perfection and conscientiousness appears to be stronger in adolescent and young adult samples, while the association between striving toward perfection and neuroticism seems weaker in adult samples (Smith et al., 2019). Accordingly, adolescents and young adults who strive toward perfection seem to be more conscientious and less neurotic than their equally perfectionistic, older counterparts. In contrast, studies on the association between striving toward perfection and self-esteem have provided mixed findings, ranging from nonsignificant correlations (Fearn et al., 2022; Flett et al., 1991) to small positive ones in samples of adolescents and young adults (L. Chen et al., 2017; Chou et al., 2019; Stricker & Preckel, 2022). Overall, small to moderately high associations of striving toward perfection with the Big Five and self-esteem point to (substantial) overlaps but no indications of construct redundancies between the different personality characteristics.[7]

However, most studies so far do not differentiate between striving toward perfection and striving toward excellence as proposed by the MEP. It therefore remains unclear if this differentiated view on perfectionistic strivings proves valid across different populations, such

[7] The investigation of nomological networks is only one aspect that should be considered to investigate potential *construct redundancies* or *jangle fallacies* between personality constructs (i.e., wrongfully assuming that two constructs are different because they are labeled differently). Other aspects include the investigation of diverging developmental trajectories or the incremental validity in the prediction of external outcomes (see Gaudreau et al., 2022, for an example).

as non-English speaking adolescents from different academic backgrounds. First results from adult samples confirm the factorial distinctiveness between striving toward perfection and striving toward excellence (Gaudreau et al., 2022, Study 1; Goulet-Pelletier et al., 2022). Further, initial empirical evidence points to altered associations between striving toward perfection and the Big Five when controlling for striving toward excellence: Specifically, striving toward perfection vs. excellence is unrelated to conscientiousness, neuroticism, and extraversion but negatively associated with openness and agreeableness. This suggests that striving toward perfection, when disentangled from striving toward excellence, may reflect in elevated narrow-mindedness and harshness rather than overly conscientiousness patterns of feeling, thinking, and behaving. In contrast, striving toward excellence appears to be positively related to conscientiousness, openness to experience, and agreeableness, negatively associated with neuroticism, and unrelated to extraversion when controlled for its positive association with striving toward perfection in a sample of Canadian University students. Surprisingly, neither striving toward perfection nor excellence were associated with self-esteem in a large online sample of young adults (Gaudreau et al., 2022, Study 2).

In summary, while many studies have reported on the cross-sectional interrelations between the Big Five and self-esteem (e.g., Amirazodi & Amirazodi, 2011; Israel et al., 2022; Robins et al., 2001; Zeigler-Hill et al., 2015), little is known about their associations with the newly proposed construct of differentiated striving toward perfection vs. excellence. So far, initial evidence supports the distinction between striving toward perfection and striving toward excellence and illustrates their diverging nomological networks in adults (Gaudreau et al., 2022; Goulet-Pelletier et al., 2022). However, additional research is needed to investigate whether this distinction is valid in adolescent samples, further taking central contextual and individual variables, such as academic background and gender into account. As such, this dissertation addresses this empirical gap by examining the factorial and nomological validity of striving toward perfection vs. excellence in a diverse adolescent population.

1.3.2. Multidirectionality of Adolescents' Personality Development: Looking at Differential Stabilities and (Intertwined) Developments

The principle of *multidirectionality* describes diverging and non-linearly increasing developmental trajectories of individual characteristics within (i.e., in line with more *person-centered approaches*) and across (i.e., in line with more *variable-* or *function-centered approaches*) people (Baltes et al., 2006). Aligned with the latter, the *disruption hypothesis* describes temporal regressions in mean-level trajectories of socially desirable personality

characteristics during early and mid-adolescence (Soto et al., 2011), a time that is, on the other hand, simultaneously characterized by increasing socio-cognitive abilities (Steinberg, 2023).

Building on and extending the ideas of multidimensionality and multidirectionality, one might further ask whether the development of a certain personality characteristic predicts the development of another and/or vice versa. Along these lines, most conceptualizations of personality suggest that personality can be regarded at different levels of abstraction. For example, many personality models (e.g., Asendorpf & Motti–Stefanidi, 2018; Costa & McCrae, 2008; McAdams & Pals, 2006) distinguish between core traits and surface characteristics (sometimes also referred to as characteristics adaptations). While *core traits* explain relatively stable, cross-situational differences between individuals (e.g., a general tendency to be intellectually curious), *surface characteristics* reflect more specific, context-dependent attributes (e.g., having a strong interest in modern history). According to Kandler et al. (2014), core traits display higher cross-temporal stabilities—reflected in higher rank-order stabilities—than surface characteristics and influence the development of surface characteristics more strongly than the other way around.[8] What does this mean for the three central personality domains examined in this dissertation? Whereas the Big Five are explicitly characterized as core traits (e.g., DeYoung, 2015; McAdams & Pals, 2006; McCrae & Costa, 2008) and striving toward perfection and excellence have been introduced as characteristic adaptations (Gaudreau, 2019), researchers have been at odds whether self-esteem is a core trait or surface characteristic (Costa & McCrae, 2008; DeYoung, 2015).

The ambiguity about self-esteem opens up two perspectives on the interrelated development of different characteristics. On the one hand, changes in Big Five traits (as core traits) could drive changes in self-esteem (as a surface characteristic). On the other hand, self-esteem as an important personal resource (Crocker et al., 2010) may act as a catalyst for personality development by providing individuals with the confidence and motivation to engage in experiences that foster changes in broader patterns of thinking, feeling, and behaving. Adolescents with increasing self-esteem may, for instance, be more likely to proactively seek social and personal challenges (e.g., initiating conversations with new peers, taking on leadership roles), reinforcing traits like extraversion and conscientiousness. In contrast, those with decreasing self-esteem may focus more on self-protection and thus reduce opportunities for changes in social engagement or responsibility and further experience heightened self-

[8] In line with current considerations, one might not be able to perfectly discriminate between core traits and surface characteristics (Bleidorn et al., 2010; Henry & Mõttus, 2020; Kandler & Rauthmann, 2022). Nevertheless, personality characteristics might have certain attributes that make them "rather core" or "rather surface" like (e.g., Instinske & Kandler, 2024).

doubts, possibly contributing to increases in neuroticism. Such processes might be particularly pronounced in adolescence as this life period is characterized by less stability (Trzesniewski et al., 2003) and slightly lower levels of self-esteem compared to childhood (Chung et al., 2017). Finally, integrating the two perspectives, Big Five and self-esteem development might also be reciprocally intertwined. This would align with the perspectives that consider different personality characteristics to be on the same hierarchy and as such, equally influential on each other's developments (e.g., Roberts & Wood, 2006).

Empirical Evidence

The discussed theoretical perspectives on multidirectional personality development in adolescence pose two questions: First, what do we know so far about the developmental trajectories of the Big Five, self-esteem, and perfectionism in adolescence? Second, what evidence is there for interrelated development among these characteristics?

Prior research with adolescent samples shows that the Big Five do not develop uniformly in the direction of what is perceived as "mature" (e.g., Borghuis et al., 2017; Gillespie et al., 2024; Luan et al., 2017). Ringwald et al. (2024), for example, find diverging mean-level changes between facets of the same Big Five trait when looking at longitudinal data from a large sample of Mexican-origin youth between the ages of 14 to 23. In contrast, studies that investigate and compare developmental trajectories of different perfectionism dimensions in adolescence are rare (for exceptions, see Damian et al., 2022; Herman et al., 2013). Further, no study so far has investigated the developmental trajectories of differentiated striving toward perfection and striving toward excellence. It thus remains open, if the two strivings show multidirectional average trajectories.

With regard to rank-order stabilities, results from adult samples suggest that certain Big Five show higher stability levels of time than self-esteem (e.g., Anusic & Schimmack, 2016; Fetvadjiev & He, 2019; Instinske & Kandler, 2024). However, comparable studies with adolescent samples are missing, making it hard to assess if these findings can be replicated in earlier life phases. Interestingly, a study conducted by Rieger et al. (2017) points to comparable rank-order stabilities between the Big Five and different socio-cognitive variables (e.g., the academic self-concept or interest in certain school subjects) during adolescence. Such results might question a rigid view about the Big Five being core traits compared to self-evaluative characteristics like self-esteem, at least during adolescence. Regarding striving toward perfection and striving toward excellence, Gaudreau et al. (2022) found that striving toward perfection and excellence display moderate to high rank-order stabilities over the course of three to four months (i.e., *r*s ranging from .48 for striving toward excellence to .78 for striving

toward perfection). The higher stability of striving toward perfection might be attributed to its inherently rigid and unflexible nature which, in turn, could contribute to its maintenance (Gaudreau et al., 2022).

Nonetheless, higher rank-order stabilities do not necessarily imply predictive effects on related but less stable personality characteristics. Past research points to longitudinal associations between the Big Five and self-esteem in adulthood (e.g., Allemand et al., 2024; Fetvadjiev & He, 2019; Weidmann et al., 2017; Weidmann et al., 2018; Zeigler-Hill et al., 2015), with two studies (Fetvadjiev & He, 2019; Weidmann et al., 2018) explicitly targeting predictive effects between them. Specifically, Fetvadjiev and He (Fetvadjiev & He, 2019) found that within-person changes in extraversion, agreeableness, conscientiousness, and openness to experience predict increases in self-esteem more strongly than vice versa, indicating that Big Five traits drive self-esteem development more strongly than the other way around. Because of methodological reasons, they could not provide information on the comparison of effects between neuroticism and self-esteem. In contrast, Weidmann et al. (2018) found that between-person differences in the Big Five and self-esteem are mostly reciprocally related to each other across time. So far, there are no comparable studies in adolescence, leaving it open whether Big Five and self-esteem development are reciprocally intertwined or if only changes in one construct (group) predict changes in the other during this phase of life.

In summary, prior research suggests that personality characteristics do not develop uniformly across adolescence. However, comparable studies on perfectionism dimensions, particularly differentiated striving toward perfection and excellence, are missing, leaving their developmental trajectories and stability largely unexplored. The lack of longitudinal research on the interplay between the Big Five and self-esteem during adolescence further limits our understanding of interrelated changes between different personality characteristics. To address this gap, the present dissertation investigates the developments of different personality characteristics on their own and in relation to each other.

1.3.3. Multifunctionality of Adolescents' Personality: Investigating Differential Effects on Psychosocial (Mal)adjustment

Multifunctionality emphasizes that developments may serve different purposes at different stages in life and that some developments may come at the cost of others, thereby describing a dynamic of gains and losses. For instance, heightened risk-taking in adolescence supports exploration and learning but might also increases vulnerability to harm (Kelley et al., 2004). In line with such considerations, personality can be integrated into a broader developmental framework of psychosocial (mal)adjustment, emphasizing processes of multi-

and equifinality (Rutter & Sroufe, 2000; Tackett & Mullins-Sweatt, 2021). *Multifinality* refers to the idea that the same initial characteristic can lead to divergent psychosocial outcomes, depending on contextual influences, co-occurring traits, or developmental timing. In contrast, *equifinality* suggests that individuals may arrive at the same developmental outcome through different pathways. Both multifinality and equifinality have been considered as special cases of multifunctionality as proposed by Baltes (1987). Focusing on personality in adolescence, more or less closely related personality characteristics may have similar, differentiable, or even opposing effects on the same indicators of psychosocial (mal)adjustment. For example, being more extraverted or conscientious might both contribute to higher self-esteem (i.e., equifinality). In contrast, despite being centered around the pursuit of high standards, striving toward perfection and excellence might relate differently to psychosocial (mal)adjustment, respectively (i.e., multifinality in a broader sense).

While certain personality characteristics have generally been considered to be more or less favorable for people's psychosocial adjustment (e.g., Bleidorn et al., 2020; Enns et al., 2002; Roberts & Nickel, 2021), it has also been noted that individual characteristics cannot be uniformly regarded as adaptive or maladaptive (Klimstra & McLean, 2025; Watson & Casillas, 2003; Widiger et al., 2012). In line with this, many theoretical notions highlight transactions between people's individual characteristics and their environments to understand psychosocial (mal)adjustment in adolescence and beyond (e.g., Bronfenbrenner, 1979; Magnusson & Stattin, 2007; Shiner & Masten, 2002). Along these lines, the functionality of a certain personality characteristic might vary as a function of the respective context (Kandler & Rauthmann, 2022; Rauthmann, 2021). Thus, the functionality of personality characteristics must be considered in relation to specific developmental task domains, environments, subgroups, or timeframes. For example, pronounced striving toward perfection might foster academic success in certain academic environments but not others. Further, despite being central to any understanding of human functioning (Faulconer & Williams, 1985), temporality is rarely addressed systematically, and therefore, remains unintegrated within theories on personality development and psycho-social maladjustment (Hopwood et al., 2022; Luhmann et al., 2014). However, the functionality of personality characteristics might change across time. While this dissertation primarily focuses on the effects of personality characteristics on different indicators of psychosocial (mal)adjustment (i.e., self-esteem, procrastination, loneliness, and depressive symptoms), it still touches on the relevance of school context, gender, and temporal dynamics, aiming to provide a broader understanding of these associations.

Empirical Evidence

As illustrated in Subsection 1.2.4, both cross-sectional (e.g., Israel et al., 2022; Mcgee & Williams, 2000; Vacca et al., 2021) and longitudinal (e.g., D. Chen et al., 2024; Damian et al., 2021; Israel et al., 2023) studies support the associations between individual personality characteristics and different indicators of psychosocial (mal)adjustment in adolescence. However, according to the multifunctionality principle, the effects of personality characteristics on psychosocial (mal)adjustment might not be uniform. Different characteristics may predict similar outcomes, while the same or similar characteristics may have distinctive effects across subgroups or contexts.

Predictive effects from the Big Five on self-esteem in adult samples (Fetvadjiev & He, 2019; Weidmann et al., 2018) show that all of the Big Five traits might contribute to self-esteem development, illustrating the concept of equifinality. Further, Weidmann et al. (2018) found that predictive effects varied across men and women. Specifically, whereas negative predictive effects from neuroticism on later self-esteem were robust across genders, they found negative predictive effects from agreeableness on self-esteem for men and positive predictive effects from conscientiousness and openness to experience for women only, respectively (Weidmann et al., 2018). However, it remains unclear whether such gender-specific association patterns from adult samples transfer to adolescence, which role different school contexts play, and at which time scale predictive effects unfold.

Concerning the newly proposed differentiation between striving toward perfection and striving toward excellence (Gaudreau, 2019, 2021), results from adult samples (Gaudreau et al., 2022; Goulet-Pelletier et al., 2022) and a mixed sample of adolescents and young adults (Tape et al., 2024) indicate diverging effects from the two kinds of striving on psychosocial (mal)adjustment. Specifically, striving toward perfection but not excellence are cross-sectionally related to higher levels of impatience, imposter feelings, and fear of failure in adults (Gaudreau et al., 2022, Study II), as well as higher levels of depression, anxiety, and stress in adolescents (Tape et al., 2024). In contrast, striving toward excellence but not toward perfection has shown to be cross-sectionally associated with different indicators of mental well-being, such as optimism and connectedness (Tape et al., 2024) as well as life satisfaction, perceived progress in personal goals (Gaudreau et al., 2022, Study 2), and creativity (Goulet-Pelletier et al., 2022). Further, first longitudinal investigations point to positive predictive effects from striving toward excellence on later academic achievement and no or negative predictive effects on later academic achievement from striving toward perfection beyond excellence (Gaudreau et al., 2022, Study 5). However, none of the available studies so far has investigated the role

of different academic environments or genders, leaving open questions about the specific conditions under which these traits might be more or less adaptive.

Taken together, the current body of research underscores aspects of multifunctionality of the Big Five and perfectionism in adulthood, illustrating that different characteristics predict similar outcomes while the same or similar characteristics relate differently across psychosocial (mal)adjustment indicators. However, open questions of (multi)functionality remain for the newly proposed conceptualization of striving toward perfection vs. excellence. Further, there is a notable scarcity of findings that refer to adolescent samples, leaving the roles of the academic environment as implicated by different school types, gender, and time spans between assessments largely unaddressed. To address these gaps, the present dissertation assesses how different personality characteristics relate to a broad range of psychosocial (mal)adjustment indicators from different developmental task domains, taking the roles of school type, gender, and time into account.

1.4. **Research Objectives**

The overarching research objective of this dissertation is to broaden the view on adolescents' personalities. To address this objective, I adopted a multidisciplinary approach and integrated theoretical considerations from developmental, personality, and clinical psychology under three principles from lifespan psychology. Using these principles as guiding theoretical pillars and reflecting on relevant empirical findings, I identified research gaps with regard to each principle and formulated the following overarching research questions to address these gaps. The first question centers on the *multidimensional* nature of personality: How can less established personality characteristics (i.e., a new conceptualization of perfectionistic strivings that differentiates between striving toward perfection and striving toward excellence) be embedded into the nomological network of other, more widely studied personality characteristics (i.e., the Big Five and self-esteem)? In addressing this question, I aim to improve our understanding of perfectionistic striving in adolescence by comparing associations of striving toward perfection vs. excellence with the Big Five traits and self-esteem. The second question addresses aspects of *multidirectionality* in adolescents' personality development by investigating change and/or stability of the Big Five, self-esteem, and perfectionism: How do different personality characteristics develop on their own account and in relation to each other in mid and late adolescence? With the third question, I aim to illuminate the *multifunctionality* of adolescents' personality characteristics with regard to different indicators of psychosocial (mal)adjustment across multiple developmental task domains, taking the roles of gender, school

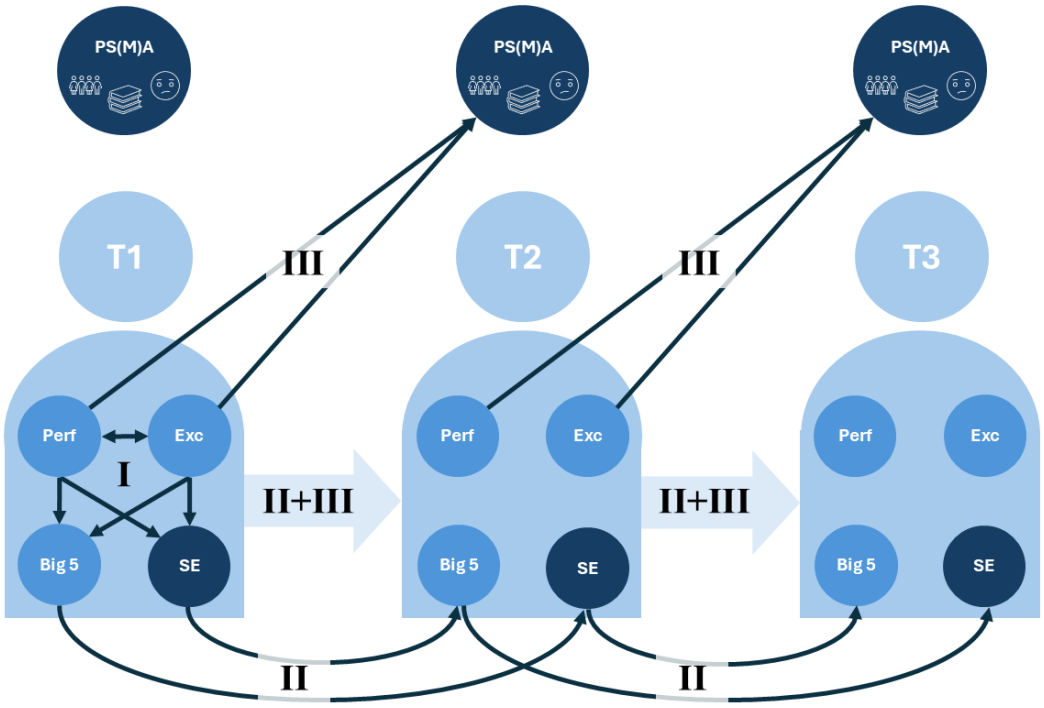
type, and time between assessments into account: How do different adolescents' personality characteristics relate to indicators of psychosocial (mal)adjustment?

To tackle the outlined research questions, I conducted three preregistered empirical studies that investigate how (the developments of) adolescents' personality characteristics are related to each other and different indicators of psychosocial (mal)adjustment. Each of the three studies focuses on specific aspects of the overarching research questions (see individual study descriptions).

The data for the studies comes from four adolescent samples: the SEED study (Wagner, Bien, et al., 2024), the SELFIE study (Wagner, Mueller, & Wieczorek, 2021) the SchoCo Study (Wagner, Wieczorek, et al., 2021), and the SNAP study (Wagner & Bleckmann, 2021). In the following subsections, I describe the scope of each study. Figure 1 provides a simplified study overview.

Figure 1

Study Overview



Note. This is a simplified study overview. PS(M)A = Psychosocial (Mal)adjustment including Loneliness, Procrastination, and Depressive Symptoms; Perf = Striving Toward Perfection; Exc = Striving Toward Excellence; Big 5 = the Big Five Personality Traits; SE = Self-Esteem (representing both a personality characteristic and an indicator of psychosocial (mal)adjustment). The Roman numerals refer to the respective study (Study I, Study II, and Study III).

1.4.1. Study I

Study I centered around the *multidimensionality* of adolescents' personalities. Further, treating self-esteem as an indicator of a positive self-concept, the study touched on questions of *multifunctionality* of striving toward perfection vs. excellence. Specifically, Study I focused on four research questions: First, it investigated the factorial structure of a newly translated German version of the Scale of Perfectionism and Excellencism (SCOPE; Gaudreau et al., 2022). Second, it examined the convergent and discriminant validity of the two German SCOPE subscales (i.e., striving toward perfection and striving toward excellence) by comparing their associations with another widely used measure of perfectionistic strivings (Frost et al., 1990). Third, it investigated the associations of striving toward perfection vs. excellence with the Big Five personality traits and self-esteem to embed the constructs within the broader nomological network of adolescent personalities. Fourth, touching on questions of generalizability, it investigated measurement invariance and mean-level differences across genders and school types.

To address these questions, I formulated four sets of hypotheses: First, drawing on findings from adult samples (Gaudreau et al., 2022, Study I), I hypothesized that striving toward perfection and excellence would emerge as two correlated but distinguishable and reliably measurable latent factors in adolescence. Second, also based on previously reported findings in adult samples (Gaudreau et al., 2022, Study II), I hypothesized that the SCOPE's striving toward perfection subscale would show convergent validity with another widely used measure of perfectionistic strivings, while the striving toward excellence subscale would show only small associations. Third, combining findings from adults samples (Gaudreau et al., 2022, Study II) with previously found age-differential effects (Smith et al., 2019), I predicted differential associations between the two SCOPE subscales with the Big Five traits and self-esteem, expecting striving toward perfection to show small positive associations with conscientiousness and self-esteem, and small negative associations with openness and agreeableness. For striving toward excellence, I predicted small to moderate associations with conscientiousness, agreeableness, openness, and self-esteem, along with a small negative association with neuroticism. Fourth, I predicted that striving toward perfection scores would be higher among girls than boys and that both types of striving would be higher among students from the academic track compared to the comprehensive school track.

I used data from the first measurement point of the SEED study (Wagner, Bien, et al., 2024), focusing on personality self-reports from 788 adolescents (M_{age} = 15.49 years) to test the pre-registered hypotheses. To investigate the psychometric properties of the German

SCOPE and the associations of striving toward perfection and excellence with the Big Five and self-esteem, I fitted a series of latent variable structural equation models (Bollen, 1989; Yuan & Bentler, 2006). Overall, Study I represents the first empirical attempt to validate the conceptual distinction between striving toward perfection and striving toward excellence in adolescence.

1.4.2. Study II

Overall, Study II addresses core aspects of *multidirectionality and multifunctionality* in adolescents' personality development by investigating developments in the Big Five and self-esteem on their own account and in relation to each other. To do so, Study II addressed three research questions: First, it explored the rank-order stabilities of all Big Five traits and self-esteem in adolescence. Second, it investigated whether adolescents' developments of certain Big Five traits and self-esteem are reciprocally related or whether predictive changes are mainly unidirectional. Third, it explored if results from self-reports would replicate when using other-reports of adolescents' personalities. While rank-order stabilities and acquaintance-reports were investigated exploratorily, I formulated four hypotheses to address the second research question: Based on theoretical assumptions (Roberts & Nickel, 2021; Roberts & Wood, 2006) and empirical findings from adult samples (Fetvadjiev & He, 2019; Weidmann et al., 2018), I assumed that a reciprocal interplay was most likely. Specifically, I predicted a positive reciprocal interplay between extraversion, agreeableness, and conscientiousness with self-esteem and a negative reciprocal interplay between neuroticism and self-esteem, taking school type and gender into account. I had no preregistered hypothesis about the developmental interplay between openness to experience and self-esteem but investigated their respective associations exploratorily.

To investigate the research questions from Study II, I integrated longitudinal data from three different adolescent samples (N = 1,088; M_{age} = 16.20 years): the SELFIE study (Wagner, Mueller, & Wieczorek, 2021), the SchoCo study (Wagner, Wieczorek, et al., 2021), and the SNAP study (Wagner & Bleckmann, 2021). I then applied hierarchical continuous time modeling (CTM; Driver & Voelkle, 2018)[9] to estimate rank-order stabilities and investigate the developmental interplay between each Big Five trait with self-esteem in a time-sensitive manner. Moreover, I extend results from personality self-reports with insights

[9] CTM is based on differential equations to treat time continuously instead of breaking it down into discrete time intervals as is done in more commonly used discrete time models (Driver & Voelkle, 2018). Following from this, CTMs can make use of the additional information that lies within (varying) interval lengths and allow the integration of information across longitudinal study samples with differing measurement intervals between assessments.

from other-reports, tapping on the question to what degree changes in personality are only part of a person's own self-perception or are similarly recognized by surrounding people. And, if so, to what degree changes in certain personality characteristics (e.g., certain Big Five), as noticed by others, are predictive of subsequent changes in further other-reported personality characteristics (e.g., self-esteem).

1.4.3. Study III

Finally, Study III centered around three research questions: First, extending Studies I and II, it investigated rank-order stabilities and mean-level changes of striving toward perfection and striving toward excellence over a period of up to nine months (*multidirectionality*). Second, it expanded the range of outcomes and aimed to investigate the longitudinal interplay between striving toward perfection vs. excellence with procrastination, loneliness, and depression on the between- and the within-person level (*multifunctionality*). Third, aiming to shed some light on potential processes between perfectionism and psychosocial maladjustment, it investigated the mediating role of perfectionistic concerns. To address these questions, I formulated three sets of hypotheses that were mainly based on theoretical considerations (Gaudreau, 2019, 2021) and initial findings in adult samples (Gaudreau et al., 2022, Studies 4 and 5). Addressing the first research question, I predicted moderately high rank-order stabilities for striving toward perfection (above .50) and striving toward excellence (above .40) as well as interindividual differences in mean-level trajectories for both types of striving. With regard to the second research question, I predicted positive predictive effects from striving toward perfection on procrastination, loneliness, and depressive symptoms on the between- and the within-person level. In turn, I predicted negative predictive effects from striving toward excellence on procrastination, loneliness, and depressive symptoms on the between- and the within-person level. Investigating between-person effects is useful for understanding how adolescents differ from one another in terms of their striving toward perfection vs. excellence and how these differences are predictive of their relative tendency to procrastinate, feel lonely, or experience symptoms of depression. This approach can, for example, inform the identification of potential vulnerable adolescent groups. Investigating average within-person effects, on the other hand, is useful for understanding how changes in adolescents' usual striving toward perfection vs. excellence might predict changes across different indicators of psychosocial maladjustment. Finally, with regard to the third research question, I predicted that positive predictive effects from striving toward perfection on procrastination, loneliness, and depression would be at least partially mediated by perfectionistic concerns.

As in Study I, I used data from the SEED study (Wagner, Bien, et al., 2024), this time including students that participated in any point of the three-wave longitudinal data collection (N = 931, M_{age} = 15.46 years). I applied second-order latent growth curve modeling (LGCM; Bollen & Curran, 2006; McArdle, 2009) alongside cross-lagged panel (CLPM; Campbell & Kenny, 2002; Rogosa, 1988) and random-intercept cross-lagged panel modeling (RI-CLPM; Hamaker et al., 2015).[10]

[10] Classical CLPMs estimate reciprocal associations over time by estimating directional associations while controlling for prior values of the respective variables (Campbell & Kenny, 2002; Rogosa, 1988). RI-CLPMs extend CLPMs by explicitly modeling more stable between-person differences using random intercepts (Hamaker et al., 2015).

2. Study I: Perfectionism and Excellencism in Adolescence

Who Tends to Be a Perfectionistic Adolescent? Distinguishing Perfectionism From Excellencism and Investigating the Links With the Big Five and Self-Esteem

The official citation that should be used in referencing this material is:

Bien, K., Wagner, J., & Brandt, N. D. (2025). Who tends to be a perfectionistic adolescent? Distinguishing perfectionism from excellencism and investigating the links with the Big Five and self-esteem. *British Journal of Psychology*, 116, 108-130. https://doi.org/10.1111/bjop.12739

Abstract

Striving toward perfection is an important concept of study, given its heterogenous associations with both positive and negative outcomes. To address this matter, recent work has emphasized the need to differentiate between striving toward perfection (perfectionism) and excellence (excellencism). However, the applicability of this differentiation in adolescence remains largely unexplored despite this life phase being particularly sensitive for the development of perfectionism. To better understand striving toward perfection in adolescence, we examined the psychometric properties of the German Scale of Perfectionism and Excellencism (SCOPE) and evaluated the nomological net with the Big Five and self-esteem in 788 German adolescents (Mage = 15.49 years; 50% female). Results underscored the distinctiveness of the different strivings in adolescents but pointed to mixed evidence regarding convergent and discriminant validities. Notably, striving toward perfection was related to lower levels of openness and self-esteem but higher levels of neuroticism, whereas striving toward excellence was related to higher levels of every trait except neuroticism. Finally, most results remained consistent across genders and school types. We discuss how the differentiation between perfectionism and excellencism deepens our understanding of adolescents' perfectionistic strivings and how it might inform future research across different psychological fields.

Keywords: perfectionism, excellencism, personality, adolescence

Who Tends to Be a Perfectionistic Adolescent? Distinguishing Perfectionism From Excellencism and Investigating the Links With the Big Five and Self-Esteem

Perfectionism is a timely topic in multiple areas of psychology due to its central role in psychological (mal)adjustment (Flett & Hewitt, 2020; Smith et al., 2022). Meanwhile, adolescence has been highlighted as a sensitive life phase for the development of perfectionism (Flett & Hewitt, 2022), with notably increasing levels in younger cohorts (Curran & Hill, 2019). However, one lingering issue in the study of perfectionism across all age groups has been the unclear differentiation and potential conflation between relentless, unrealistic striving toward perfection, so-called perfectionistic strivings, and determined but realistic strivings toward excellence across available questionnaires (Flett et al., 2017; Gaudreau, 2019; Osenk et al., 2020). At the same time, striving toward perfection shows quite mixed associations with both adaptive and maladaptive outcomes, such as academic achievement (Madigan, 2019) or depressive symptoms (Smith et al., 2021). A clearer differentiation between striving toward perfection and excellence could promote long-needed clarity and reflect in altered associations within the larger nomological net of personality characteristics; providing insights into how perfection strivers and excellence strivers differ in their characteristic patterns of thinking, feeling, and acting and thus laying a groundwork to clarify on some of the previous mixed findings of striving toward perfection with (mal)adaptive outcomes.

To follow the goal of a clearer differentiation between striving toward perfection (i.e., perfectionism) and excellence (i.e., excellencism), Gaudreau (2019) recently introduced the Model of Excellencism and Perfectionism (MEP) along with the newly developed Scale of Perfectionism and Excellencism (SCOPE; Gaudreau et al., 2022). Initial evidence in adult samples supports the two-factorial structure of striving toward perfection and striving toward excellence and points to convergent and discriminant validities of the SCOPE (Gaudreau et al., 2022). Also, striving toward perfection, when differentiated from striving toward excellence, appears to have an altered position in the nomological net of related personality characteristics (Gaudreau et al., 2022). However, it remains largely open how these results transfer to adolescence. Adolescence is a time period with pronounced changes of personality characteristics compared to later phases in life (Hill & Edmonds, 2017) and it marks the beginning of the steadily increasing differentiation of them (Mõttus et al., 2019; Soto et al., 2008).

To address the aim of enhancing our understanding of adolescents' perfectionism, we followed four goals: First, we aimed to test the two-factorial structure of striving toward perfection and excellence, which is proposed by the MEP. Second, we investigated convergent

and discriminant validities of SCOPE subscales by relating them to another widely used perfectionism scale. Third, we examined whether the nomological net of striving toward perfection and excellence with the Big Five and self-esteem has changed compared to older perfectionism taxonomies and explored the role of striving toward perfection within adolescents' multivariate personality networks. Fourth, touching on questions of generalizability, we considered the effects of gender and school type. Therefore, we introduced the first German translation of the SCOPE and analyzed self-reports from 788 German 10th graders.

On Being Perfect or Good Enough: Distinguishing Perfectionism and Excellencism

One proposition of the MEP is the differentiation between striving toward perfection and excellence (Gaudreau, 2019). A person who strives toward excellence sets high standards for themselves and strives toward them in a determined yet flexible manner (Gaudreau, 2019). In contrast, perfectionists envision a different endpoint to their strivings as they strive toward "idealized, flawless, and excessively high standards in a relentless manner" (Gaudreau, 2019, p. 200). Thus, the different kinds of striving should be correlated but conceptually distinguishable, as excellence strivers do not necessarily strive toward perfection, but perfection strivers strive toward excellence along the way. Consequently, striving toward perfection and excellence should be evaluated in a multivariate framework to account for their positive correlation (Gaudreau et al., 2023). In sum, the MEP does not propose a new definition of striving toward perfection but underlines the need to differentiate striving toward perfection from striving toward excellence on a conceptual and an empirical level. Further, the MEP proposes that perfectionistic concerns, including concerns over mistakes, doubts about actions, and overly critical self-evaluations, should be related to striving toward perfection but not excellence (Gaudreau, 2021).

To differentiate the two different strivings, Gaudreau et al. (2022) developed the Scale of Perfectionism and Excellencism (SCOPE) and evaluated its psychometric properties in multiple adult samples, which were mostly, but not exclusively, composed of university students. They found support for the proposed two-factorial structure of striving toward perfection and excellence. Further, they confirmed the SCOPE's convergent and discriminant validities, with striving toward perfection showing stronger associations with other widely used scales of striving toward perfection and perfectionistic concerns than striving toward excellence (Gaudreau et al., 2022). It remains unknown whether these findings replicate in adolescence and in academically more diverse, non-English speaking samples.

Adolescence is a particularly sensitive period for the development of perfectionism (Flett & Hewitt, 2022). This sensitivity is constituted by different aspects, including elevated expectations from society, institutions, and caregivers (Havighurst, 1948; Masten & Coatsworth, 1998) as well as adolescents' heightened awareness of these expectations (Rivis & Sheeran, 2003) and evaluations (Somerville, 2013). Empirically, up to every second adolescent scores high on one or more perfectionism dimensions (Sironic & Reeve, 2015; Ståhlberg et al., 2021).

The relevance of adolescents' perfectionism is further underlined by cross-temporal findings that point to increases in perfectionism among current generations compared to earlier born generations (Curran & Hill, 2019). However, these findings do not differentiate between striving toward perfection and excellence. Differentiating between potentially harmful, unrealistically high strivings toward perfection and ambitious but realistic strivings toward excellence complements our understanding of rising standards among adolescents and young adults in current generations.

Perfectionism Within the Nomological Net of Personality Characteristics

Localizing constructs within their nomological net—their representation of associated constructs, observable manifestations, and interrelationships (Cronbach & Meehl, 1955)—improves our understanding, allows comparisons, and reveals possible redundancies. The *five-factor model* (Goldberg, 1990; John et al., 2008) occupies a special role in personality psychology, offering an economical yet comprehensive description of characteristic patterns of thoughts, feelings, and actions in which individuals may differ (McCrae & Costa, 2008). The model differentiates five dimensions (i.e., often referred to as the *Big Five*) that are frequently studied in psychology and can provide guidance in the spectrum of different personality characteristics.

Another personality characteristic that has been studied in association with perfectionism is *self-esteem* (Stricker & Preckel, 2022; Taylor et al., 2016). Referring to the subjective evaluation of one's general value as a person (Rosenberg et al., 1995), self-esteem represents an important layer of personality that is not explicitly included in other personality taxonomies. Embedding striving toward perfection and excellence into the nomological network of other well-established and widely used personality characteristics is a straightforward way to illustrate their overlaps and differences between central personality characteristics. Further, it allows us to compare our results to available validation studies from adult samples (Gaudreau et al., 2022, Study II). Based on the conceptualization of striving toward perfection and excellence as so-called characteristic adaptations (Gaudreau, 2019), we

do not consider them as mere facets of other personality traits (e.g., conscientiousness or neuroticism, see Flett & Hewitt, 2020 for works on the uniqueness and incremental validity of perfectionism). Rather, we are primarily interested in how each of them is situated in the context of multiple other broader personality characteristics.

Perfectionism and the Big Five

Based on the traditional conceptualization of striving toward perfection, the strongest associations have been found with conscientiousness, reflecting common characteristics such as high goal setting, dutifulness, and self-discipline (Dunkley et al., 2012; Kim et al., 2015). For the associations with the remaining Big Five traits, meta-analytical results are more heterogeneous: Generally, striving toward perfection shows small to moderate positive associations with openness and extraversion, small negative to moderately positive associations with agreeableness, and small positive associations with neuroticism (Smith et al., 2019; Stricker et al., 2019). Interestingly, the association between striving toward perfection and conscientiousness appears to be stronger in adolescent and young adult samples, whereas the association with neuroticism appears to be weaker in adult samples (Smith et al., 2019). This suggests that younger perfection strivers tend to be more conscientious and less neurotic than their older counterparts. This might be a reflection of perfection strivers becoming less conscientious and more neurotic across the lifespan as they repeatedly fail to meet their unrealistic goals of perfection (Smith et al., 2019).

Comparing the nomological net of the Big Five and previous conceptualizations of perfectionism to initial findings that differentiate striving toward perfection from striving toward excellence shows some striking deviations: Specifically, striving toward perfection is unrelated to conscientiousness, neuroticism, and extraversion but negatively related to openness and agreeableness (Gaudreau et al., 2022). In contrast, striving toward excellence is positively associated with conscientiousness, openness, and agreeableness, negatively related to neuroticism, and unrelated to extraversion (Gaudreau et al., 2022). These complex association patterns underline the conceptualization of perfectionism and excellencism as characteristic adaptations which relate to many other personality characteristics without being redundant to them (Gaudreau et al., 2022). It remains open to what extent these patterns differ in adolescents. As perfectionistic adolescents potentially had yet fewer opportunities to miss their perfectionist goals compared to adults (Smith et al., 2019), one could assume less pronounced associations between striving toward perfection with low openness and low agreeableness levels or expect small positive associations between striving toward perfection and conscientiousness.

Perfectionism and Self-Esteem

As for previous associations between self-esteem and striving toward perfection, it has been suggested that positive effects might be explained by approach-focused goal orientations. Specifically, striving toward high standards is thought to be motivated by approach-focused goal orientations, which might enhance self-esteem via positive reinforcement principles (Blankstein et al., 2008). However, considering that perfection is naturally "intangible, fleeting, and rare" (Smith et al., 2019, p. 20), one could question whether this argumentation might be more applicable to striving toward excellence and less pronounced for properly measured striving toward perfection. Empirical findings have been mixed, with some studies finding positive (Grzegorek et al., 2004; Rice, Ashby, & Slaney, 2007; Stricker & Preckel, 2022) and others no associations (Fearn et al., 2022; Flett et al., 1991) between self-esteem and striving toward perfection.

Gaudreau et al. (2022) found no associations between self-esteem and either striving toward perfection or excellence. While these findings suggest no overlap between striving toward perfection and self-esteem, it remains unclear how these results transfer to adolescents, especially when considering the lower stability of self-esteem during this life phase (Trzesniewski et al., 2003). Similar to previous results (Robinson et al., 2021), one could expect small positive associations between striving toward perfection and self-esteem in adolescents that might eventually decrease in adulthood.

More Than the Sum of Its Parts? Exploring the Role of Perfectionism Within the Personality Network with the Big Five and Self-Esteem

To move one step further in understanding striving toward perfection and excellence, the two constructs might be considered in the more complex network of multiple interrelated personality characteristics. We know, for example, that certain Big Five (e.g., agreeableness and conscientiousness) tend to coalesce in younger age groups, indicated by stronger correlations between these traits (van der Linden et al., 2010). Further, high self-esteem has repeatedly been shown to be associated with certain manifestations of the Big Five (Erdle et al., 2009; Robins et al., 2001). Thus, a complementary approach that accounts for the multivariate, interrelated structure of personality (Cramer et al., 2012; Schmittmann et al., 2013) might offer more of a "bird's eye" perspective on perfectionism as it is embedded into a network of personality characteristics.

Looking at the average personality network, however, one may wonder whether the found associations are characteristic for all manifestations of perfectionism or whether striving toward perfection moderate the existence and strength of other associations in the personality

network. For instance, adolescents with high manifestations of striving toward perfection might be, on average, characterized by a somewhat different personality network than adolescents with lower manifestations. Based on bivariate results from Gaudreau et al. (2022), one might speculate whether this pattern results from dynamic interactions between personality traits that are especially pronounced in perfectionistic individuals, such as lower agreeableness or openness.

Perfectionism in Different Groups and Contexts: The Role of Gender and School Type

To expand on questions of generalizability in adolescent populations, individual and contextual aspects need to be integrated into the examination of the SCOPE's psychometric properties. When it comes to individual aspects, gender differences are an important first step in the consideration of generalizability. When it comes to contextual aspects, the Integrated Model of Development of Perfectionism suggests several contributors, highlighting the role of the academic context (Flett & Hewitt, 2002). It is currently unclear how the differentiation between striving toward perfection and excellence could alter existing findings.

Looking at mean levels of previous conceptualizations of striving toward perfection sometimes reveals slightly higher perfectionism scores for adolescent girls (Sand et al., 2021). Further, more girls are found at the upper extremes of striving toward perfection and perfectionistic concerns (Sand et al., 2021), suggesting that external or self-imposed expectations that are linked to their gender might play a role in some girls' perfectionism. However, other studies report no statistically significant gender differences in adolescents (Curran & Hill, 2019; Rice, Leever, et al., 2007).

Also, the school years are considered to be formative for the development of perfectionism (Flett et al., 2022). Referring to the school context as a place where performances are expected and evaluated, one might assume that it fosters the development of striving toward excellence or even perfection in some adolescents. However, school contexts differ in the demands and opportunities they provide for their students, and these differences seem to be meaningful with regard to students' personality characteristics (Brandt et al., 2020; Tetzner et al., 2020). More academically oriented schools might foster perfectionistic strivings as ambitious students could feel the need to strive toward something higher than excellence (i.e., perfection) to set themselves apart in a school context that is characterized by motivated and high-performing students. So far, no study has taken a closer look at school type effects. As a first approach, it is interesting to investigate the differences in adolescents' striving toward perfection and excellence between different school types in the same country.

The Present Study

To address the aim of enhancing construct clarity of adolescents' perfectionistic strivings, the present study investigates four objectives in a sample of 788 German 10th graders. First, we test if striving toward perfection and excellence are differentiable in adolescence. Drawing on theoretical considerations of the MEP (Gaudreau, 2019, 2021) and first empirical results in adulthood (Gaudreau et al., 2022), we propose the following preregistered hypotheses: Striving toward perfection and excellence are distinguishable and emerge as two distinct but correlated factors in adolescence (Hypothesis 1a). Further, the assumed two factors should be reliably assessed in terms of their internal consistencies (Hypothesis 1b). Second, we examined convergent and discriminant validities of the two factors from the German SCOPE (presented in this manuscript) with another widely used perfectionism scale. We used the personal standards dimension from the Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990) here. We hypothesized that the SCOPE's striving toward perfection subscale would show convergent validity with the FMPS personal standards scale (Hypothesis 2a), whereas the SCOPE's striving toward excellence subscale would show only small associations with the FMPS personal standards scale (Hypothesis 2b). Third, we investigated the associations of the striving toward perfection and excellence subscales with the Big Five and self-esteem. Investigating the nomological net of personality characteristics, we predicted associations between striving toward perfection with the Big Five and self-esteem (Hypothesis 3a), namely, small positive associations with conscientiousness and self-esteem and small negative associations with openness and agreeableness. Regarding striving toward excellence, we predicted associations with the Big Five and self-esteem (Hypothesis 3b), namely, small to moderate associations with conscientiousness, agreeableness, openness, and self-esteem, and lastly, a small negative association with neuroticism. Additionally, we explored the moderating role of striving toward perfection within adolescents' personality networks. Lastly, investigating generalizability, we considered the role of gender and school type by examining if our results on the SCOPE's factor structure, convergent, and discriminant validities, as well as the nomological net, differed between girls and boys or between students from the academic and from the comprehensive school track. We hypothesized that striving toward perfection are higher among girls than boys (Hypothesis 4a) and that scores for striving toward perfection and excellence are higher among students from the academic track (Hypothesis 4b). All further differences across genders and school types were investigated exploratorily.

Altogether, the current study extends existing research in three ways: First, we test aspects of the newly proposed MEP in a diverse sample of adolescent students outside the core

Anglosphere. Second, we introduce and evaluate the first German version of the SCOPE. Third, we analyze and discuss the potentially changed meaning of striving toward perfection with respect to the Big Five and self-esteem during a life phase that has proven to be essential for the development of personality characteristics.

Method

For the present study, we used data from the first measurement point of the SEED (Socio-Emotional Development in School) project. Data collection was approved by the local School Authority and the local ethics committee of the faculty of psychology and human movement science at the university of Hamburg (protocol code: 2022_045). The respective questionnaires were presented via the m-Path App (www.m-Path.io) on students' private mobile devices. Participants provided informed consent. The present study is considered a primary analysis of existing data. All hypotheses and the analytic plan were pre-registered before data analyses. The data, analysis codes, and research materials are available on the Open Science Framework (https://osf.io/aszf5/). We describe derivations from the pre-registration in Table OS1 in the online supplementary materials (OSM).

Participants

The sample consisted of N = 788 10th-grade students (mean age = 15.49 years, SD = 0.68 years, 95% of participants were 15 or 16 years old). Half (50%) identified as female. While 57% attended a school with an academic profile, 43% attended a comprehensive school. Forty-seven per cent of the students reported that they or at least one of their parents was born outside of Germany, which is comparable to the proportion in the corresponding age group in Hamburg, Germany. The participating students came from 12 different schools and 54 classes[1].

Sample Size Rationale

Regarding statistical power to detect effects from striving toward perfection and excellence on related personality characteristics, G*Power software (Faul et al., 2007) indicated that 495 participants are required to find small effects ($f^2 = 0.02$) with 80% power in a multiple regression with two predictors. Given previous research in adult samples (Gaudreau et al., 2022), we expected to find small- to medium-sized effects.

[1] We tested our results' robustness with regard to three criteria and identified 127 participants who declared in the quality check that they did not answer parts of the questionnaire honestly (1), answered one of our attention check items incorrectly (2), or displayed no variance in responding to at least one of the assessed personality characteristics (3). We performed all main analyses with and without these participants to compare the results. As the interpretation of effects did not change, we report the results that we obtained from analyzing the complete sample.

Measures

Striving toward perfection and **striving toward excellence** were assessed with a German translation of the Scale of Perfectionism and Excellencism (SCOPE; Gaudreau et al., 2022). The SCOPE consists of 22 items (11 items per factor) that are rated on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). An example item for striving toward perfection from the SCOPE is "As a person, my general goal in life is to have perfect performance." An example item for striving toward excellence from the SCOPE is "As a person, my general goal in life is to have very good performances." The German version of the SCOPE (presented in this manuscript) has been translated for the SEED project. For translation, we used a combination of the classical forward-backward translation and the so-called TRAPD method (Harkness, 2007) for survey translation. A description of the translation process can be found on page 3 in the OSM.

Personal standards (i.e., a traditional conceptualization of striving toward perfection) were assessed with the respective dimension of the German version of the Frost Multidimensional Perfectionism Scale (FMPS; Stoeber, 1995). The personal standards dimension consists of 7 items that are rated on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). An example item for personal standards is "I have extremely high goals." Scale-based reliabilities (McDonald's omega) can be found in Table 1 for all measures.

The Big Five personality traits were assessed with the German version of the Big Five Inventory 2 (BFI-2; Danner et al., 2019). The BFI-2 consists of 60 items (12 items per trait) that are rated on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). An example item for extraversion is "I am outgoing, sociable." Example items for the other dimensions can be found in Soto and John (2017).

Self-esteem was assessed with 4 items from the German short version of the Rosenberg Self-Esteem Scale (RSE-short; Collani & Herzberg, 2003) on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). An example item is "I take a positive attitude toward myself."

Gender was assessed by a dichotomous item (i.e., female or male) with the instruction to select the option with which one identifies most (i.e., If uncertain, please choose the sex that you can identify with the most.).

School type was subsequently coded. The dichotomous variable differentiates between schools with an academic profile (German: "Gymnasium") and comprehensive schools (German: "Gesamtschule"). In the German education system, schools with an academic profile focus on a more rigorous academic curriculum designed to prepare students for university,

while comprehensive schools provide a more diverse education, offering various types of school-leaving qualifications to cater to different student academic levels and career paths. The assignment is largely based on academic results during elementary school and these two tracks are known to differ with respect to values and norms (Brandt et al., 2020).

Analytic Strategy

We estimated structural equation models (SEMs). We start off with a description of the measurement models that served as input for the SEMs: First, we created four parcels for striving toward perfection and four parcels for striving toward excellence, each parcel consisting of two to three items. We combined the same items as Gaudreau et al. (2022) to construct the respective SCOPE parcels. We modeled striving toward perfection and striving toward excellence as covarying latent predictors in all SEMs to control for their shared variance. Further, we created two parcels of personal standards (i.e., a widely used measure of striving toward perfection in past studies), with one parcel consisting of four items and the other parcel consisting of three items. For the Big Five, we parceled across facets which results in three parcels, consisting of three items each, per trait. The four RSE-S items served as manifest indicators of the latent self-esteem factor. All models were identified using the effect coding method (Little et al., 2006) and were estimated using the mean- and variance-adjusted weighted least squares (WLSMV) estimator. We used established indices to evaluate the goodness of model fit (CFI >.95/90, RMSEA <.05/.08, and SRMR <.08/.11 for good/acceptable fit, change in fit criteria ΔCFI<.01, ΔRMSEA <.015, and ΔSRMR <.030; Hu & Bentler, 1999; Schermelleh-Engel et al., 2003).

To address the first aim of assessing the German SCOPE's factorial validity, we applied confirmatory factor analyses (CFA) and tested the hypothesized two-factor structure (Hypothesis 1a). We used fit indices to compare the fit of the two-factor model to an alternative one-factor solution. To assess the SCOPE's internal consistency, we computed McDonald's ω for each subscale. We considered values of 0.70 or higher as indicators of at least acceptable internal consistency (Hypothesis 1b).

Second, to assess convergent and discriminant validities of the German SCOPE with another widely-used perfectionism scale, personal standards were regressed on striving toward perfection and excellence. We hypothesized that striving toward perfection would positively predict personal standards (Hypothesis 2a), whereas striving toward excellence would maximally weakly predict personal standards (Hypothesis 2b). In accordance with a recently published paper (Gaudreau et al., 2023), we used a pick-a-point approach to calculate predicted values and effect sizes in personal standards for (a) nonexcellence/nonperfection strivers (-1SD

of striving toward excellence and -1SD for striving toward perfection), (b) excellence strivers (+1SD of striving toward excellence and -1SDfor striving toward perfection), and (c) perfection strivers (+1SD of striving toward excellence and +1SD for striving toward perfection). This approach places striving toward perfection and excellence as two dimensions with their own continuous distributions without dividing people into subgroups. For a detailed description of this approach, see Gaudreau et al. (2023).

To address the third aim of nomological validity and test Hypotheses 3a and 3b, we estimated the regression paths between striving toward perfection striving and excellence with the Big Five and self-esteem. Each model contained a combination of either one Big Five trait or self-esteem as the outcome with both striving toward perfection and striving toward excellence as predictors, resulting in six models. Figure OS1 on page 4 of the OSM shows an exemplary graphical representation of such a model. We further computed predicted values and effect sizes for nonexcellence/nonperfection strivers, excellence strivers, and perfection strivers across all personality characteristics.

To explore the moderating role of perfectionism within adolescents' personality networks, we applied moderated network modeling (MNM; Haslbeck et al., 2021). We assessed the stability of the network estimates and parameters across 200 bootstrap samples.

To address the fourth aim of examining our results' generalizability with regard to gender and school type, we estimated multi-group SEM-models and, first, examined measurement invariance across groups (Little, 2013). We evaluated the model fits of increasingly restrictive models starting with a configural model, testing metric invariance, and then, finally aiming to implement (partial) strong measurement invariance across groups. We then repeated all analyses from research aims 1, 2, and 3 separately for school type and gender exploratively and compared the results. To do so, we compared each model with freely estimated means to a simpler model where means for girls and boys or students from academic and comprehensive school tracks were constrained to equality using a deviancy test on the 2 Log-Likelihood statistics (Δ-2LL). Lastly, we compared levels of striving toward perfection and excellence across genders and school types (Hypotheses 4a and 4b).

We report exact *p*-values and discuss all effects significant up to $p < .05$. For a rigorous test of our hypotheses, we tested whether significant findings remained robust after adjusting p-values in the SEM-models with a false discovery rate procedure (Benjamini & Hochberg, 1995).

All analyses were conducted in *R Studio*, R version 4.3.0 (R Core Team, 2023). Models addressing the factorial validity, convergent and discriminant validities, the nomological net,

and the effects of gender and school type were estimated with the lavaan package, version 0.6-16 (Rosseel, 2012). The moderated network models addressing the moderating role of perfectionism within personality networks were estimated with the *mgm* package, version 1.2-14 (Haslbeck & Waldorp, 2017). Predicted values and effect sizes for nonexcellence/nonperfection strivers, excellence strivers, and perfection strivers were calculated with the MEP shiny App (https://model-of-excellencism-and-perfectionism.shinyapps.io/Shiny_Version2/).

Due to technical reasons of the study app, only fully completed questionnaires were transferred. Thus, there were no cases of missing data in the analyzed data set.

Results

Descriptive statistics and correlations can be found in Table 1. Distribution characteristics of each German SCOPE item are presented in Table OS2 in the OSM. Overall, all items were negatively skewed, indicating that the majority of students' responses were concentrated on the higher end of striving toward perfection and excellence. This tendency was more pronounced for striving toward excellence. In the following, we report findings on the psychometric properties of the German SCOPE in adolescents before we move on to the questions of the nomological net and generalizability.

Table 1

Means, Standard Deviations, and Correlations of the Perfectionism Scales, the Big Five and Self-Esteem.

	Variable	*M*	*SD*	ω	Intercorrelations									
					1	2	3	4	5	6	7	8	9	10
1	Perfectionistic Strivings (SCOPE Perfectionism)	4.89	1.35	.95										
2	Strivings Toward Excellence (SCOPE Excellencism)	5.55	1.01	.94	.64**									
3	Personal Standards (FMPS)	4.41	1.23	.90	.48**	.49**								
4	Extraversion	4.48	1.03	.87	.10**	.20**	.20**							
5	Agreeableness	4.78	0.87	.82	.01	.09**	-.01	.08*						
6	Conscientiousness	4.42	1.00	.87	.19**	.23**	.27**	.25**	.35**					
7	Neuroticism	4.17	1.05	.87	.15**	.04	.02	-.24**	-.20**	-.34**				
8	Openness	4.28	0.86	.81	.10**	.25**	.24**	.34**	.19**	.21**	-.04			
9	Self-Esteem	4.35	1.65	.92	-.13**	-.02	-.04	.40**	.16**	.36**	-.66**	.08*		
10	Gender (1 = female)	0.50	0.50		.08*	.07	-.01	.04	.20**	.11**	.38**	.16**	-.21**	
11	School Type (1 = academic track)	0.56	0.50		-.07*	.06	-.02	.09*	.11*	.06	-.07*	.06	-.02	.08*

Note. SCOPE = Scale of Perfectionism and Excellencism; FMPS = Frost Multidimensional Perfectionism Scale. * indicates $p < .05$; ** indicates $p < .01$.

Factorial Validity: Factor Structure and Internal Consistencies

The CFA provided good support for the fit of our hypothesized two-factor model (Hypothesis 1a) that differentiates between striving toward perfection and striving toward excellence ($\chi^2 = 85.52$, df = 19, p = .901, CFI = .998, RMSEA = .025, SRMR =.024). The two factors showed a moderate to strong correlation (r = .69, p < .001). Applying Fisher's r to z transformation (Fisher, 1915) to compare this correlation to the highest observed latent correlation (r = .47) in the samples of Gaudreau et al. (2022) revealed that the two factors correlated significantly stronger (z = 4.16, p < .001) in our sample than in each of Gaudreau's adult samples. Factor loadings are presented in Table OS3 in the OSM. We compared the fit of the two-factor model to an alternative one-factor model. This one-factor model showed worse model fit ($\chi^2 = 303.128$, df = 20, p < .001, CFI = .966, RMSEA = .113, SRMR =.106), indicating that although striving toward perfection and excellence appear to be stronger related in adolescence, they are already conceptually distinguishable. Furthermore, we performed a CFA on item-level. Results provided good fit for a two-factor solution. Factor loadings and model fit indices are presented in Table OS4 in the OSM. Results further provided evidence for the internal consistencies of the two SCOPE factors with $\omega = .95$ for perfectionistic strivings and $\omega = .94$ for strivings toward excellence (Hypothesis 1b).

Convergent and Discriminant Validity: Associations With Another Widely Used Perfectionism Measure

To control for the shared variance between the two SCOPE factors, we estimated a multivariate SEM, which fit the data well ($\chi^2 = 109.65$, df = 32, p = .978, CFI = .998, RMSEA = .023, SRMR =.024). Contrary to our hypothesis, results of this model revealed only a small association between striving toward perfection and personal standards ($\beta = .26$, p < .001). We found a moderate association between striving toward excellence and personal standards ($\beta = .39$, p < .001).

An explorative analysis revealed a moderately strong association between striving toward perfection and perfectionistic concerns that was measured with the concern over mistakes subscale from the FMPS ($\beta = .44$, p < .001). The corresponding associations between striving toward excellence and perfectionistic concerns, however, was not statistically significant ($\beta = -.01$, p = .821). Together, these findings show no clear support for the hypothesized convergent and discriminant validity of the SCOPE in our adolescent sample (Hypotheses 2a and 2b) when assessed with regard to the FMPS personal standards scale. Regarding a criterion capturing perfectionistic concerns, findings point to differential associations with the two SCOPE scales.

In addition, we calculated predicted values and effect sizes (see Table 2) for different levels of striving. The results complement standardized beta weights and show that personal standards tend to be highest in perfection strivers, followed by excellence strivers, and then nonstrivers. As for perfectionistic concerns, they tend to be highest in perfection strivers and comparably high in nonstrivers and excellence strivers.

Table 2

Predicted Values and Effect Sizes for Personal Standards and Perfectionistic Concerns at Different Levels of Striving

	Nonstrivers	Excellence Strivers	Perfection Strivers	Excellences vs. Nonstrivers	Perfection vs. Excellence Strivers	Perfection vs. Nonstrivers
FMPS – Personal Standards	3.67 [3.48; 3.86]	4.54 [4.54; 4.54]	5.15 [4.96; 5.34]	0.98	0.69	1.67
Perfectionistic Concerns	3.12 [2.92; 3.31]	3.09 [3.08; 3.09]	4.28 [4.08; 4.47]	-0.03	0.96	0.99

Note. Values in square brackets indicate the 83.4% confidence interval of the predicted value. As shown in Gaudreau et al. (2023, supplementary file), these should be interpreted with caution because a difference can be statistically significant even if two intervals are overlapping.

Nomological Net: Associations With the Big Five and Self-Esteem

Table 3 shows the latent associations between each Big Five trait and self-esteem with striving toward perfection and excellence derived from six multivariate SEMs. All models fit the data well. The different strivings show distinctive association patterns with the Big Five and self-esteem. Confirming one part of Hypothesis 3a, we found a statistically significant negative association between striving toward perfection and openness. This suggests that, controlling for levels of striving toward excellence, adolescents with higher levels of striving toward perfection are, on average, less open. Contrary to our hypothesis, the predicted negative associations with agreeableness as well as the predicted positive association with conscientiousness were not statistically significant despite pointing in the hypothesized directions. Two further findings were contrary to our hypothesis: First, we found a negative association between striving toward perfection and self-esteem, which suggests that, controlling for striving toward excellence, adolescents with higher levels of striving toward perfection are, on average, less self-confident. Second, we observed a positive association between striving toward perfection and neuroticism.

As for the associations with striving toward excellence, results were largely in line with Hypothesis 3b: We observed statistically significant positive associations between striving toward excellence with agreeableness, conscientiousness, openness, and self-esteem suggesting that, when controlling for striving toward perfection adolescents with higher levels of striving toward excellence are, on average, more agreeable, conscientious, open, and self-confident than adolescents with lower levels of striving toward excellence. The predicted negative association with neuroticism was not statistically significant, although pointing in the hypothesized direction. Also, we observed a positive association between striving toward excellence and extraversion.

Table 3

Standardized Regression Paths from Striving Toward Perfection and Striving Toward Excellence on the Big Five and Self-Esteem and Model Fit Indices

Dependent Variable	Correlated Predictors				Model Fit		
	Striving Toward Perfection		Striving Toward Excellence				
	β	*p*	β	*p*	CFI	RMSEA	SRMR
Extraversion	-.09	.147	**.29**	<.001	1.00	.025	.027
Agreeableness	-.13	.082	**.22**	.005	.987	.051	.046
Conscientiousness	.05	.433	**.25**	<.001	.996	.030	.031
Neuroticism	**.26**	<.001	-.11	.059	.996	.028	.029
Openness	**-.19**	.003	**.47**	<.001	.996	.028	.029
Self-Esteem	**-.25**	<.001	**.15**	.006	.999	.034	.034

Note. df = 41 in all models. Bold font indicates statistical significance at $p < .05$. All *p*-values remain significant after adjusting for multiple testing with the Benjamini-Hochberg procedure (Benjamini & Hochberg, 1995).

Further, we calculated predictive values and effect sizes (see Table 4) for the Big Five and self-esteem across different levels of strivings. The results complement standardized beta weights and show that excellence strivers tend to score higher on all Big Five traits (except neuroticism) and self-esteem than nonstrivers or perfection strivers. Also, perfection strivers tend to have the lowest levels of self-esteem and the highest levels of neuroticism. Predictive values for all outcomes are further visualized in Figure OS2 of the OSM.

Table 4

Predicted Values and Effect Sizes for the Big Five and Self-Esteem at Different Levels of Striving

	Nonstrivers	Excellence Strivers	Perfection Strivers	Excellences vs. Nonstrivers	Perfection vs. Excellence Strivers	Perfection vs. Nonstrivers
Extraversion	3.08 [2.93; 3.23]	3.61 [3.61; 3.61]	3.45 [3.30; 3.60]	0.60	-0.18	0.42
Agreeableness	4.14 [3.99; 4.29]	4.46 [4.45; 4.47]	4.28 [4.13; 4.43]	0.45	-0.26	0.19
Conscientiousness	2.88 [2.73; 3.03]	3.31 [3.31;3.31]	3.22 [3.07; 3.37]	0.51	-0.10	0.41
Neuroticism	3.73 [3.58; 3.89]	3.53 [3.53; 3.54]	4.00 [3.85; 4.16]	-0.23	0.53	0.30
Openness	3.01 [2.87; 3.15]	3.70 [3.69; 3.71]	3.42 [3.28; 3.56]	1.02	-0.41	0.61
Self-Esteem	4.58 [4.34; 4.82]	5.05 [5.04; 5.06]	4.29 [4.05; 4.53]	0.31	-0.51	-0.20

Note. Values in square brackets indicate the 83.4% confidence interval of the predicted value. As shown in Gaudreau et al. (2023, supplementary file), these should be interpreted with caution because a difference can be statistically significant even if two intervals are overlapping.

Network Analyses

The network model revealed pairwise cross-sectional associations of striving toward perfection with striving toward excellence (weight = .57, bootstrapped 95%-CI [.51; .62]), conscientiousness (weight = .11, bootstrapped 95%-CI [.00; .18]), neuroticism (weight = .07, bootstrapped 95%-CI [.00; .11]), and self-esteem (weight = -.05, bootstrapped 95%-CI [-.11; .00]). Further, there were pairwise cross-sectional interactions between strivings toward excellence with extraversion (weight = .06, bootstrapped 95%-CI [.00: .12]), conscientiousness (weight = .06, bootstrapped 95%-CI [.00; .12]), and openness (weight = .13, 95%-CI [.08; .19]). Whereas 100% of the bootstrap estimations showed non-zero edges between striving toward perfection and excellence and 99% of the bootstrap estimations showed non-zero edges between striving toward excellence and openness, the proportion of non-zero edges in the other bootstrap estimations varied between 4% and 58%.

There were no moderator effects of striving toward perfection (or any other characteristic) in the personality network. Figure OS3 in the OSM shows a graphical representation of the network model and Figure OS4 shows the edge weight estimations across all bootstrap estimations.

Gender and School Type Effects

We were able to establish strong measurement invariance for all models across genders and school types (cf., Table OS5 and OS6), indicating that the German SCOPE items are likely to be interpreted in similar ways across girls and boys as well as students from academically-oriented and comprehensive schools. We found no robust statistically significant differences between genders or school types in any of our models regarding the associations with other personality characteristics. All corresponding models and results on differences between genders and school types can be found in the Tables OS7 and OS8 in the OSM. In line with Hypothesis 4a, we observed statistically significant higher levels of striving toward perfection in girls compared to boys. However, this result was not robust against the correction for multiple testing. In addition, and contrary to Hypothesis 4b, we observed higher striving toward perfection among students from comprehensive schools than among students from academically-oriented schools (see Table 5).

Table 5

Latent Mean Differences in Perfectionistic Strivings and Striving Toward Excellence Across Genders and School Types

	Girls	Boys			Academic Track	Comprehensive School		
	M (*SD*)	*M* (*SD*)	*d*	*p*	*M* (*SD*)	*M* (*SD*)	*d*	*p*
Perfectionistic Strivings	4.98 (1.40)	4.77 (1.31)	0.16	**.027** †	4.78 (1.41)	5.00 (1.30)	**- 0.17**	**.024**
Striving Toward Excellence	5.59 (1.07)	5.46 (0.98)	0.10	.061	5.58 (0.95)	5.47 (1.10)	0.10	.171

Note. The *p*-value refers to the likelihood ratio test comparing the model with freely estimated mean parameters to the model with equal mean parameters; a significant *p*-value indicates a better fit of the more complex model. Bold font indicates statistical significance at $p < .05$. † indicates that *p* value did not remain significant after adjusting for multiple testing

Discussion

With the current study, we set out to increase construct clarity of striving toward perfection in adolescence. Therefore, we introduced a German version of the SCOPE (Gaudreau et al., 2022), evaluated its psychometric properties, and investigated the nomological net in a large and academically diverse sample of adolescents. We identified four main findings: First, generally replicating results from English-speaking adult samples, we established a two-factor structure and observed high internal consistencies of striving toward perfection and excellence. Second, partly differing from results in English-speaking adult samples, we found that striving toward perfection was only weakly associated with another widely used perfectionism measure, whereas striving toward excellence was moderately associated with it. Third, extending initial results from English-speaking adult samples, striving toward perfection and excellence showed differentiated nomological nets with the Big Five and self-esteem: Striving toward perfection was related to lower levels of openness and self-esteem but higher levels of neuroticism, whereas striving toward excellence was related to higher levels in every trait except neuroticism. Finally, our analyses revealed high levels of generalization across genders and school types. In the following, we discuss these findings and reflect on how the differentiation between perfectionism and excellencism contributes to a better understanding of striving toward perfection and might inform future research.

Perfectionism and Excellencism Are Distinguishable in Adolescents

Our results support the conceptual distinctiveness between striving toward perfection and excellence in adolescents. These findings are in line with the basic assumption of the MEP (Gaudreau, 2019) and fit well with first results derived from adult samples (Gaudreau et al., 2022), which suggest that the SCOPE can be used to extract distinct scores for striving toward perfection and excellence.

Interestingly, in line with findings from Tape et al. (2024)[2], we observed a stronger correlation between striving toward perfection and excellence than Gaudreau et al. (Gaudreau et al., 2022). As suggested by Tape et al. (2024), this might be related to the ongoing development of adolescents' self-concept (Pfeifer & Berkman, 2018). As a result, some personality characteristics tend to coalesce stronger in adolescents and only become more

[2] A final literature research after uploading the preregistration to our study and having finished all analyses brought our attention to a recently published paper on the SCOPE's psychometric properties in a sample of 350 Australian adolescents by Tape et al. (2024). While the majority of the sample consisted of female undergraduate psychology students from a public university, the remainder of the participants were secondary school students attending years 10 to 12 of a senior college. Given the partial overlap with our sample's age, the findings from Tape et al. (2024) provide a valuable reference point for the discussion of our results.

differentiated in adults (van der Linden et al., 2010). Against this background, the differentiated assessment of striving toward perfection and excellence might be particularly needed in younger samples to capture the nuances between these evolving characteristics effectively.

Mixed Results on Convergent and Discriminant Validities

In contrast to Gaudreau et al. (2022), we found only partial support for the convergent validity of the SCOPE's striving toward perfection dimension and no support for the discriminant validity of the striving toward excellence dimension. That is, although our analyses clearly support the two-dimensional nature of the SCOPE, associations with another widely used perfectionism scale did not emphasize their differential meaning with regard to previous conceptualizations of perfectionistic strivings. A potential reason that could explain these diverging findings might be that we the personal standards dimension from the FMPS (Frost et al., 1990), whereas Gaudreau et al. (2022) used the rigid perfectionism dimension from the Big Three Perfectionism Scale (Smith et al., 2016) and the self-oriented perfectionism dimension from the Multidimensional Perfectionism Scale (Hewitt et al., 1991). The most apparent linguistic difference between these scales is the use of the word "perfect". It is used in several items (e.g., "One of my goals is to be perfect in everything I do") throughout the rigid perfectionism and the self-oriented perfectionism dimensions but not the FMPS personal standards dimension, where the term is swapped for alternatives (e.g., "I expect higher performance in my daily tasks than most people"). In turn, the FMPS personal standards items might leave more room for interpretation as to whether, for example, "high performances" refer to unrealistically high standards of perfection or rather high but realistic strivings toward excellence. In line with this argument, Tape et al. (2024) also found no clear differentiation between striving toward perfection and striving toward excellence when looking at associations with two other perfectionism measures, which happened to also not contain the term "perfect" in their item formulations.

Overall, our findings corroborate previous accounts (i.e., including the MEP) on the potential conflation of striving toward perfection with striving toward excellence in existing measures, such as the FMPS (Blasberg et al., 2016; Osenk et al., 2020). Further, our results and those of Tape et al. (2024) suggest that conflations might be more pronounced in some measures than others and play out stronger in adolescents than adults.

Perfectionism and Excellencism Have Different Nomological Nets

Results on nomological nets emphasize the differential characteristics of striving toward perfection and excellence in the broader personality sphere. While these different positions in

the nomological net further corroborate the distinctiveness between striving toward perfection and excellence (Gaudreau, 2019, 2021), they also provide insights into how adolescent excellence and perfection strivers might differ. Against this background, we highlight three findings and discuss their relevance in the fields of academia and mental health.

First, and in line with findings from adult samples (Gaudreau et al., 2022), our results question the often-reported link between striving toward perfection and conscientiousness (Smith et al., 2019; Stricker et al., 2019), suggesting that previous findings might be attributable to the conflation of perfectionism and excellencism. Reflecting on the central role of conscientiousness in the prediction of academic achievement (Mammadov, 2022), future studies should further reevaluate previously reported positive links between striving toward perfection and achievement measures (Madigan, 2019), as these findings are potentially biased by the influence of striving toward excellence. It is an open question. which unique aspects of striving toward excellence drive the positive link with conscientiousness and which unique aspects of striving toward perfection are, in turn, negatively associated with conscientiousness.

Second, also in line with findings in adult samples (Gaudreau et al., 2022; Goulet-Pelletier et al., 2022), we observed opposing associations between striving toward perfection and excellence with openness: Adolescent perfection strivers reported lower openness, whereas adolescent excellence strivers reported higher openness. As scoring high in openness has proven to be a central predictor for academic (e.g., Israel et al., 2019; Spengler et al., 2016) and creative (Kaufman et al., 2016) achievements, future studies should reevaluate existing findings on positive links between striving toward perfection with academic achievements (Madigan, 2019) and indicators of creativity (e.g., Wigert et al., 2012). First findings in adult samples already suggest that striving toward excellence but not perfection are associated with better performances in divergent and associative thinking tasks (Goulet-Pelletier et al., 2022). Excellence strivers might have more internal capacities to be intellectually curious, enjoy novel experiences, or explore alternative ideas in contrast to perfection strivers, who might have their minds fixed on “one perfect approach” of doing things.

Third and contrary to our assumptions, striving toward perfection was associated with more negative self-evaluations as well as more anxious thoughts and feelings. Adolescent perfection strivers showed the lowest levels of self-esteem and highest levels of neuroticism when compared to excellence and nonstrivers. Excellence strivers, in turn, showed higher self-esteem and lower neuroticism than nonstrivers. We complement null findings in adult samples (Gaudreau et al., 2022) with the observation of an inverse association pattern between striving toward perfection and excellence with self-esteem. In combination, the findings on self-esteem

and neuroticism might be interpreted through the lens of perfectionistic concerns, which include doubts about one's actions as well as concerns about making mistakes when not meeting one's perfectionistic standards. In line with such thinking and in accordance with the MEP (Gaudreau, 2021) as well as previous empirical findings (Gaudreau et al., 2022), perfectionistic concerns were positively associated with striving toward perfection but not excellence in our sample. Perfection strivers showed the highest levels of perfectionistic concerns in our sample. Based on the diathesis-stress framework of perfectionism (Flett et al., 1995), which suggests that perfectionism is a vulnerability that leads to more psychological maladjustment when individuals experience challenging times, one could conclude that the life phase of adolescence represents such a challenging time, as adolescents are confronted with achievement-related stresses and transitions while also having a more volatile self-view (Trzesniewski et al., 2003).

Overall, our findings paint a complex picture of links between perfectionism, excellencism, and other personality characteristics. While striving toward perfection tends to align with patterns indicative of a less "healthy personality," striving toward excellence seems to align with a more adaptive personality profile in adolescents.

Little Differences Across Genders and School Types

We observed little differences in striving toward perfection and excellence among boys and girls or among students from different school types. One exception was a small effect suggesting higher levels of striving toward perfection but not excellence in girls. Our findings indicate that some, but not all girls have higher striving toward perfection than their male counterparts which has also been found in a previous study (Sand et al., 2021). However, the effect was not statistically significant after controlling for multiple testing. Overall, these findings align with previous studies that found only small or inconsistent gender effects among adolescents (Curran & Hill, 2019; Rice, Leever, et al., 2007) and should therefore be interpreted with caution.

As another exception and contrary to our hypothesis, we observed higher levels of striving toward perfection among students from comprehensive schools than among students from academically-oriented schools. One explanation for this might be the specific timing of our study in 10th grade. For students in German comprehensive schools, exams at the end of 10th grade decide whether students can continue with high school or need to leave school to start vocational training or get a job. In contrast, these exams have little long-term effects on students in the academic school track. This increases the stakes for students of comprehensive schools in this particular school year and potentially fosters higher levels of perfectionism as students strive to secure their desired future.

Overall, high levels of generalization across genders and school types suggest that the pressures to achieve and the internalization of very high standards may affect adolescents broadly. This corroborates adolescence as a vulnerable developmental phase for perfectionism (Flett & Hewitt, 2022) and suggests that (academic) demands pose great challenges for adolescents.

Strengths and Limitations

The present study has several strengths: First, it was a preregistered test of theoretically and empirically derived hypotheses on the applicability of the MEP in an adolescent population. Second, we relied on a sufficiently-powered sample of German students, which was balanced in terms of gender and academic background, thereby addressing the often-stated need for perfectionism research in more academically diverse and gender-balanced samples outside the core Anglosphere (Smith et al., 2022). Third, by embedding the SCOPE scales into the nomological net of central personality characteristics, namely the Big Five and self-esteem, we establish striving toward perfection and excellence in adolescence and reflect on their differential patterns of acting, thinking, and feeling.

Despite these strengths, we acknowledge several limitations. First, we relied on self-report measures, which might have inflated observed associations between the SCOPE scales and other personality characteristics due to common methods bias (Podsakoff et al., 2012). Future research could use additional sources (e.g., personality other-reports or structured interviews) and try to replicate our findings. As a second limitation, the use of cross-sectional data in our study does not allow conclusions about the stabilities of adolescents' strivings toward perfection and excellence, which would further complement the evaluation of the reliability of the German SCOPE version. Finally, we tested convergent and discriminant validities of the German SCOPE dimensions with the personal standards dimension from the FMPS (Frost et al., 1990); other perfectionism scales could complement the picture. Reflecting on the mixed results with regard to the mentioned validity measures, the inclusion of multiple perfectionism measures could help to derive hypotheses on whether our findings might be due to idiosyncratic linguistic features of the respective perfectionism scale, participants' younger age, or even peculiarities of the German translation.

Conclusion and Outlook

The present study set out to better understand perfectionism in a diverse sample of German adolescents. By investigating the psychometric properties of the German SCOPE and evaluating the nomological net with further personality characteristics, our results are able to

complement and extend initial insights into the applicability of the MEP in adolescence (Gaudreau et al., 2022; Tape et al., 2024), confirming the need for a more differentiated conceptualization and operationalization of striving toward perfection. Adolescent perfection strivers can be characterized by less open and less self-confident but more neurotic patterns of acting, thinking, and feeling when compared to their less perfectionistic but excellence striving peers. Our results have practical implications for the study and interpretation of perfectionism in adolescent samples. Starting off, they underline the necessity of differentiating between perfectionism and excellencism in perfectionism research among adolescents. Hopefully, the newly developed German translation of the SCOPE will be used in future studies to further understand the adaptive and maladaptive sides of perfectionism. Moving forward, our findings lay the basis for the investigation of potentially differential longitudinal effects of striving toward perfection and excellence on indicators of academic achievement or mental health in adolescence. Whether students should aim toward excellence rather than perfection to be more productive, popular, or happy is a question of further research.

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Supplemental Material Study I

Table OS 1

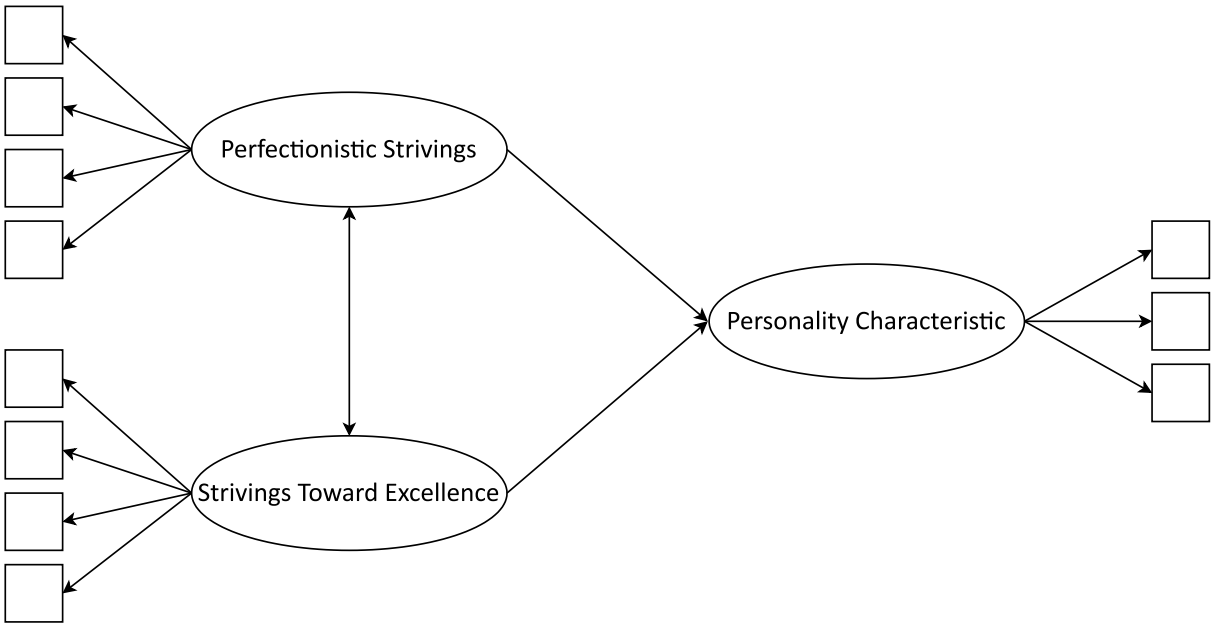
Deviations From The Pre-Registration

Pre-Registered Plan	Deviation	Reasons for Deviation
We pre-registered to estimate the confirmatory factor analysis and the structural equation models with the maximum-likelihood robust estimator (MLR).	We estimated and reported the confirmatory factor analysis and the structural equation models with the mean- and variance-adjusted weighted least squares (WLSMV) estimator.	To replicate previous research from adult samples, we adjusted our estimator to match it to Gaudreau et al. (2022). The WLSMV estimator is particularly appropriate when treating ordinal data and dealing with deviations from multivariate normality caused by Likert scales (Sellbom & Tellegen, 2019). Still, we checked for differences between results derived from the two different estimators. The estimation of the confirmatory factor analysis with the MLR estimator yielded highly comparable factor loadings $\Delta\lambda \leq .01$) with excellent model fit in terms of the CFA (.972) and SRMR (.025), however, a slightly elevated RMSEA (.100) in selected models.

Translation Process of the Scale of Perfectionism and Excellencism From English to German

For the translation, we used a combination of the classical forward-backward translation and the so-called TRAPD method (Harkness, 2007) for survey translation. We had assistance from two English native speakers and two German native speakers. All four were fluent (at least C1) in the respective language that was not their mother tongue or were raised bilingually. The procedure included five steps: First, the two German native speakers translated the English SCOPE version independently from another. Second, they discussed discrepancies and agreed on a preliminary German version. Third, the two English native speakers translated the preliminary German version back into English. Fourth, they discussed discrepancies and agreed on an English version. Fifth, all translators compared the two English versions and discussed differences, and adjusted the German version in those cases, where the forward-backward translation had yielded diverging results.

Figure OS 1



Note. Squares denote manifest variables (parcels) and ellipses depict latent variables.

Table OS2

German Translation of Perfectionism and Excellencism Scale (SCOPE) and Distribution Properties

Original Item	German Translation	*M*	*SD*	Skewness	Kurtosis
Excellencism (Striving Toward Excellence):	Exzellenzismus:				
As a person, my general goal in life is to …	Für mich als Person ist mein generelles Ziel im Leben …				
1) … have very good performances.	… sehr gute Leistungen zu erbringen.	5.62	1.35	-1.17	4.18
2) … be a competent person.	… eine kompetente Person zu sein.	5.79	1.22	-1.14	4.46
3) … accomplish great things.	… großartige Dinge zu vollbringen.	5.48	1.40	-0.90	3.46
4) … be very productive.	… sehr produktiv zu sein.	5.41	1.44	-0.89	3.33
5) … be a skilful person.	… eine fähige Person zu sein.	5.83	1.24	-1.29	4.92
6) … produce high quality work.	… qualitativ hochwertige Arbeit zu leisten.	5.76	1.25	-1.13	4.35
7) … attain difficult but realistic goals.	… schwierige, aber realistische Ziele zu erreichen.	5.82	1.25	-1.27	4.78
8) … successfully learn difficult things.	… schwierige Dinge erfolgreich zu erlernen.	5.64	1.25	-1.01	4.08
9) … reach excellence.	… Exzellenz (Herausragendes) zu erreichen.	5.15	1.50	-0.67	2.83
10) … perform very well.	… sehr gut zu leisten.	5.62	1.28	-0.96	3.70
11) … work very hard until I reach excellence.	… sehr hart zu arbeiten, bis ich Exzellenz (Herausragendes) erreiche.	4.94	1.67	-0.58	2.54
Perfectionism (Striving Toward Perfection):	Perfektionismus:				
As a person, my general goal in life is to …	Für mich als Person ist mein generelles Ziel im Leben …				
1) … have perfect performances.	… perfekte Leistungen zu erbringen.	5.25	1.63	-0.88	2.91
2) … be a perfect person.	… eine perfekte Person zu sein.	4.73	1.81	-0.48	2.19
3) … accomplish great things perfectly.	… großartige Dinge perfekt zu vollbringen.	5.15	1.80	-0.81	3.00
4) … be exceptionally productive all the time.	… die ganze Zeit über äußerst produktiv zu sein.	4.81	1.70	-0.48	2.26
5) … be a flawless person.	… eine makellose Person zu sein.	4.37	1.80	-0.19	2.01
6) … produce error-free work.	… fehlerfreie Arbeit zu leisten.	5.09	1.71	-0.70	2.54
7) … attain perfection.	… Perfektion zu erlangen.	4.87	1.74	-0.53	2.34
8) … perfectly learn difficult things.	… schwierige Dinge perfekt zu erlernen.	5.34	1.54	-0.91	3.20
9) … reach perfection.	… Perfektion zu erreichen.	4.83	1.77	-0.52	2.31
10) … perform perfectly.	… perfekt zu leisten.	4.98	1.75	-0.69	2.55
11) … work relentlessly until I reach perfection.	… unermüdlich zu arbeiten, bis ich Perfektion erreiche.	4.39	1.90	-0.29	1.95

Table OS 3

Standardized Primary Factor Loadings of the SCOPE Parcels

	Factors	
Parcels	Striving Toward Perfection (Perfectionism)	Striving Toward Excellence (Excellencism)
P1	.88	
P2	.86	
P3	.90	
P4	.87	
E1		.86
E2		.84
E3		.86
E4		.88

Note. P1 = first perfectionism parcel, P2 = second perfectionism parcel, etc.; E1 = first excellencism parcel, E2 = second excellencism parcel, etc.

Table OS4

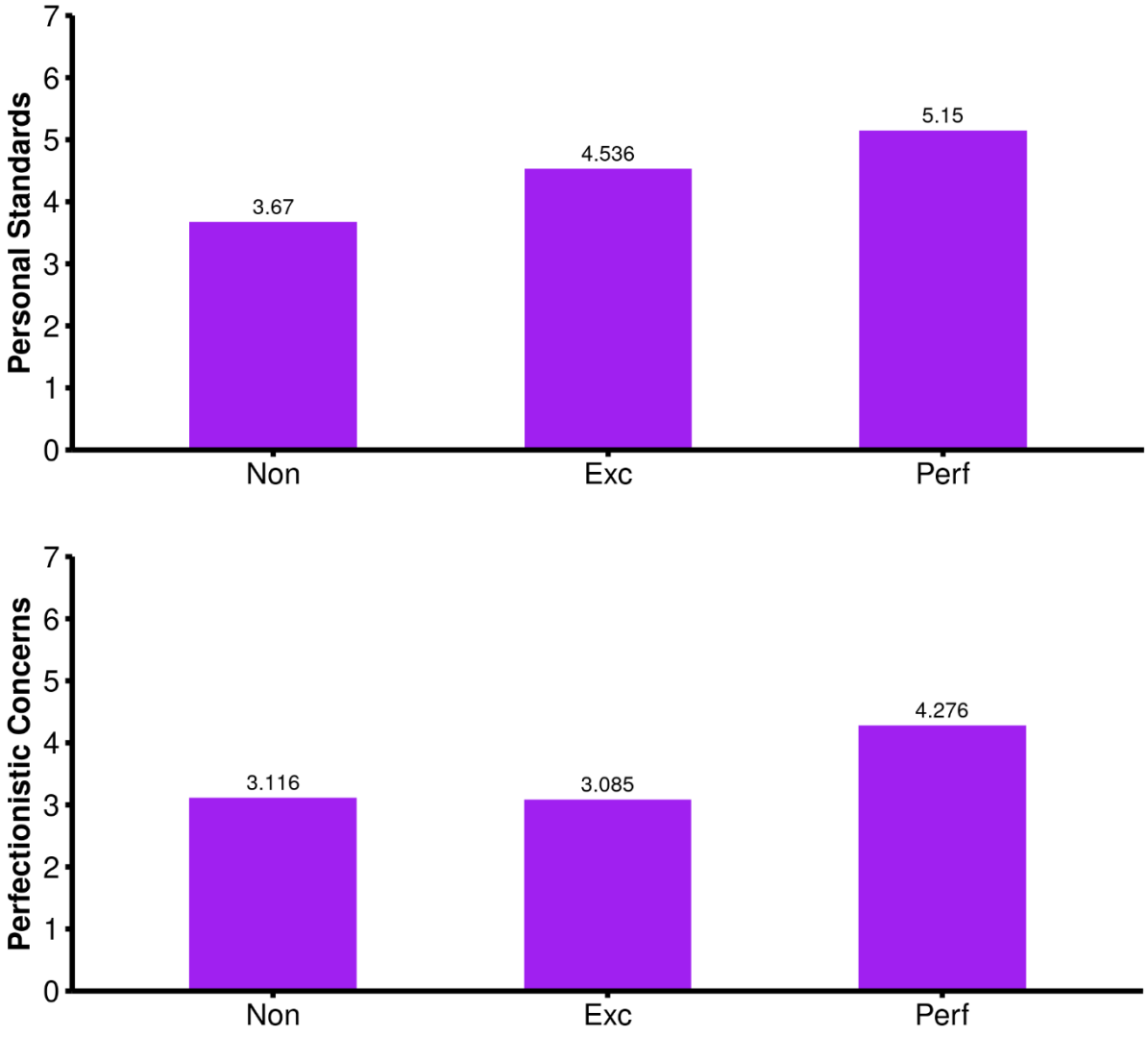
Standardized Primary Factor Loadings of the German SCOPE Items

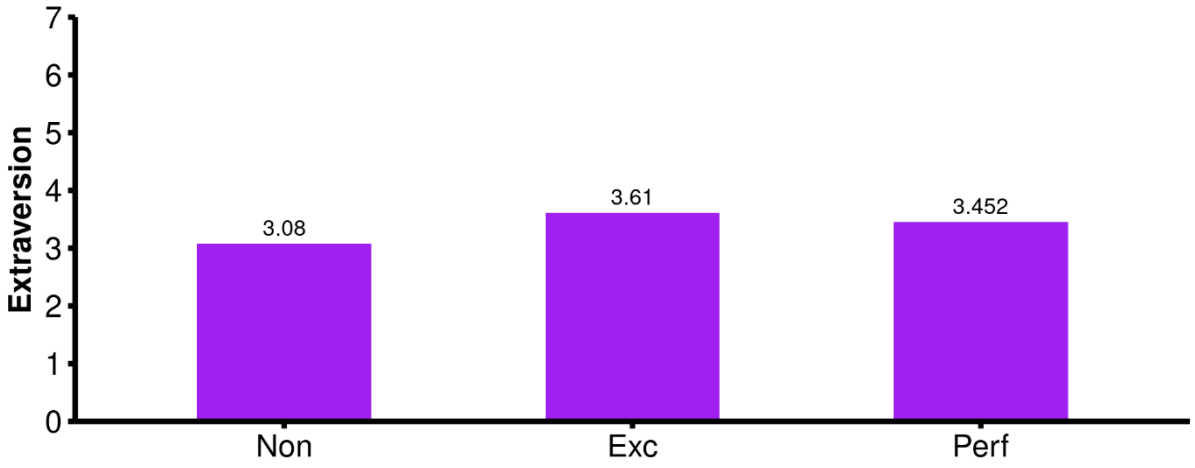
Original Items	Factors	
	Striving Toward Perfection (Perfectionism)	Striving Toward Excellence (Excellencism)
As a person, my general goal in life is to …		
1) … have perfect performances.	.78	
2) … be a perfect person.	.74	
3) … accomplish great things perfectly.	.81	
4) …be exceptionally productive all the time.	.71	
5) … be a flawless person.	.69	
6) … produce error-free work.	.73	
7) …attain perfection.	.78	
8) … perfectly learn difficult things.	.77	
9) … reach perfection.	.81	
10) … perform perfectly.	.86	
11) … work relentlessly until I reach perfection.	.70	
1) … have very good performances.		.75
2) … be a competent person.		.57
3) … accomplish great things.		.75
4) … be very productive.		.72
5) … be a skillful person.		.62
6) … produce high quality work.		.77
7) … attain difficult but realistic goals.		.65
8) … successfully learn difficult things.		.70
9) … reach excellence.		.80
10) … perform very well.		.81
11) … work very hard until I reach excellence.		.68

Note. Model Fit Indices: CFI = .993, RMSEA = .045, and SRMR = .055

Figure OS 2

Visualization of Predictive Values for Nonstrivers, Excellence Strivers, and Perfection Strivers Across Different Personality Characteristics




Extraversion
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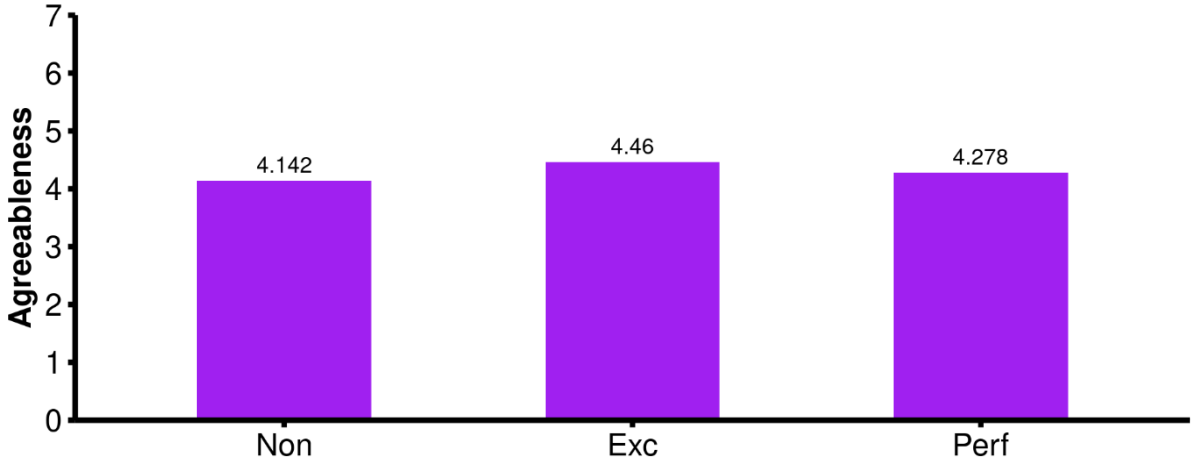
6
5
4
3
2
1
0
3.08
3.61
3.452
Non
Exc
Perf


Agreeableness
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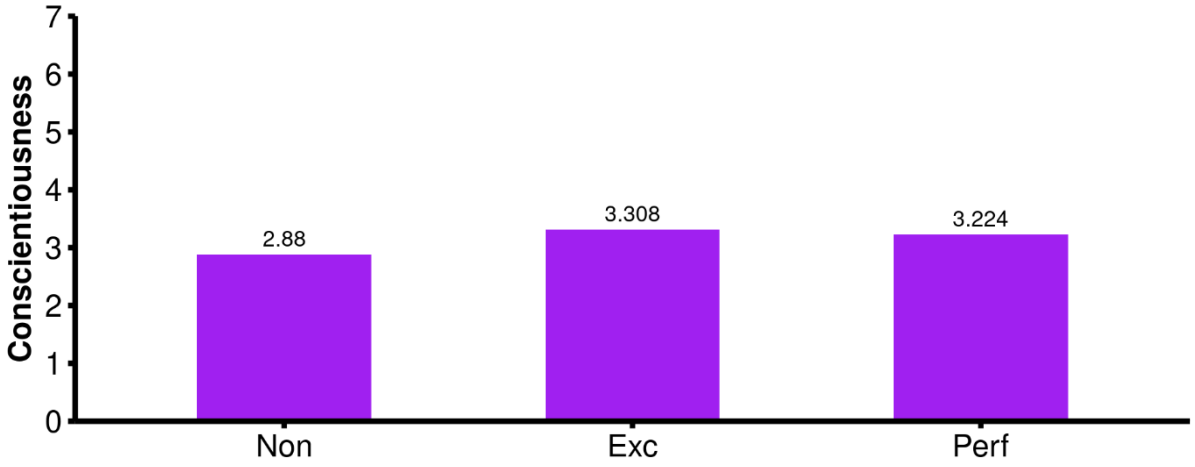
6
5
4
3
2
1
0
4.142
4.46
4.278
Non
Exc
Perf


Conscientiousness
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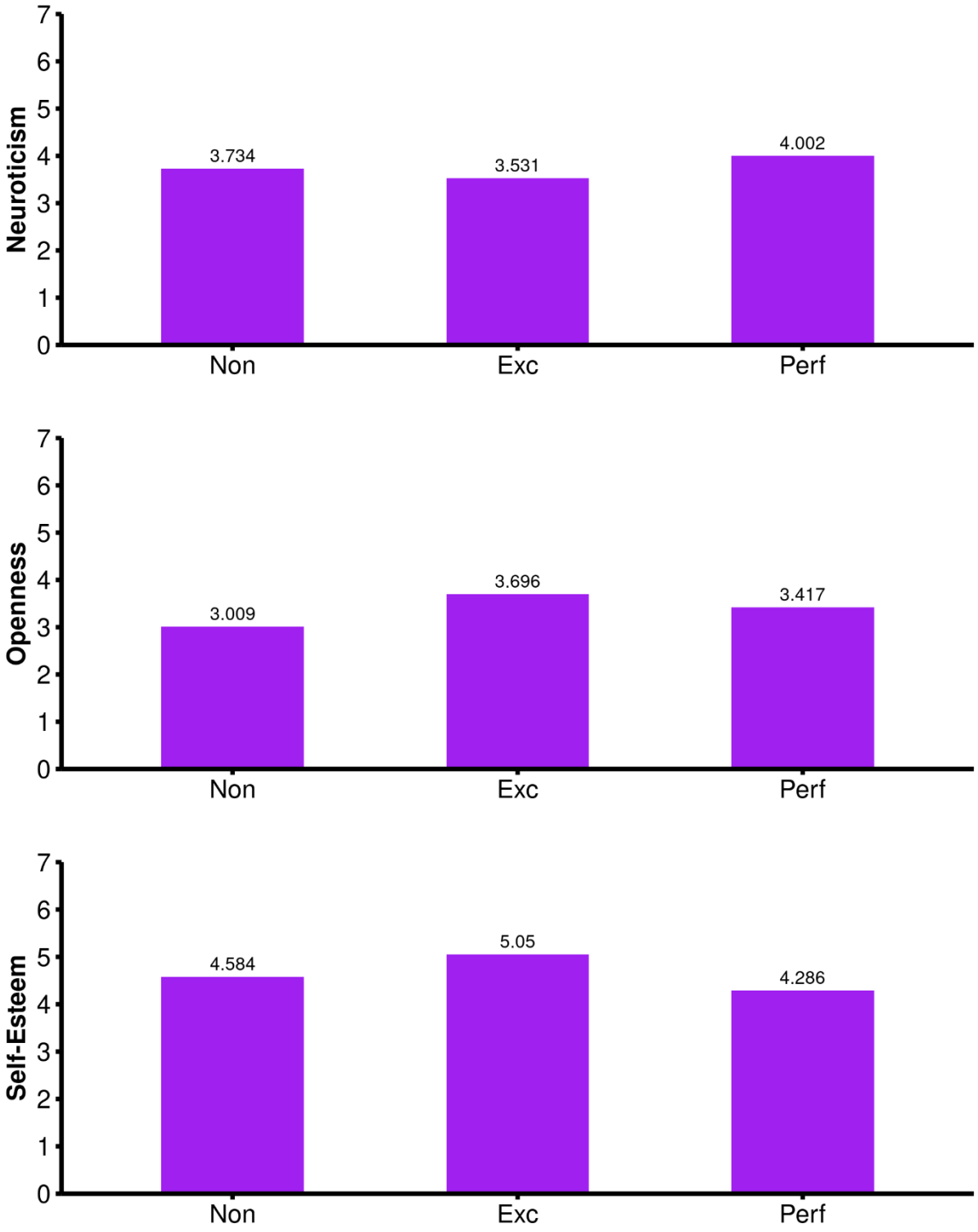
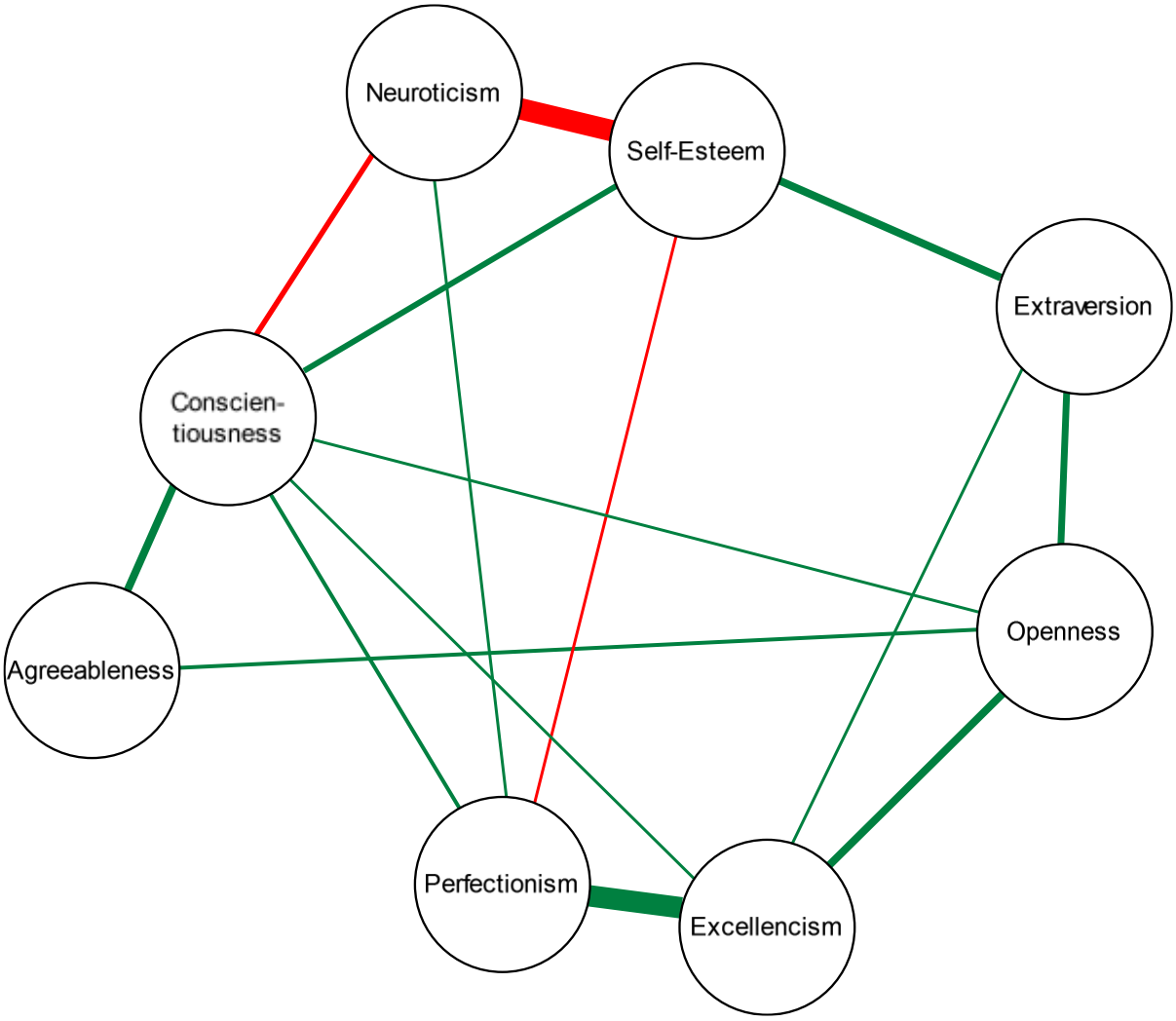
6
5
4
3
2
1
0
2.88
3.308
3.224
Non
Exc
Perf



Note. Non = Nonexcellence/nonperfection strivers; Exc = Excellence strivers; Perf = Perfection strivers.

Figure OS 3

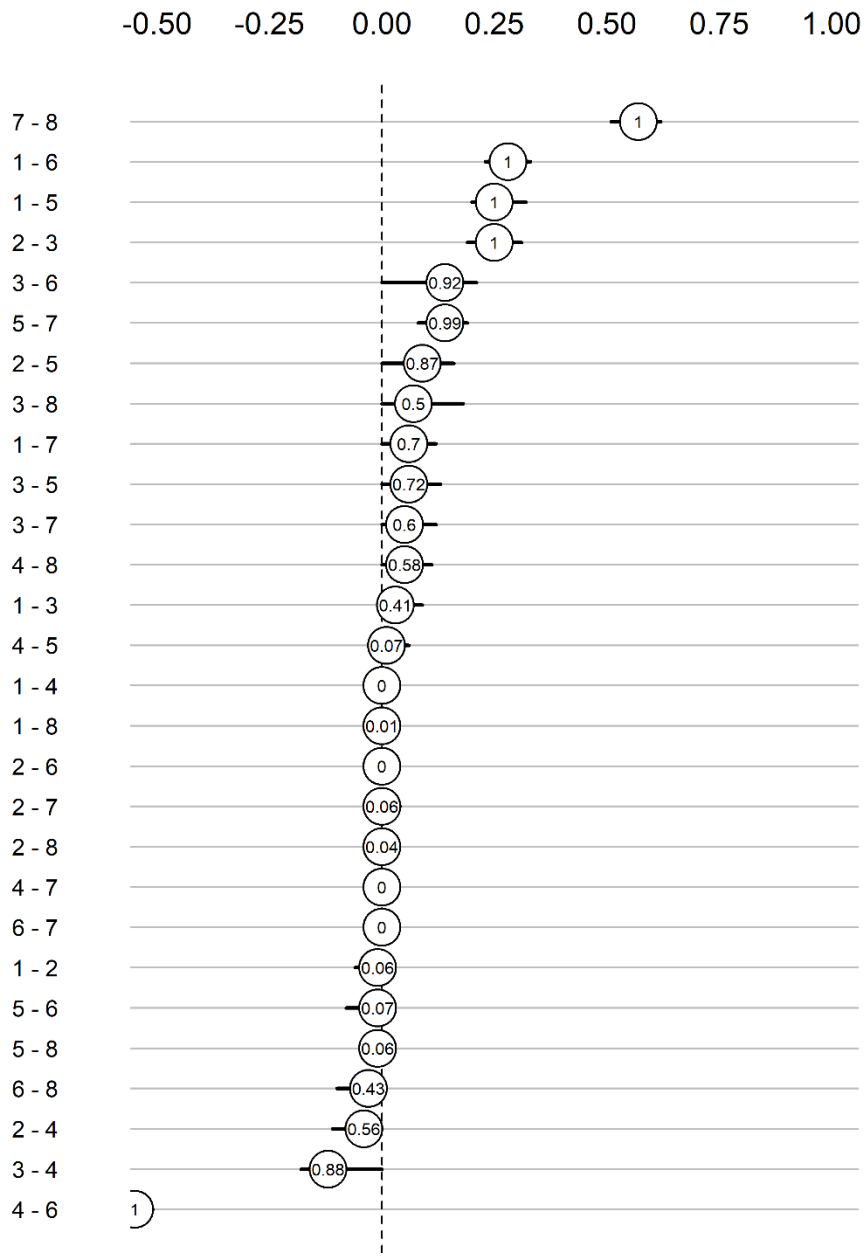
Visualization of the Unmoderated Personality Network



Note. The green edges represent positive pairwise interactions (i.e., partial correlations). The red edges represent negative pairwise interactions. The relative thickness of the edges corresponds to their effect sizes. The present figure was adapted from a figure which was automatically-generated with the FactorGraph() function from the mgm package.

Figure OS 4

Summary of the Edge Weight Estimations for the Unmoderated Networks Across 200 Bootstrap Estimations



Note. The value shows the proportion of nonzero edges across all of the 200 bootstrap estimations, whilst the black line represents the 0.05 and 0.95 quantiles of the bootstrap sampling distributions. The pairwise effects represent the stability of associations between two variables, with values near 1 representing perfect stability across all bootstrap estimations. Legend: 1 = Extraversion, 2 = Agreeableness, 3 = Conscientiousness, 4 = Neuroticism, 5 = Openness, 6 = Self-Esteem, 7 = Excellencism (Strivings Toward Excellence), 8 = Perfectionism (Perfectionistic Strivings)

Table OS 5

Fit Indices for Measurement Invariance of the SCOPE Across Genders

Model	Scaled χ^2	*df*	CFI	RMSEA	SRMR
SCOPE Two-Factor Structure					
Model 1: Unconstrained model	92.38	38	1.00	.024	.024
Model 2: Weak invariance	76.33	44	1.00	.026	.029
Model 3: Strong invariance	87.84	50	1.00	.026	.030
SCOPE with Personal Standards					
Model 1: Unconstrained model	146.94	64	.998	.026	.026
Model 2: Weak invariance	112.52	71	1.00	.024	.029
Model 3: Strong invariance	125.32	78	.998	.024	.030
SCOPE with Extraversion					
Model 1: Unconstrained model	116.83	82	.997	.023	.028
Model 2: Weak invariance	127.77	90	.997	.025	.032
Model 3: Strong invariance	142.43	98	.996	.026	.033
SCOPE with Agreeableness					
Model 1: Unconstrained model	184.89	82	.988	.050	.043
Model 2: Weak invariance	196.37	90	.987	.049	.046
Model 3: Strong invariance	239.94	98	.983	.054	.052
SCOPE with Conscientiousness					
Model 1: Unconstrained model	154.04	82	.995	.033	.033
Model 2: Weak invariance	154.67	90	.994	.034	.037
Model 3: Strong invariance	204.62	98	.991	.041	.043

Table OS 5 (continued)

Model	Scaled χ^2	*df*	CFI	RMSEA	SRMR
SCOPE with Neuroticism					
Model 1: Unconstrained model	115.19	82	1.00	.026	.031
Model 2: Weak invariance	122.61	90	1.00	.026	.034
Model 3: Strong invariance	135.04	98	1.00	.026	.035
SCOPE with Openness					
Model 1: Unconstrained model	130.63	82	1.00	.029	.032
Model 2: Weak invariance	136.11	90	1.00	.031	.036
Model 3: Strong invariance	235.90	98	.994	.051	.049
SCOPE with Self-Esteem					
Model 1: Unconstrained model	181.24	102	.993	.037	.036
Model 2: Weak invariance	191.15	111	.992	.037	.039
Model 3: Strong invariance	206.97	120	.992	.037	.040

Table OS 6

Fit Indices for Measurement Invariance of the SCOPE Across School Types

Model	Scaled χ^2	*df*	CFI	RMSEA	SRMR
SCOPE Two-Factor Structure					
Model 1: Unconstrained model	92.79	38	.999	.023	.022
Model 2: Weak invariance	83.94	44	.998	.028	.030
Model 3: Strong invariance	137.81	50	.995	.039	.038
SCOPE with Personal Standards					
Model 1: Unconstrained model	130.07	64	.999	.022	.023
Model 2: Weak invariance	113.20	71	.998	.024	.029
Model 3: Strong invariance	163.33	78	.996	.032	.034
SCOPE with Extraversion					
Model 1: Unconstrained model	123.10	82	.997	.025	.028
Model 2: Weak invariance	141.44	90	.996	.030	.034
Model 3: Strong invariance	142.43	98	.996	.026	.033
SCOPE with Agreeableness					
Model 1: Unconstrained model	187.95	82	.988	.050	.045
Model 2: Weak invariance	195.40	90	.998	.049	.048
Model 3: Strong invariance	245.76	98	.983	.054	.053
SCOPE with Conscientiousness					
Model 1: Unconstrained model	134.66	82	1.00	.028	.030
Model 2: Weak invariance	137.64	90	1.00	.029	.034
Model 3: Strong invariance	188.05	98	1.00	.038	.040

Table OS6 (continued)

Model	Scaled χ^2	*df*	CFI	RMSEA	SRMR
SCOPE with Neuroticism					
Model 1: Unconstrained model	126.05	82	.996	.031	.031
Model 2: Weak invariance	137.66	90	.995	.032	.035
Model 3: Strong invariance	169.28	98	.993	.036	.039
SCOPE with Openness					
Model 1: Unconstrained model	123.06	82	.997	.026	.030
Model 2: Weak invariance	123.13	90	.996	.026	.035
Model 3: Strong invariance	152.82	98	.994	.032	.039
SCOPE with Self-Esteem					
Model 1: Unconstrained model	187.60	102	.992	.040	.039
Model 2: Weak invariance	208.90	111	.991	.042	.043
Model 3: Strong invariance	246.44	120	.989	.045	.046

Table OS 7

Gender Differences in Associations Between Striving Toward Perfection and Striving Toward Excellence With Other Personality Characteristics

Dependent Variable	Correlated Predictors					
	Striving Toward Perfection			Striving Toward Excellence		
	Girls	Boys		Girls	Boys	
	b	*b*	*p*	*b*	*b*	*p*
Personal Standards	0.271	0.184	.409	0.410	0.475	.641
Extraversion	-0.100	-0.023	.350	0.261	0.290	.788
Agreeableness	-0.022	-0.111	.235	0.062	0.243	.100
Conscientiousness	-0.019	0.073	.262	0.234	0.214	.854
Neuroticism	0.175	0.146	.718	-0.044	-0.220	.147
Openness	-0.060	-0.150	.214	0.244	0.449	**.046**†
Self-Esteem	-0.411	-0.130	**.039**†	0.144	0.400	.130

Note. The *p*-value refers to the likelihood ratio test comparing the model with freely estimated regression parameters to the model with equal regression parameters; a significant *p*-value would indicate a better fit of the more complex model. † indicates that the *p* value did not remain significant after adjusting for multiple testing (Benjamini & Hochberg, 1995).

Table OS 8

School Type Differences in Associations Between Striving Toward Perfection and Striving Toward Excellence With Other Personality Characteristics

Dependent Variable	Correlated Predictors					
	Striving Toward Perfection			Striving Toward Excellence		
	Academic Profile	Comprehensive		Academic Profile	Comprehensive	
	b	*b*	*p*	*b*	*b*	*p*
Personal Standards	0.136	0.328	.073	0.649	0.253	**.007**†
Extraversion	- 0.022	- 0.100	.367	0.249	0.282	.766
Agreeableness	- 0.028	- 0.075	.593	0.080	0.198	.309
Conscientiousness	0.036	- 0.012	.569	0.166	0.314	.185
Neuroticism	0.215	0.152	.504	- 0.099	-0.126	.817
Openness	- 0.078	-0.134	.446	0.337	0.357	.849
Self-Esteem	- 0.292	- 0.279	.929	0.165	0.301	.440

Note. The *p*-value refers to the likelihood ratio test comparing the model with freely estimated regression parameters to the model with equal regression parameters; a significant *p*-value would indicate a better fit of the more complex model. † indicates that the *p* value did not remain significant after adjusting for multiple testing (Benjamini & Hochberg, 1995).

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3. Study II: Interplay of Big Five Traits and Self-Esteen

Growing Up to Be Mature and Confident? The Longitudinal Interplay Between the Big Five and Self-Esteem in Adolescence

The official citation that should be used in referencing this material is:

Bien, K., Wagner, J., & Brandt, N. D. (2024). Growing up to be mature and confident? The longitudinal interplay between the Big Five and self-esteem in adolescence. *Journal of Personality and Social Psychology*, *127*(2), 404-431. https://doi.org/10.1037/pspp0000518

Abstract

Adolescence is a formative life phase for the development of personality characteristics. Although past findings suggest Big Five traits alongside self-esteem as indicators for successful development, little is known about their longitudinal interplay. We addressed this research gap by integrating data from three longitudinal studies (NT1 = 1,088; Mage = 16.02 years, 72% female). We apply continuous time modeling to investigate longitudinal associations between Big Five traits and self-esteem in a period of up to one year. Results illustrate four main findings: First, rank-order stabilities were overall high for all personality characteristics. Second, longitudinal associations between Big Five traits and self-esteem were reciprocal for extraversion, neuroticism, and openness but one-sided from agreeableness and conscientiousness on self-esteem. Effects peaked within the first month and mostly faded after two months. Third, the majority of cross-effects was similar in size, however, the effect from neuroticism on later values of self-esteem was stronger than vice versa. Fourth, most effects were robust against influences of gender, age, and study characteristics. Analyses with acquaintance-reports supported the results but suggested stronger effects that lasted longer than effects of self-reports. We conclude that the development of personality characteristics act as possible sources of development for each other. All in all, the interplay between Big Five and self-esteem development appears reciprocal for some traits but was most often driven by Big-Five-traits. We integrate our findings into three contrasting theoretical perspectives and discuss the importance of time for a better understanding of personality development.

Keywords: Big Five, self-esteem, adolescence, developmental interplay, continuous time models

Growing Up to Be Mature and Confident? The Longitudinal Interplay Between the Big Five and Self-Esteem in Adolescence

Numerous studies demonstrate that personality characteristics change across the life span (Bleidorn et al., 2022; Denissen et al., 2013; Donnellan et al., 2015; Israel et al., 2022; Roberts & DelVecchio, 2000). Personality characteristics can be described on various layers: The most prominent taxonomy are the Big Five traits, defined as relatively stable patterns of emotion, cognition, and behavior (Goldberg, 1990; McCrae & Costa, 2008). Besides the Big Five, a large amount of empirical work has emphasized the relevance of self-esteem, the overall evaluation of the self (Leary & Baumeister, 2000). While both constructs and their developments are associated with major life outcomes, such as academic achievement, success at work, or overall well-being (Beck & Jackson, 2022; Orth et al., 2012; Soto, 2019), little is known about their developmental interplay.

Past research points to robust cross-sectional associations between the Big Five and self-esteem (Erdle et al., 2009; Israel et al., 2021; Robins, Tracy, et al., 2001; Weidmann et al., 2017). That is, self-esteem is positively associated with extraversion and conscientiousness, to a lesser degree, with agreeableness and openness to experience, and negatively associated with neuroticism. However, because developmental trajectories between the Big Five and self-esteem were most often traced separately, longitudinal associations between them remain unclear. This research gap is especially pronounced for adolescent samples, as no study so far has investigated the longitudinal associations between the Big Five traits and self-esteem during this life phase. Both groups of constructs have been suggested as relevant indicators of how well adolescents cope with age-sensitive changes and transitions (Birkeland et al., 2012; Vazsonyi et al., 2015). Consequently, identifying longitudinal dynamics between the Big Five and self-esteem has the potential to understand whether specific personality characteristics act as sources for the development of other personality characteristics. Second, it might therefore be able to inform theoretical notions on adolescent personality development as well as associations between these developments and (un-)desirable outcomes during this life phase (Borghuis et al., 2017). Along these lines, the insights of our study could be one important step to pave the way for theoretically informed approaches about how changing specific patterns of thinking, feeling, and behaving (i.e., as comprised within the Big Five traits) might represent a vehicle for changing affective self-evaluative concepts (e.g., self-esteem) and/or vice versa in interventional settings.

In the present study, we investigated whether and how the Big Five traits and self-esteem are longitudinally related across middle and late adolescence. We combined data from three

longitudinal studies and examined the developmental interplay between each Big Five trait and self-esteem in 1,088 German students (Mage = 16.20, age range =16-22 years, 72% female) by applying continuous time dynamic modeling techniques (Driver & Voelkle, 2018; Voelkle et al., 2012).

Personality on Different Layers

Personality is often equated with the Big Five traits (John et al., 2008) which summarize individual differences in five broad traits: *Openness to experience* describes people who are intellectually curious and have the tendency to seek new experiences or explore novel ideas. People scoring high in *conscientiousness* are characterized as hard-working, organized, and motivated to pursue goals. Those high in *extraversion* are portrayed as assertive, energetic, and talkative whereas those high in *agreeableness* are trusting, forgiving, and caring. Finally, people scoring high in *neuroticism* report to experience negative emotions like anxiety, depression, and self-consciousness more frequently, and can thus be described as more vulnerable to demands and threat compared to people scoring low in neuroticism (Costa & McCrae, 2008). These definitions illustrate the wide bandwidth of the Big Five traits.

Besides the broad Big Five traits, other personality characteristics have been emphasized to be relevant for peoples' everyday-lives and to predict long-term consequential outcomes (Furnham et al., 2013; McAbee et al., 2019; Orth et al., 2012; Smith et al., 2017; Wagner, Lüdtke, et al., 2018). In this light, self-esteem, defined as the overall evaluation of the self (Leary & Baumeister, 2000), posits one of the most widely studied constructs in psychology (Donnellan et al., 2011). Comparing the Big Five traits and self-esteem in terms of their conceptual similarities and differences may illuminate our understanding of their complementary nature within an interrelated network of personality characteristics, furthering the need to examine their interrelationship longitudinally as well.

A closer look on construct content reveals that items in commonly applied questionnaires for assessing Big Five traits and self-esteem refer to multiple trait dimensions. That is, items can be categorized depending on whether they assess affect (i.e., how people typically feel), behavior (i.e., how people typically act), cognition (i.e., how people typically think), or desire (i.e., what people typically want; Pytlik Zillig et al., 2002; Wilt & Revelle, 2015). Interestingly, item content analyses of Big Five questionnaires reveal that each Big Five trait captures different amounts of affect, behavior, cognition, or desire (Pytlik Zillig et al., 2002; Wilt & Revelle, 2015). By contrast, items commonly applied in self-esteem questionnaires focus on either affects (i.e., how one feels about themselves) or cognitions (i.e., how one thinks about themselves) toward the self and do not capture behaviors or desires in

everyday situations or toward other people (Harter, 2012; Rosenberg, 1965). Thus, rather than focusing on entirely different trait dimensions, the assessment of self-esteem might be considered as adding an additional layer (i.e., the cognitive and affective evaluation of the self) which further broadens the Big Five perspective. This conclusion also corresponds with cross-sectional factor-analytical findings that point to significant overlaps between Big Five traits and self-esteem but, nevertheless, emphasize their conceptual distinctiveness (Erdle et al., 2009). In contrast, not much is known about longitudinal associations between Big Five traits and self-esteem, although it is well established that they are likewise subject to change across life (Bleidorn et al., 2022; Denissen et al., 2013; Donnellan et al., 2015; Israel et al., 2022; Roberts & DelVecchio, 2000). These personality changes are particularly noteworthy during the developmental phase of adolescence (Hill & Edmonds, 2017).

Big Five and Self-Esteem Development in Adolescence

Considering the many biological (e.g., hormonal or brain structural) and environmental (e.g., increasing academic demands, emergence of new social roles) changes (Crone & Dahl, 2012; Galván, 2021; Zarrett & Eccles, 2006), it is safe to label adolescence[1] a rather dynamic life phase. Many of these environmental changes contributing to the dynamic nature of adolescence present themselves as developmental tasks (Havighurst, 1948). These are fundamental emotional, social, or intellectual challenges (e.g., graduating from school or build a stable circle of friends) that must be mastered at certain ages to support successful development and facilitate the management of upcoming developmental tasks. On the one hand, mastering developmental tasks (Bleidorn et al., 2018; Hutteman et al., 2014; Wagner et al., 2015) has been shown to facilitate personality development. On the other hand, personality characteristics, such as the Big Five or self-esteem, can predict how well someone copes with developmental tasks (De Fruyt et al., 2017; Hill & Edmonds, 2017; Soto & Tackett, 2015). Thus, mastering developmental tasks constitutes potential sources for the development of personality characteristics as well as byproducts of (mal-)adaptive developmental processes (Luan et al., 2018).

In line with this, the dynamic nature of adolescence also shows with regard to personality development (Hill & Edmonds, 2017). Personality development is often described in terms of the degree of mean level change and rank-order stability (Roberts et al., 2008).

[1] Developmental literature (Collins & Steinberg, 2006) commonly divides adolescence into three periods: early adolescence (typically ages 10–13), middle adolescence (typically ages 14–16), and late adolescence (typically ages 17–19). However, authors note that adolescence often continues until age 20 or beyond nowadays (Konrad & König, 2018; Sawyer et al., 2018) and blends into a life phase that could be termed emerging adulthood Arnett (2007).

Mean-level changes display the average change in the level of a personality characteristic over time, whereas rank-order stabilities refer to the maintenance of a relative rank of individuals on a personality characteristic over time. Big Five traits are generally assumed to mature from childhood to early adulthood but sometimes show a small maturational dip in early adolescence in those traits that are associated with greater social maturity (Borghuis et al., 2017; Denissen, 2014; Göllner et al., 2017; Luan et al., 2017; Soto & Tackett, 2015). Apart from such, overall small, mean level changes, individuals show lower rank-order stabilities in their Big Five traits across adolescence compared to later phases in life (Mõttus et al., 2019; Roberts & DelVecchio, 2000).

Regarding self-esteem, a similar picture emerges: Some older studies (Chubb et al., 1997; Young & Mroczek, 2003) found that mean-levels tend to drop during the transition from childhood to early adolescence (Robins, Hendin, & Trzesniewski, 2001; Trzesniewski et al., 2003) before they increase moderately in the subsequent years (Erol & Orth, 2011). However, more recent studies do not show this clear dip but point to more stability of self-esteem mean levels during this life phase (Orth et al., 2018; Scherrer & Preckel, 2019; Wagner, Lüdtke, et al., 2018). Also, rank-order stabilities of self-esteem are lower during adolescence than during later phases in life (Trzesniewski et al., 2003). In summary, one can draw certain parallels between the developmental trajectories of Big Five traits and self-esteem during adolescence.

Reflecting on the lower rank-order stabilities of the Big Five traits as well as self-esteem during adolescence compared to later life phases suggests that individuals might vary in their experiences of and reactions to life phase specific changes. For example, studies point to the large diversity of romantic relationship experiences (Gonzalez Avilés et al., 2021) or variability in friendship network stabilities (Ferguson et al., 2022). Taking up on this perspective, it could be noteworthy to further expand the picture by illuminating how personality development might not only be related to environmental changes during this turbulent life phase (e.g., Bleidorn, 2012; Hutteman et al., 2015) but also to longitudinal interdependencies across complementary personality characteristics.

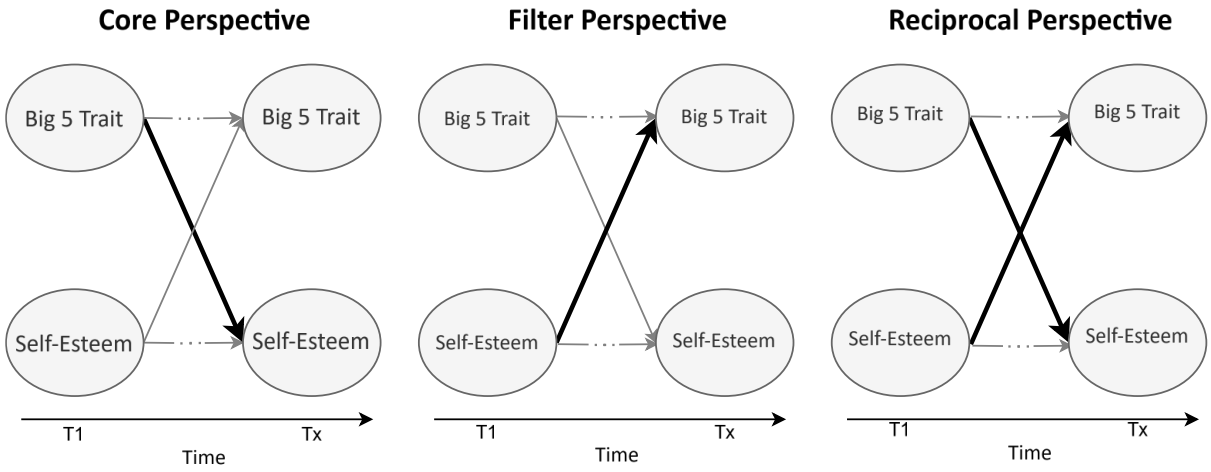
Three Perspectives on the Interplay Between the Big Five Traits and Self-Esteem

The similarity in the change trajectories and the existence of joint sources in developmental tasks in adolescence raise the question whether developments of the Big Five traits and self-esteem are not only similar but also intertwined. Three different perspectives could illuminate the longitudinal interplay between Big Five traits and self-esteem: First, self-esteem development is mainly predicted by the development in Big Five traits (core perspective). Second, the development of Big Five traits is mainly predicted by the development

of self-esteem (filter perspective). Third, developmental trajectories of self-esteem and Big Five traits reciprocally predict each other across time (reciprocal perspective). Figure 1 summarizes these three theoretical ideas on Big Five trait and self-esteem development.

Figure 1

Schematic Representation of Three Theoretical Perspectives on the Longitudinal Interplay Between Big Five Traits and Self-Esteem



Note. The dots (…) indicate that there can be more than two measurement points. This is a schematic representation to illustrate the three different theoretical perspectives that are investigated in the current paper. For the graphical representation of the statistical model, see Figure 3.

The Core Perspective: Big Five Traits as Drivers of Self-Esteem Development

One view to integrate different layers of personality characteristics into a system of interindividual differences is the traditional perspective of the *Five-Factor Theory* (McCrae & Costa, 1999, 2008) which assumes a hierarchical structure with five genetically anchored traits at the top (i.e., the Big Five). These traits are considered to be core characteristics that constitute the basis of individual differences in people's patterns of thinking, feeling, and behaving. The complexity of individual differences is furthermore expressed through a wider set of surface characteristics, such as self-esteem (McCrae & Costa, 2008). A common assumption across different personality theories is that relatively stable core traits drive changes in more malleable surface characteristics (Asendorpf & Motti–Stefanidi, 2018; DeYoung, 2015; McAdams & Pals, 2006; McCrae & Costa, 2008). Following this rationale, self-esteem development should be impacted by Big Five trait development but not impact it in reverse. To illustrate this, imagine a teenage student named John. John is comparably extraverted and therefore enjoys the company of others. He, thus, has many friends and participates in many team sport activities

after school, which fosters experiences (e.g., feeling socially included and becoming a better athlete) that might contribute to his self-esteem whereas becoming more or less extraverted in the course of the following years would be determined by intrinsic maturation processes rather than by environmental experiences or changes in self-esteem.

Newer frameworks that distinguish between core and surface characteristics loosen this rather rigid perspective and advocate a more integrative view on personality (Asendorpf & Motti–Stefanidi, 2018; Kandler et al., 2014; McAdams & Pals, 2006). Consequently, they do not rule out influences of surface characteristic development on core trait development but, nevertheless, postulate causal dominance of core over surface characteristics Accordingly, effects from Big Five development on self-esteem should be stronger than the other way around.

So far, there are some empirical findings in adult populations to corroborate the assumption that Big Five traits can be understood as core characteristics that have an impact on subsequent levels of self-esteem (Erol & Orth, 2011; Fetvadjiev & He, 2019; von Soest et al., 2018; Wagner et al., 2013). In particular, studies show that higher levels of neuroticism predict lower levels of self-esteem in young (Wagner et al., 2013) and late adulthood (von Soest et al., 2018) over a time span of two and five years, respectively. Using cross-lagged models with time intervals of one to two years, Fetvadjiev and He (2019) found that individual differences in openness, conscientiousness, extraversion, and agreeableness predicted increases in self-esteem more strongly than vice versa, indicating that Big Five traits drive self-esteem development more strongly than the other way around. Because of methodological reasons, Fetvadjiev and He (2019) do not provide information on the comparison of effects between neuroticism and self-esteem.

In sum, theoretical notions and empirical findings encourage classifying Big Five traits as core characteristics that drive changes in other personality characteristics. However, studies in adolescent samples are missing, which makes it difficult to assess how far these findings are transferable to earlier life phase. Initial evidence, however, suggests that the stability of Big Five traits and various self-evaluative characteristics, such as self-concept, are rather comparable than different in adolescence (Rieger et al., 2017). This might question a rigid view of causal dominance of Big Five traits over self-esteem, which can also be regarded as a self-evaluative characteristic, during the more dynamic phase of adolescence.

The Filter Perspective: Self-Esteem as a Driver of Big Five Development

Compared to the many frameworks that can be referenced to explain the effects of Big Five traits on self-esteem, there are no theoretical notions that explicitly postulate a one-sided influence of self-esteem on Big Five traits. As an exception, Weidmann et al. (2018) present an

explanation that is consistent with egosystem motivation theory (McGregor et al., 2006) and literature on self-regulated personality change (Hennecke et al., 2014). In this theoretical underpinning, self-esteem constitutes a psychological resource (McGregor et al., 2006) that might enable people to pursue long-term goals. Goals can, in turn, drive the development of personality traits (Hennecke et al., 2014). Such goals can either explicitly target the wish to change one's personality characteristics (e.g., the pure goal to become more agreeable) or target the aim of achieving external goals and changing personality characteristics along the way to achieve these goals (e.g., become more extraverted to come into contact with new people; Hennecke et al., 2014). As being a person of value is very high up in the hierarchy of people's goals (Crocker et al., 2010), individuals with lower self-esteem are thought to be primarily preoccupied with self-esteem regulation and less likely to successfully pursue other goals. Such processes might be particularly profound in adolescence as this life period is characterized by less stability (Trzesniewski et al., 2003) and lower levels of self-esteem compared to childhood (Chung et al., 2017; Thomaes et al., 2017), on the one hand, as well as heightened levels of self-consciousness and social evaluation fears, on the other hand (Westenberg et al., 2007).

To illustrate this, imagine a teenage student named Emma who wants to improve her grades. To achieve this goal, she needs to become more organized and dedicate more time to her assignments, ergo, she needs to become more conscientious. Having high self-esteem puts Emma with more capacities to work toward changes in her behaviors, cognitions, and affective reactions. In contrast, having low self-esteem would put Emma in a position of being preoccupied with her self-image in the first place (e.g., being constantly worried about how others perceive her and monitoring her behavior). This is very tedious and depletes her of self-regulatory resources needed to achieve her academic goals in the first place. Figuratively speaking, one could compare high self-esteem to a perceptive filter that tints everything in pleasant colors and thus fosters helpful patterns of actions, thoughts, and emotions whereas a decrease in self-esteem might darken the filter and impair helpful patterns of actions, thoughts, and emotions.

In sum, the filter perspective proposes self-esteem as a driver behind changes in Big Five traits. So far, we know of no longitudinal findings to corroborate such a one-sided prospective effect. Rather, selective findings imply reciprocal associations between self-esteem and Big Five traits (Fetvadjiev & He, 2019; Weidmann et al., 2018). Going from here, one might extrapolate that the filter perspective can only describe one side of the coin regarding longitudinal associations between Big Five traits and self-esteem.

The Reciprocal Perspective: Mutual Longitudinal Associations Between Big Five Traits and Self-Esteem

The synthesis of the former two perspectives suggests that Big Five traits and self-esteem might be reciprocally related over time. Thus, as a third perspective, there might be no clear driver of the development, but personality characteristics shape each other on rather similar terms. In line with this, previous studies found reciprocal longitudinal associations between Big Five traits and subjective well-being (Soto, 2015) as well as between Big Five traits and life satisfaction (Specht et al., 2013). The idea of equally influential personality characteristics at different layers is also put forth in the *Neo-Socioanalytic Theory* (NST) of personality (Roberts & Nickel, 2021; Roberts & Wood, 2006).

The NST proposes that emerging social roles drive maturation (i.e., development) in personality characteristics (Roberts & Wood, 2006). However, as the NST was originally formulated for personality development in young adulthood, most empirical evidence targets this life phase (Bleidorn, 2012; Lehnart et al., 2010; Lodi-Smith & Roberts, 2007; Neyer & Lehnart, 2007; Wagner et al., 2015). At the same time, others have extended the social investment principle to adolescence (Klimstra et al., 2009) considering that adolescents face a variety of different social roles that come with investing in romantic relationships (Gonzalez Avilés et al., 2021), facing academic demands (Israel et al., 2021), or preparing for final exams that exhibit great importance for the future (French et al., 2015). A reciprocal relationship between Big Five traits and self-esteem could be mediated by the acquisition of new social roles (in adolescence) via two different pathways: Moving toward a more mature Big Five profile (i.e., becoming more agreeable, more conscientious, less neurotic) might lead to the acquisition of new social roles. The successful acquisition of these new social roles might in turn increase adolescents' self-esteem. At the same time, higher self-esteem might be linked to a higher probability of acquiring new social roles in the first place which could trigger more mature patterns of feeling, thinking, and behaving in terms of the Big Five.

Reciprocal associations between self-esteem and Big Five traits are partly backed up by Weidmann et al. (2018) who investigated these associations in a sample of family members. Weidmann et al. (2018) did not report results that are specific to adolescents, however, in individuals aged 14 to 35, levels of emotional stability and self-esteem were positively related across time. With regard to the older age group in their study, Weidmann et al. (2018) found that, apart from the robust reciprocal association between neuroticism and self-esteem, conscientiousness and self-esteem were reciprocally related in adult women. Furthermore, analyzing a representative sample of Dutch adults, Fetvadjiev and He (2019) found that higher

levels of extraversion predicted higher levels of self-esteem and vice versa one to two years. This result pattern is consistent with different theories on the connection between social inclusion and self-esteem (Leary & Baumeister, 2000; Srivastava & Beer, 2005) as extraversion is known to be associated with sociable behaviors in adolescence (Wieczorek, Mueller, et al., 2021) and early adulthood (Breil et al., 2019).

Taken together, at least for adults, there are initial findings on reciprocal associations between Big Five traits and self-esteem, which would contradict a strict view of the core or the filter perspective in each case. Given the integration of theoretical approaches and available findings, we take the reciprocal perspective as the basis for our hypotheses. Reflecting on available theoretical notions and previous findings, we consider a reciprocal longitudinal interplay between "mature" Big Five traits (i.e., agreeableness, conscientiousness, and low neuroticism) and self-esteem as well as between extraversion, as an inherently "social" trait that can foster social inclusion and self-esteem most likely.

The Role of Gender

Taking up the idea that certain Big Five traits and self-esteem foster the successful adoption of social roles, one should consider that these processes could work differently in boys and girls. Past studies revealed that women report higher levels of self-esteem compared to men when they are more agreeable (Wagner et al., 2013) as well as extraverted (Block & Robins, 1993). Whereas being self-defensive or anxious (i.e., being more neurotic) predicted self-esteem decreases in young men (Block & Robins, 1993). These findings suggest that certain personality traits tend to have more or less rewarding effects for men and women, depending on whether they are considered masculine, such as, agentic components of extraversion, or feminine, such as, conscientiousness or agreeableness (Kurpisz et al., 2016). It has been proposed that this gender-specific pattern might be a result of different life goals in males and females (Ferriman et al., 2009; Roberts & Robins, 2000). Male university students have been shown to stronger emphasize career goals whereas female students tended to value communal goals, such as maintaining social relationships more than male students (Ferriman et al., 2009). Considering that, for males, agreeableness is known to be positively associated with relationship maintenance (Gebauer et al., 2013) but negatively with income in employees (Judge et al., 2012), females could be more likely than men to foster this personality characteristic, which in turn relates back to self-esteem.

Taken together, available evidence points to some gender-specific differences between Big-Five-self-esteem-associations in (young) adult samples. Given the increasing awareness of different gender roles and expectations throughout adolescence (Bussey, 2011), it might also

be worthwhile to explore, in how far gender-specific associations can already be observed during this earlier life phase.

Who Notices Change? The Role of Acquaintance-Reports

Extending self-report research, the role of acquaintance-reports has been highlighted in the endeavor of understanding personality development (Roberts & Wood, 2006). Specifically, it is an ongoing question to what degree changes in personality are only part of a person's own self-perception and identity or are similarly recognized by surrounding people (McAbee & Connelly, 2016). So far, there are some cross-sectional and longitudinal findings suggesting that adolescents' self-reported personality characteristics are moderately related to those that are derived from acquaintance-reports (e.g., Göllner et al., 2017; Luan et al., 2017; 2018; Wagner et al., 2023), with studies finding varying levels of agreement between self- and acquaintance-reports across traits.

Scholars have proposed different influential factors for personality ratings derived from acquaintance-reports: one central factor is the availability or visibility of relevant information (Connelly & Ones, 2010; Funder, 2012; Vazire, 2010). To illustrate, extraversion and conscientiousness are generally considered to be reflected in more directly observable behaviors (i.e., being talkative or orderly) and therefore easier to rate by others than traits that are rather characterized by internally displayed patterns of thinking and feeling, such as neuroticism or self-esteem. However, due to the limited number of comparable studies in adolescence, it remains unclear how exactly these findings transfer to this age group. Also, different age-specific contexts, such as school, might change the activation and hence the visibility of certain personality characteristics during adolescence compared to adulthood (Tett & Guterman, 2000). Thus, exploring longitudinal dynamics between personality characteristics derived from acquaintance-reports and comparing them to results from self-reports represents another step toward expanding our understanding of personality development.

The Present Study

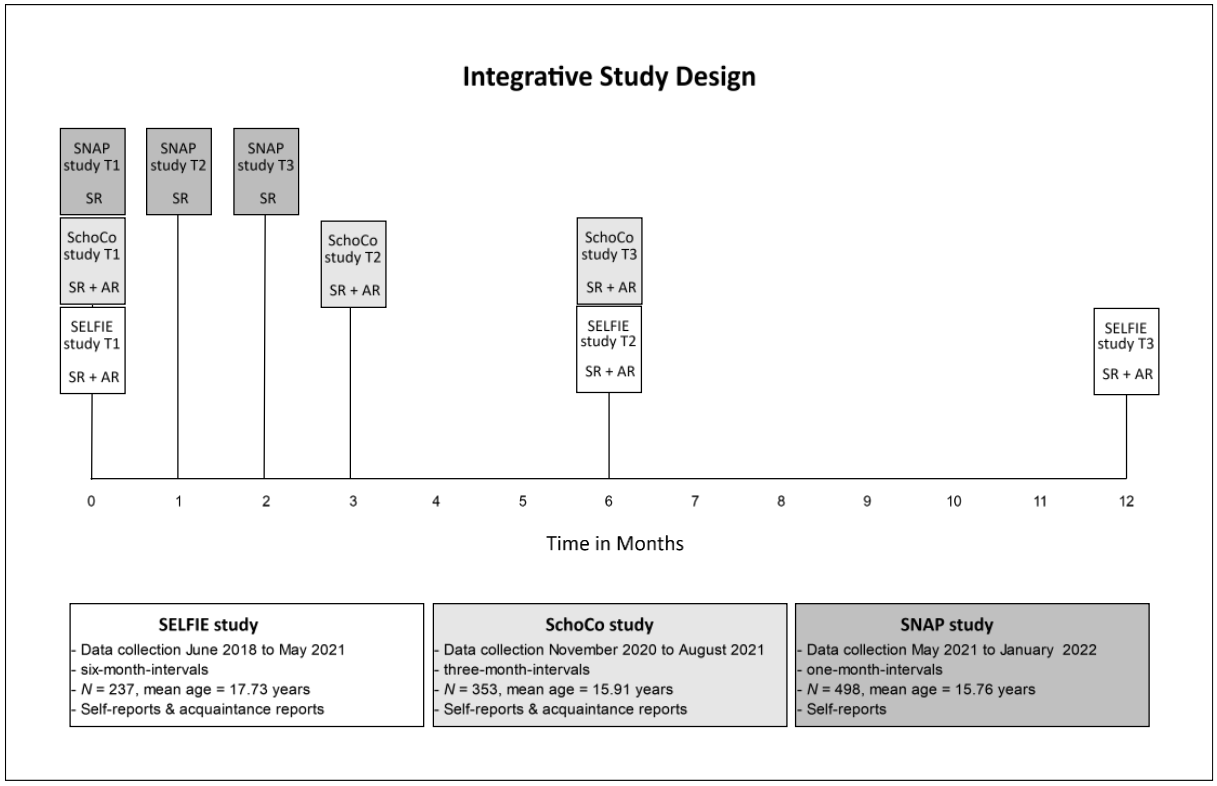
The aim of the current study is to understand whether adolescents' developments of Big Five traits and self-esteem are reciprocally related or whether only change in one construct predicts change in the other. Given the theoretical assumptions and empirical findings for corresponding effects across time (Fetvadjiev & He, 2019; Weidmann et al., 2018), we assume that a reciprocal interplay is most likely. While a strict interpretation of the core perspective has been refuted in some respects (Rieger et al., 2017; Soto, 2015; Weidmann et al., 2018) and the filter perspective has not found confirmation so far, the synthesis of these perspectives is the

basis of our hypotheses in the present study. Specifically, we propose that the development of personality traits that are indicative of social maturity (i.e., lower neuroticism, higher conscientiousness, and higher agreeableness) or relevant for the initiation and shaping of social relationships (i.e., higher extraversion) should predict self-esteem development and be predicted by self-esteem development in return. We thus hypothesize that an increase in neuroticism is positively associated with a decrease in self-esteem (Hypothesis 1a), whereas increases in extraversion, conscientiousness, and agreeableness are associated with an increase in self-esteem (Hypotheses 1b-1d). Regarding the opposite direction, we expect the same result pattern (Hypotheses 2a-d). We have no hypothesis on the interplay between openness and self-esteem but analyze their relationship exploratorily. Drawing on findings in adult samples (Block & Robins, 1993; Kurpisz et al., 2016; Wagner et al., 2013), we explored whether effects differ between boys and girls. Further, we controlled for possible effects of age. Lastly, we used acquaintance-reports to see whether our findings based on self-reports replicate.

To test our hypotheses, we combined data from three longitudinal studies that used the same inventories to capture Big Five traits and self-esteem at three time points (one month to six months apart, respectively) and applied hierarchical continuous time modeling (Driver & Voelkle, 2018). Figure 2 illustrates the study design. Following adolescents across relatively short-distanced time intervals up to one year has rarely been done so far as previous work rather focused on either yearly or longer intervals (e.g., Tetzner et al., 2022; Wagner et al., 2013) or investigated even shorter intervals of days or weeks within experience sampling or daily diary studies (e.g., Bleckmann et al., 2023; Quintus et al., 2017). In adolescence, people face a lot of different social, biological, and emotional changes (Crone & Dahl, 2012; Galván, 2021; Zarrett & Eccles, 2006), and therefore, development might happen on short to medium time scales. Also, intervention studies in adult samples illustrate the potential for changes in personality after only a few weeks or months (Roberts et al., 2017; Stieger et al., 2022). It is therefore particularly worthwhile to look more closely at shorter time intervals while still covering the span of a whole year.

Figure 2

Integrative Study Design and Information on Original Studies



Method

We analyzed longitudinal data from three studies: The Personality and Self-Esteem in Everyday Life (SELFIE; https://osf.io/4gnz9/) study, the School and Life During Corona (SchoCo; https://osf.io/r5gjx/) study, and the Social Interaction and Adolescent Personality (SNAP; https://osf.io/w4nmj/) study. All adolescents were recruited via (online) advertisements and received monetary compensation for their participation. Data collections were either approved by the German Psychological Society (SELFIE; protocol code: JW 052014_rev) or the Local Ethics Committee of the Faculty of Psychology and Human Movement Sciences of the University of Hamburg (SchoCo; protocol code: 2020_327_Wagner_KA_Schlussvotum, and SNAP; protocol code: 2021_349_Bleckmann_Wagner_Degner_Schlussvotum). A more detailed description of the individual studies can be found in the online supplemental materials (OSM).

In our study, we used all three available measurement points from all three studies. In addition, we used acquaintance-reports of Big Five traits and self-esteem from the SELFIE and the SchoCo Study.

Transparency and Openness

As the data were collected between 2018 and 2021, the present study is considered a secondary analysis of existing data. In the current study, all hypotheses, and the analysis plan were pre-registered before data analyses. We did not exclude any data points from the analyses. We describe derivations from the pre-registration in Table OS1 in the OSM. We report how we determine the sample size and all study measures. The data, analyses codes, and research materials to reproduce the presented results are available at (https://osf.io/92v8x/). Data were analyzed using *R*, version 4.2.2 (R Core Team, 2023) and the packages *lavaan*, version 0.6-11 and *ctsem*, version 3.7.2 (Driver & Voelkle, 2018). The present study is not classified as a replication or registered report.

Participants

In total, the combined sample consisted of 1,088 adolescents that participated at the first measurement point (T1), 497 adolescents that participated at the second measurement point (T2), and 419 adolescents that participated at the third measurement point (T3). Adolescents in the combined sample were between 15 and 22 years old (M_{age}=16.20 years, SD = 1.45) at T1. 72 % identified as female and most adolescents (82%) came from the academic track of the German school system. Further, the majority of adolescents were born in Germany (93%) and reported German as their first language (88%).

Longitudinal attrition analyses showed that adolescents who participated at T1 only were slightly younger (d = -0.14, p = .02), less extraverted (d = -0.18, p = .004), less agreeable (d = -0.14, p = .018), less conscientious (d = -0.23, p < .001), less open (d = -0.25, p < .001), had lower self-esteem (d = -0.16, p = .007), and were less likely to be from the academic track of the German school system (OR = 0.45, p < .001) compared to those who participated in at least two assessments. The two groups did not differ in regard to gender, place of birth, or neuroticism. These differences indicate a small to medium degree of selectivity that should be considered when interpreting the results. Table 1 shows means, standard deviations, and manifest correlations of constructs for the combined sample. Descriptive information for each study sample separately can be found in Table OS2 in the OSM. Sample-wise attrition analyses can be found in the OSM on page 6.

Measures

Big Five Traits

In all three studies, the Big Five personality traits were assessed with the German version of the Big Five Inventory 2 (BFI-2; Danner et al., 2019). The BFI-2 consists of 60 items (12 items per trait) that were rated on a 7-point scale ranging from 1 (*strongly disagree*) to 7

(*strongly agree*). Reliability was estimated using McDonald's ω (McDonald, 2013) and was satisfactory at all traits and at all three measurement points: .87/.88/.88 for extraversion, .85/.87/.88 for agreeableness, .88/.90/.91 for conscientiousness, .89/.91/.91 for neuroticism, and .85/.88/.89 for openness.

Self-Esteem

In all three studies, self-esteem was assessed with four items from the German version of the Rosenberg Self-Esteem Scale (RSE; Collani & Herzberg, 2003). The items were rated on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Reliability was estimated using McDonald's ω (McDonald, 2013) and was satisfactory .90/.90/.92 at all three measurement points.

Covariates

At the first measurement point, adolescents reported their gender (0 = female vs. 1 = male) with the additional instruction to select the option with which one identifies most (i.e., *If uncertain, please choose the sex that you can identify with the most*.). Further, adolescents reported their age in years at the first measurement point. Lastly, we coded the information about the original study (i.e., we set the SELFIE study as the baseline category and added two binary variables for the other two studies to encode the original study participants' data came from).

Table 1

Means, Standard Deviations, and Correlations of Manifest Big Five Traits and Self-Esteem.

	Var.	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	T1 E	4.45	0.96																	
2	T1 A	4.68	0.74	.21*																
3	T1 C	4.43	0.96	.23*	.24*															
4	T1 N	4.03	1.00	-.35*	-.15*	-.28*														
5	T1 O	4.82	0.93	.27*	.17*	.14*	-.06*													
6	T1 SE	4.47	1.51	.43*	.21*	.27*	-.67*	.08*												
7	T2 E	4.47	0.96	.83*	.19*	.24*	-.35*	.19*	.43*											
8	T2 A	4.63	0.78	.13*	.69*	.16*	-.10*	.05	.06	.21*										
9	T2 C	4.41	0.99	.20*	.15*	.80*	-.24*	.05	.25*	.25*	.27*									
10	T2 N	4.05	1.05	-.30*	-.11*	-.18*	.81*	-.03	-.61*	-.38*	-.19*	-.26*								
11	T2 O	4.87	0.98	.21*	.01	.06	-.07	.78*	.09*	.28*	.13*	.13*	-.10*							
12	T2 SE	4.55	1.47	.34*	.08	.16*	-.55*	-.01	.74*	.44*	.13*	.25*	-.70*	.09*						
13	T3 E	4.52	0.94	.80*	.17*	.27*	-.27*	.21*	.36*	.81*	.13*	.25*	-.29*	.20*	.37*					
14	T3 A	4.71	0.76	.09	.66*	.15*	-.13*	.07	.12*	.11*	.80*	.23*	-.17*	.07	.10*	.18*				
15	T3 C	4.46	1.03	.23*	.10*	.81*	-.29*	.07	.29*	.29*	.19*	.87*	-.28*	.12*	.27*	.29*	.24*			
16	T3 N	3.94	1.03	-.25*	-.13*	-.23*	.75*	-.12*	-.59*	-.35*	-.16*	-.26*	.82*	-.15*	-.59*	-.36*	-.24*	-.34*		
17	T3 O	4.87	0.99	.21*	.03	.04	-.15*	.76*	.14*	.23*	.11*	.13*	-.19*	.85*	.15*	.28*	.15*	.17*	-.23*	
18	T3 SE	4.69	1.53	.35*	.15*	.24*	-.52*	.10	.69*	.48*	.12*	.25*	-.58*	.13*	.74*	.50*	.22*	.32*	-.71*	.21*

Note. Var. = Variables, *M* and *SD* are used to represent mean and standard deviation, respectively. E = Extraversion, A = Agreeableness, C = Conscientiousness, N = Neuroticism, O = Openness. * indicates $p < .01$.

Analytic Strategy

To investigate our research question on the longitudinal relationship between Big Five traits and self-esteem, we examined the interplay between each Big Five trait and self-esteem separately. We used a data fusion approach to integrate information across all three studies (see Marcoulides & Grimm, 2017 for an introduction to the synthesis of longitudinal data sets)[2]. Integrating data across studies has multiple strengths, such as, increase of statistical power and more flexibility in terms of data analysis but can also pose methodological challenges, such as, handling differences in terms of operationalizations and study designs (Marcoulides & Grimm, 2017). As our fused studies exhibit similar sample characteristics (adolescent students within the German school system), an equal number of measurement occasions (three in each), and identical operationalizations of our central constructs (Big Five traits with the BFI-2 and self-esteem with the RSES), a data fusion approach is particularly appropriate here to address our research question.

We took three steps to analyze our data: In a preanalytical first step, we tested for measurement invariance across the measurement points (T1-T3) within and across study samples. As a second step, we examined rank-order stabilities of Big Five traits and self-esteem by computing continuous time auto-effects for each construct. As a third step, we analyzed longitudinal associations between each Big Five trait and self-esteem by estimating continuous time cross-effects between personality and self-esteem. The latter two steps were conducted using continuous time modeling (Driver et al., 2017; Voelkle et al., 2012). After describing the pre-analytical step of measurement invariance testing, we provide more detailed information on the general logic of continuous time models (CTMs) before referring to the specific model setups that we used for testing our hypotheses. We used a level of $\alpha = .01$ for hypothesis testing.

Testing for Measurement Invariance Across Time

To test for measurement invariance across time, we built separate latent measurement models for each personality trait and for self-esteem (resulting in six measurement models) using the R package lavaan (Rosseel, 2012). For personality, we built three parcels per trait with four items per parcel identified via the facets of the respective personality trait as manifest indicators of the latent constructs. Given that the BFI-2 is a well-established scale and its items load as expected on their designated traits and facets (Danner et al., 2019; Soto & John, 2017),

[2] Marcoulides and Grimm (2017) differentiate between *data fusion approaches* where raw data from different studies are combined within a new dataset before they are analyzed and *parallel analysis approaches* where raw data from different studies are analyzed separately first and then synthesized in a second step, often using meta-analytical techniques. Based on this definition, we consider our approach as a data fusion approach.

using item parcels is considered appropriate in this case (Little et al., 2013; Matsunaga, 2008). For self-esteem, the four items served es manifest indicators. All models were identified using the effect-coding method (Little et al., 2006). We evaluated the model fits of increasingly restrictive models starting with a configural model, tested metric invariance (equal loadings across time) and, finally, aimed to implement strong measurement invariance (equal loadings and intercepts) across time. We evaluated the increasingly restrictive models regarding their overall fit with CFI > .95/90, RMSEA < .05/.08, and SRMR < .08/.11 for good/acceptable fit (Hu & Bentler, 1999; Schermelleh-Engel et al., 2003) and change in fit criteria (ΔCFI<.01, ΔRMSEA <.015; ΔSRMR <.030). We handled item-based missing data by applying the Full Information Maximum Likelihood Approach (FIML; Arbuckle, 1996). We derived factor scores from the final measurement invariance models as input for the continuous time models in steps two and three. We implemented strong measurement invariance for all constructs (all ΔCFI ≤ .005, all ΔRMSEA ≤ .015, all ΔSRMR ≤. 007). Table 2 summarizes the results for the measurement invariance testing.

Table 2

Evaluation of Longitudinal Measurement Invariance Across Three Measurement Points for the Personality Self-Reports

Construct	Invariance Model	χ^2	df	*p*-value	CFI	ΔCFI	RMSEA	SRMR
Extraversion	Configural	21.659	15	.064	.998		.021	.014
	Metric	27.168	19	.054	.998	.000	.021	.019
	Scalar	47.192	23	.001	.993	.05	.032	.023
Agreeableness	Configural	16.868	15	.190	.999		.012	.022
	Metric	18.500	19	.340	1.00	.001	.000	.025
	Scalar	28.009	23	.120	.998	.002	.015	.028
Conscientiousness	Configural	14.017	15	.419	1.00		.000	.011
	Metric	15.946	19	.587	1.00	.000	.000	.012
	Scalar	30.947	23	.086	.998	.002	.018	.017
Neuroticism	Configural	29.396	15	.006	.996		.031	.018
	Metric	35.556	19	.007	.995	.001	.029	.024
	Scalar	38.100	23	.016	.996	.001	.025	.025
Openness	Configural	16.416	15	.253	.999		.010	.016
	Metric	19.173	19	.346	1.00	.001	.003	.020
	Scalar	21.321	23	.466	1.00	.000	.000	.020
Self-Esteem	Configural	290.986	39	.000	.946		.082	.044
	Metric	315.827	45	.000	.943	.003	.078	.053
	Scalar	351.862	51	.000	.938	.005	.077	.056

Note. CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual.

Continuous Time Modeling

As the use of CTMs has only recently received more attention in psychological research (for recent examples in the field of personality psychology, see de Moor et al., 2021; Haehner et al., 2022; Mueller et al., 2018; Wagner, Voelkle, et al., 2018), we start with a brief description of their basic principles and contrast them with the more common discrete time models. The general idea of continuous time models is that time is treated continuously instead of being broken down into discrete time intervals as in discrete time models. As a result, continuous time parameters are not limited to specific time intervals but describe how processes change at any particular moment (Voelkle et al., 2012). In contrast, discrete time approaches (e.g., such as cross-lagged panel models or random-intercept cross-lagged panel models; Hamaker et al., 2015) estimate longitudinal associations between variables in discrete time steps. These models mostly rely on equidistant assessments and only yield estimates for the specific time interval under study. Consequently, results from studies with different intervals are hardly comparable. Importantly, in the context of psychological theories pre-determined assumptions about specific time intervals are rarely made or addressed. Not accounting for the role of time might further lead to biased parameter estimates and a misunderstanding of the strength and time course of effects (Driver et al., 2017; Kuiper & Ryan, 2018).

CTMs, by contrast, make use of the additional information that lies within (varying) interval lengths (Oud & Voelkle, 2014; Voelkle et al., 2012). In our case, CTMs are particularly suited because they allow the integration of information from three samples with differing measurement intervals (one to six months). Furthermore, our results from CTMs can easily be compared to studies with different time intervals. As continuous time parameters are calculated on the basis of differential equations (Ryan et al., 2018), their interpretation can be unintuitive without a deeper understanding of these basics. Specifically, within CTMs, the drift matrix captures the temporal dynamics of latent processes across time. With two constructs, a 2x2 *drift matrix* is specified. The drift matrix contains two types of parameters: the continuous time auto-effects on the main diagonal and the continuous time cross-effects on the off-diagonal. In the following breakdown, we, therefore, explain these two most important parameters to address our research question.

The continuous time *auto-effects* describe how persistent a process is (i.e., how fast or slow it reverts back to a stable equilibrium after change). More persistent processes need longer to revert to their equilibrium (e.g., changes in extraversion might have a strong predictive impact for later states of extraversion) than less persistent processes (e.g., changes in self-esteem might have a weaker predictive impact for later states of self-esteem when compared to

extraversion). More persistent processes express themselves in negative values that are closer to zero than less persistent processes, which express themselves in negative values further from zero. Positive auto-effects are indicative for dynamic processes that don't revert to their respective equilibria but are (explosively) repelled from them (Ryan et al., 2018). More persistent processes result in higher positive discrete time autoregressive[3] effects than less persistent processes.

The continuous time *cross-effects* describe how changes in different processes predict each other over time. Larger absolute values correspond to larger effects in either the same direction for positive values (e.g., positive changes in extraversion predict higher levels of self-esteem) or the opposite direction for negative values (e.g., positive changes in extraversion predict lower levels of self-esteem). Accordingly, cross-effects from self-esteem on personality ($\alpha_{SE \rightarrow P}$) indicate how changes in self-esteem predict changes in one specific personality trait. As with continuous time auto-effects, continuous time cross-effects can be transformed into discrete time cross-lagged effects for any time interval. Higher continuous time cross-effects result in higher discrete time cross-lagged effects than lower cross-effects as long as they refer to time intervals of equal length.

Another important continuous time parameter is the continuous intercept (CINT). The CINT indicates the long-term level around which the processes fluctuate (Driver & Voelkle, 2021). Model specifications without CINTs (i.e., CINT fixed to zero) describe processes that return to zero after change occurred. Depending on the estimation approach, either a population parameter only is estimated for the CINT or it is additionally possible to have the CINT vary from person to person. Model specifications without individually varying CINTs are similar to discrete time fixed-intercept cross-lagged panel models, with the distinction that time is modeled continuously. Model specifications with individually varying CINTs, on the other hand, correspond to discrete time random-intercepts cross-lagged panel models, again with the distinction that time is modeled continuously. The parameters from the former models (fixed-intercept or no individually varying intercept parameters) show between-person differences, whereas the parameters from the latter models (random-intercepts or individually varying intercept parameters) allow a within-person interpretation of the results.

In addition to the general advantages of CTMs over discrete-time models, the combination of CTMs with hierarchical Bayesian modeling provides a convenient approach to investigate how longitudinal processes might differ across individuals (Driver & Voelkle,

[3] To distinguish between continuous and discrete time effects, we use the terms autoregressive effects and cross-lagged effects for discrete time effects and the terms auto- and cross-effects for continuous time effects. Also, we add an asterisk to discrete time effects when they refer to a specific time interval.

2018). Hierarchical Bayesian continuous time dynamic models estimate a population distribution for all model parameters while simultaneously using the population distribution as a prior distribution to sample individually varying subject level parameters (see Driver and Voelkle, 2018 for a thorough introduction to hierarchical Bayesian continuous dynamic modeling). This allows an interpretation of the effects from a within-person perspective. To overcome the limits of discrete time models and to make use of the beforementioned advantages of the continuous time approach, we implemented hierarchical Bayesian continuous time dynamic modeling to separate within-person longitudinal associations between Big Five personality traits and self-esteem from between-person effects and further explore how cross-effects vary across individuals. As no previous study tested the interplay between personality and self-esteem in adolescence modeling time continuously, we used default priors and start values.

Regarding power to detect effects, a simulation study by Hecht and Zitzmann (2021b) showed that we are likely to have good performance to estimate the continuous time auto-effects with the number of measurement points and observed individuals. Further, we have a power of 99.9% or higher to detect small standardized peak cross-effects ($\alpha = 0.1$) considering our minimum amount of people per measurement point in a basic bivariate continuous time model (Hecht & Zitzmann, 2021a). However, it is currently unclear how these findings generalize to other study conditions, such as our bivariate models with individually varying CINTs.

Rank-Order Stabilities of Big Five Traits and Self-Esteem

To estimate rank-order stabilities of Big Five traits and self-esteem, we specified six CTMs (one model for each construct) with one latent process, respectively. Each model contained a 1x1 drift matrix with one continuous time auto-effect. Derived factor scores from measurement invariance models served as input. Specifically, we applied Bayesian continuous time dynamic modeling (Driver & Voelkle, 2018) using the *R* package *ctsem* (Driver et al., 2017) in combination with the Stan interface to R (Stan Development Team, 2022). Because we were mainly interested in longitudinal dynamics across time, we treated time as 'clock time' and coded it in months (i.e., we set the time variable to zero for all observations at T1 and indicated for later observations how many months had passed since T1). As rank-order stabilities characterize differences between people in their rank-ordering across time, we specified fixed-intercept models (CINTs were not allowed to vary individually). We fixed the manifest variances (i.e., the measurement error term) to zero as we used latent (measurement-error-free) factor scores as input variables. In CTMs, auto-effects that are closer to zero show a higher rank-order stability in the construct. To better relate our results to previous findings that

modeled discrete time intervals and to ease interpretation, we transformed the continuous time auto-effects into discrete time autoregressive effects of different time intervals (Hecht & Voelkle, 2021). We had no pre-registered hypotheses for this step but wanted to check whether our combination of data fusion and continuous time approach yielded similar results with respect to rank-order stabilities of Big Five traits and self-esteem as in previous studies that used discrete time models. The matrix specification of the models can be found in the OSM (page 7).

Longitudinal Associations Between Big Five Traits and Self-Esteem

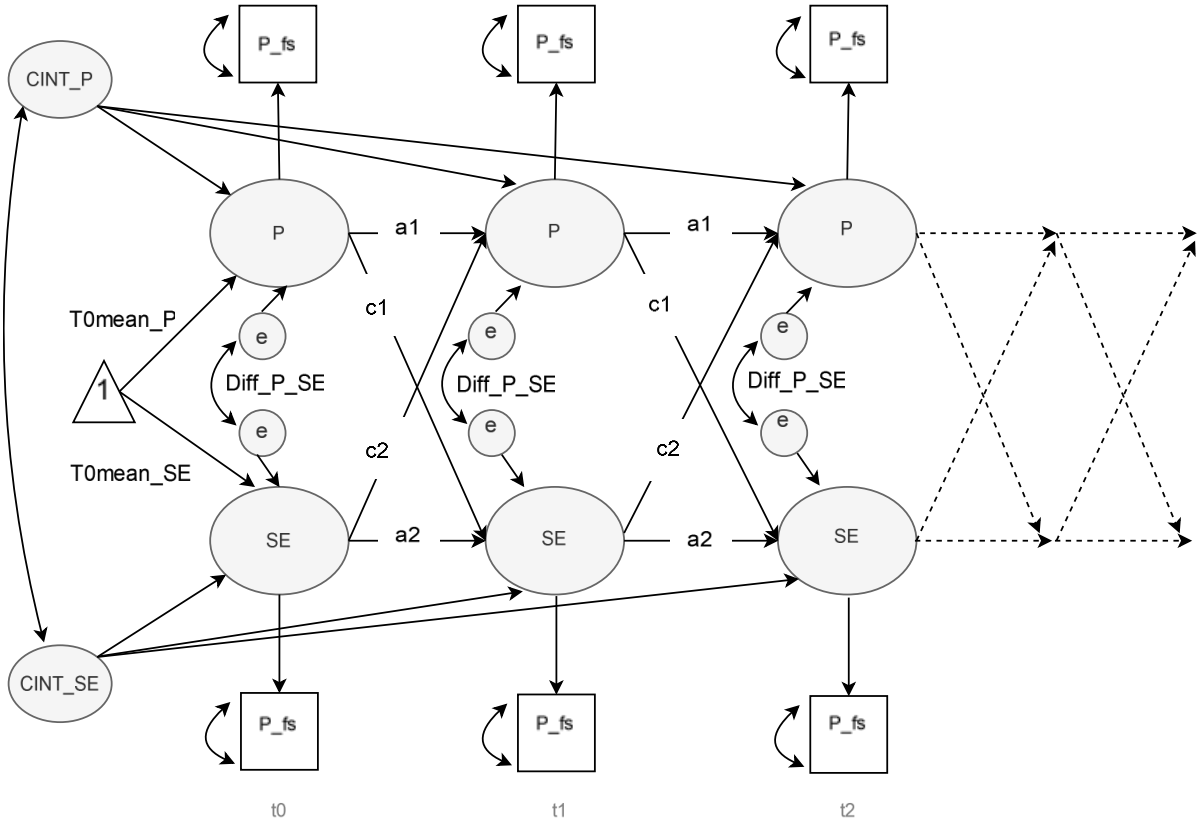
To target our main research question on the longitudinal relationship between Big Five traits and self-esteem, we specified five CTMs (combining each Big Five trait with self-esteem in a separate model). In this model specification, we allowed continuous time intercepts (CINTs) to vary across individuals. The latter is conceptually comparable to estimating random intercepts for each participant in a random-intercepts cross-lagged panel model (Hamaker et al., 2015) to avoid stable between-person differences to bias cross-lagged effects. Figure 3 shows a graphical representation of our model. The matrix specification of the models can be found in the OSM (page 8). Again, we transformed the resulting continuous time cross-effects into discrete time cross-lagged effects of different time intervals to relate our results to previous findings that modeled time discretely and ease interpretation of effect sizes. To test whether cross-effects within the same model differed in size, we compared each model with freely estimated cross-effects to a simpler model with cross-effects constrained to equality using a deviancy test on the 2 Log-Likelihood statistics (Δ-2LL).

We further investigated whether and how the cross-effects from our main analyses differed across participants' age[4], gender, and original sample by including these variables as time-independent predictors into our models. The variable age in years was centered before being entered into the analyses. The matrix specification of an exemplary model with a time-independent predictor (i.e., participants' gender) can be found in the OSM on page 9.

[4] As we had no theory-derived hypotheses on why longitudinal dynamics between personality characteristics might substantially differ across adolescents of different ages, we considered it appropriate to combine different samples of different averages ages. However, we included age as a covariate to test the robustness of our effects.

Figure 3

Graphical Representation of a Bivariate Hierarchical Bayesian Continuous Time Dynamic Model



Note. P = any Big Five trait; SE = self-esteem; fs = factor score; CINT = continuous time intercept; T0mean = latent process mean at t0; a1 = auto-effect of Big Five trait; a2 = auto-effect of self-esteem; c1 = cross-effect from Big Five trait on self-esteem, c2 = cross-effect from self-esteem on Big Five trait; Diff = covariance of the latent process; The dashed arrows indicate that the time series continues (t3 = three months after first assessment, t4 = six months after first assessment, t5 = twelve months after first assessment). Some elements of this figure are adapted from Marciano et al. (2022).

Exploratory Analyses

Hierarchical Bayesian CTMs allow individual variation of different model parameters. To explore individual differences in the longitudinal associations between Big Five traits and self-esteem, we allowed for individual variation of the continuous time drift parameters, both auto and cross effects, in an exploratory step. The matrix specification of the models can be found in the OSM (page 10).

Further, we repeated our analyses using acquaintance-reports, which were available from two of our original three studies (SELFIE and SchoCo). Based on invariant measurement models across time, we repeated continuous time analyses in the same way as specified for self-rated personality characteristics. In both original studies, participants were asked to provide acquaintance-reports of their personality (i.e., on Big Five traits and self-esteem) from one to

five acquaintances. The acquaintances were allowed to vary over the three measurement points. 553 participants provided at least one acquaintance-report at the first measurement point (mean ratings per person = 1.83), 135 participants provided at least one acquaintance-report at the second measurement point (mean ratings per person = 1.92), and 87 participants provided at least one acquaintance-report at the third measurement point (mean ratings per person = 1.90). At T1, acquaintances had known participants for an average of 10 years. The majority of acquaintances were friends (48.86 %) or parents (24.59 %). We computed the mean of all personality ratings at one measurement point per person if participants provided more than one acquaintance-report. Table OS9 in the OSM provides an overview of the manifest means and correlations of acquaintance-reports across time. Cross-sectional correlations between self- and acquaintance-reports were moderate to high and are displayed in Table 3. We implemented strong measurement invariance for all constructs as can be seen in Table 4.

Table 3

Correlations Between Personality Self- and Acquaintance-Reports

Variable	Correlation between Self- and Acquaintance-reports		
	T1	T2	T3
Extraversion	.72	.69	.61
Agreeableness	.48	.42	.43
Conscientiousness	.67	.64	.64
Neuroticism	.57	.52	.45
Openness	.64	.70	.52
Self-Esteem	.51	.47	.50

Note. All correlations are statistically significant at $p < .01$.

Table 4

Evaluation of Longitudinal Measurement Invariance Across Three Measurement Points for the Personality Acquaintance-reports.

Construct	Invariance Model	χ^2	df	*p*-value	CFI	ΔCFI	RMSEA	SRMR
Extraversion	Configural	19.625	15	.166	.993		.031	.055
	Metric	21.178	19	.266	.997	.004	.019	.050
	Scalar	25.746	23	.269	.996	.001	.019	.053
Agreeableness	Configural	10.228	15	.688	1.00		.000	.021
	Metric	26.540	19	.052	.988	.002	.037	.090
	Scalar	32.873	23	.043	.985	.003	.038	.091
Conscientiousness	Configural	16.680	15	0.209	.992		.020	.042
	Metric	25.070	19	0.080	.998	.006	.033	.056
	Scalar	31.305	23	.056	.989	.001	.035	.058
Neuroticism	Configural	32.021	15	.006	.982		.059	.046
	Metric	37.019	19	.009	.982	.000	.053	.067
	Scalar	39.835	23	.018	.983	.001	.047	.068
Openness	Configural	19.021	15	.295	.995		.027	.035
	Metric	20.787	19	.423	.997	.002	.016	.040
	Scalar	30.831	23	.180	.989	.008	.031	.045
Self-Esteem	Configural	162.975	15	.000	.992		.097	.068
	Metric	156.519	19	.000	.925	.003	.089	.067
	Scalar	162.659	23	.000	.926	.001	.083	.068

Note. CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual.

Results

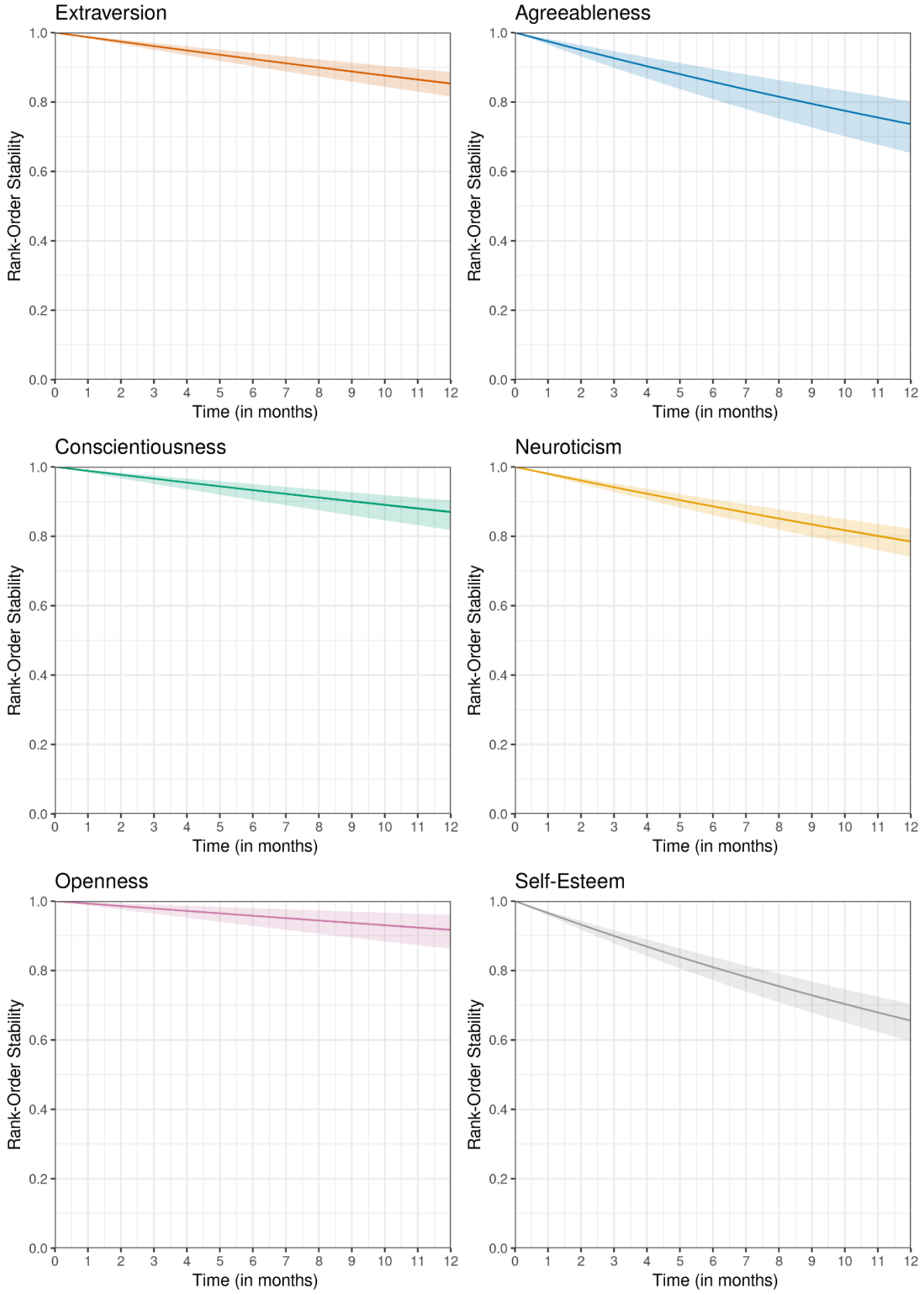
In the following, we first, briefly describe rank-order stabilities of Big Five traits and self-esteem. Second, we present the results from our main analyses on the within-person longitudinal associations between Big Five traits and self-esteem. Third, we report findings including the time-invariant covariates gender, age, and study origin. Fourth, we report the results from our exploratory analyses on bivariate CTMs with individually varying cross-effects. Fifth, we report on our findings from the acquaintance-reports.

Rank-Order Stabilities

From our five fixed-intercept CTMs combining each Big Five trait with self-esteem, we derive that all Big Five traits and self-esteem showed statistically significant negative auto-effects which are indicative of processes that tend to return to a stable equilibrium after change occurred (see Figure 4). In general, all observed personality characteristics in our sample had negative continuous time auto-effects that were close to zero which correspond to high discrete time rank-order stabilities. To illustrate, the continuous time auto-effects ranged from α = - 0.036 for self-esteem to α = - 0.008 for openness with corresponding discrete time six-month-rank-order-stabilities ranging from a_6^* = 0.808 for self-esteem to a_6^* = 0.956 for openness. That is, in line with findings from previous studies, people maintain their relative ranks on a personality characteristic over time with rank-order stabilities for Big Five traits descriptively appearing slightly higher than for self-esteem. Discrete time auto-effects for different time intervals and model fits are displayed in Table OS3 in the OSM.

Figure 4

Discrete Time Autoregressive Effects for Different Time Interval Lengths



Note. N = 1,088. Colored areas around the lines display 99%-confidence intervals.

Longitudinal Associations Between Big Five Traits and Self-Esteem

We found statistically significant positive reciprocal within-person effects between extraversion and self-esteem in our bivariate CTMs: Increases in extraversion predicted later increases in self-esteem and vice versa, confirming Hypotheses 1b and 2b. Also, in line with our hypotheses, we found statistically significant negative reciprocal effects between neuroticism and self-esteem, confirming Hypotheses 1a and 2a. As for the effects between agreeableness, conscientiousness, and self-esteem, cross-effects were all positive, however, the effects from self-esteem on agreeableness and conscientiousness failed did not differ statistically from zero, confirming Hypotheses 1c and 1d but not 2c and 2d. Finally, we explored the effects between openness and self-esteem and found a negative effect from openness on self-esteem but a positive effect from self-esteem on openness, implying that increases in openness predicted decreases in later values of self-esteem but increases in self-esteem predicted increases in later values of openness. On a descriptive level, most effects were small and similar in size with the exception of the medium-sized effect from neuroticism on self-esteem. Comparing our bivariate models with freely estimated cross-effects to models with equality constraints on the cross-effects using a deviancy test on 2 Log-Likelihood statistics (Δ-2LL), these conclusions were supported by showing that the more complex model with freely estimated cross-effects from neuroticism and self-esteem showed significantly better model fit ($p < .01$) than the simpler model with constrained cross-effects. See Table 5 for a summary of cross-effects.

Transforming the resulting continuous time cross-effects into discrete time cross-lagged effects of different time intervals (i.e., intervals of one, two, three, and six months), we found that cross-lagged effects between Big Five traits and self-esteem peak within the first month. When looking at longer time intervals, cross-lagged effects diminished in size and lost statistical significance after about two months. Only cross-lagged effects between neuroticism and self-esteem remained for a period of up to six months. However, the respective effects were very small for longer time intervals (i.e., $\alpha_6^* = -0.013$ for the effect from neuroticism on self-esteem and $\alpha_6^* = -0.002$ for the effect from self-esteem on neuroticism after six months). The second part of Table 5 shows discrete time cross-lagged effects from Big Five traits on self-esteem and vice versa. For a graphical representation see Figure 5.

Table 5

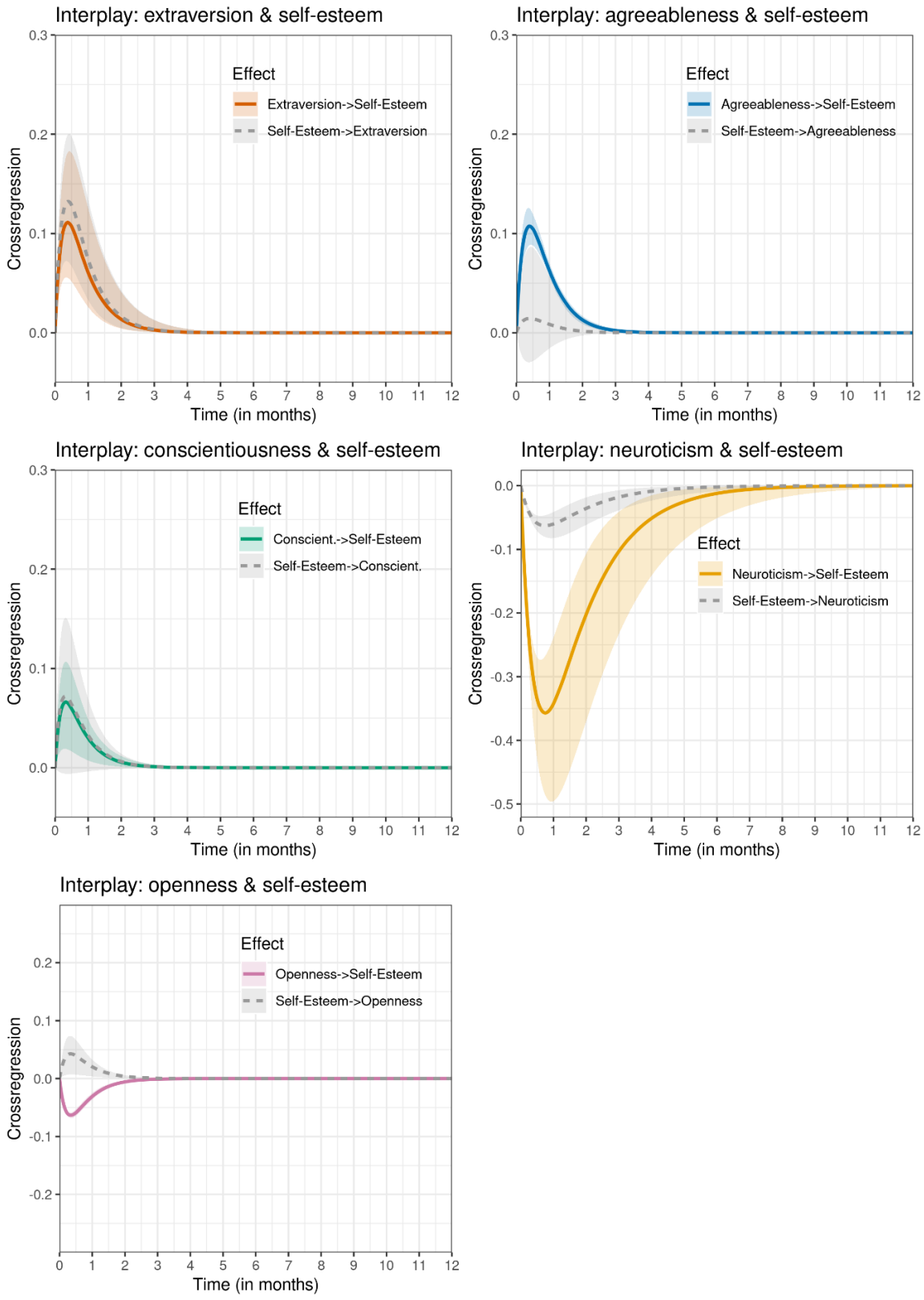
Continuous and Discrete Time Cross-Lagged Effects Between Big Five Traits on Self-Esteem for Different Time Intervals

	Big Five on self-esteem					
	Continuous time cross-effects	Discrete time cross-lagged effects				Log-Likelihood
	α_{21} [99%-CI]	1 month: a_1^* [99%-CI]	2 months: a_2^* [99%-CI]	3 months: a_3^* [99%-CI]	6 months: a_6^* [99%-CI]	
Extraversion	**0.830 [0.440; 1.179]**	**0.065 [0.027; 0.101]**	**0.015 [0.005; 0.042]**	**0.004 [0.001; 0.014]**	0.000 [0.000; 0.000]	-3567.297
Agreeableness	**0.745 [0.578; 0.914]**	**0.063 [0.054; 0.073]**	**0.013 [0.008; 0.018]**	**0.002 [0.001; 0.004]**	0.000 [0.000; 0.000]	-3366.162
Conscientiousness	**0.574 [0.132; 0.976]**	**0.029[0.007; 0.058]**	**0.006 [0.001; 0.014]**	0.001 [0.000; 0.003]	0.000 [0.000; 0.000]	-3718.555
Neuroticism	**-1.382 [-1.526; -1.273]**	**-0.344 [-0.482; -0.239]**	**-0.206 [-0.356; -0.110]**	**-0.101 [-0.222; -0.044]**	**-0.013 [-0.048; -0.003]**	-3782.196
Openness	**-0.523 [-0.568; -0.484]**	**-0.031 [-0.036; -0.026]**	-0.006 [-0.008; -0.000]	-0.001 [-0.002; -0.000]	0.000 [0.000; 0.000]	-3434.572
	Self-esteem on Big Five					
	Continuous time cross-effects	Discrete time cross-lagged effects				
	α_{12} [99%-CI]	1 month: a_1^* [99%-CI]	2 months: a_2^* [99%-CI]	3 months: a_3^* [99%-CI]	6 months: a_6^* [99%-CI]	
Extraversion	**0.996 [0.556; 1.437]**	**0.0783 [0.124; 0.129]**	**0.019 [0.016; 0.055]**	**0.004 [0.001; 0.019]**	0.000 [0.000; 0.001]	-3567.297
Agreeableness	0.093 [-0.302; 0.527]	0.009 [-0.023; 0.054]	0.002 [-0.004; 0.014]	0.000 [-0.001; 0.002]	0.000 [0.000; 0.000]	-3366.162
Conscientiousness	0.663 [-0.083; 1.2431]	0.033 [-0.005; 0.065]	0.006 [-0.001; 0.015]	0.001 [0.000; 0.003]	0.000 [0.000; 0.000]	-3718.555
Neuroticism	**-0.241[- 0.264; -0.224]**	**-0.060[-0.081; -0.042]**	**-0.036 [-0.060; -0.019]**	**-0.018 [-0.038; -0.008]**	-0.002 [-0.008; -0.000]	-3782.196
Openness	**0.360 [0.067; 0.656]**	**0.021 [0.004; 0.032]**	**0.004 [0.001; 0.007]**	0.001 [0.000; 0.001]	0.000 [0.000; 0.000]	-3434.572

Note. α_{21} = continuous time cross-effect from respective Big Five trait ($_1$) on self-esteem ($_2$); α_{12} = continuous time cross-effect from self-esteem ($_2$) on respective Big Five trait ($_1$). The direction of effects should be interpreted from column to row (i.e., α_{21} is read as the effect of changes in the respective Big Five traits on later values of self-esteem). Bold font indicates statistical significance at $p < .01$.

Figure 5

Representation of Discrete Time Cross-Lagged Effects Between Big Five Traits and Self-Esteem Across Time Intervals of 12 Months.



Note. N = 1,088. Colored areas around the lines display 99%-confidence intervals.

Covariate Effects

To examine possible effects of gender and age on cross-effects between Big Five traits and self-esteem, we included time-invariant predictors in our CTMs. We found no statistically significant effects of either gender or age. That is, longitudinal associations between Big Five traits and self-esteem did not differ between boys and girls or across adolescents' age. Tables OS4, OS5, and OS6 in the OSM show the results from the CTMs with covariates.

As we integrated data from three studies (i.e., SELFIE, SchoCo, and SNAP), we furthermore investigated study origin as a covariate. Findings were largely comparable across studies with one notable difference: The negative continuous time cross-effect from openness on self-esteem was slightly stronger in the SELFIE study than in the SchoCo study. Overall, our results were robust across sample characteristics.

Exploratory Analyses

Variation of drift parameters. To explore individual differences in the average within-person longitudinal associations between Big Five traits and self-esteem, we additionally allowed for individual variation of all four drift parameters of our CTMs. In general, we found statistically significant variation across subjects. Most individual continuous time cross-effects ranged from negative to positive across all five models. We report medians and interquartile ranges for all cross-effects in Table OS7. However, we refrain from a more in-depth description and interpretation of the results as the simultaneous variation of the many parameters likely has exceeded the models' capacities given our data structure (i.e., number of observations per participant). We will examine this issue in more detail in the discussion section.

Diffusion parameters. Further, we explored the off-diagonal covariance diffusion parameters which in CTM reflect unexplained exogenous inputs of the respective model and are considered hard to interpret on their own (Driver & Voelkle, 2018). We found substantial negative covariation between neuroticism and self-esteem (diff_Selfesteem_Neuroticism = -0.146, 99%-CI [- 0.195; - 0.094]). So, on occasions where neuroticism is high due to unmodeled factors, self-esteem appears to be substantially lower as well. There we no other statistically significant effects for the remaining Big Five/self-esteem combinations. We report all corresponding diffusion parameters and their 99%-confidence intervals in Table OS8 in the OSM.

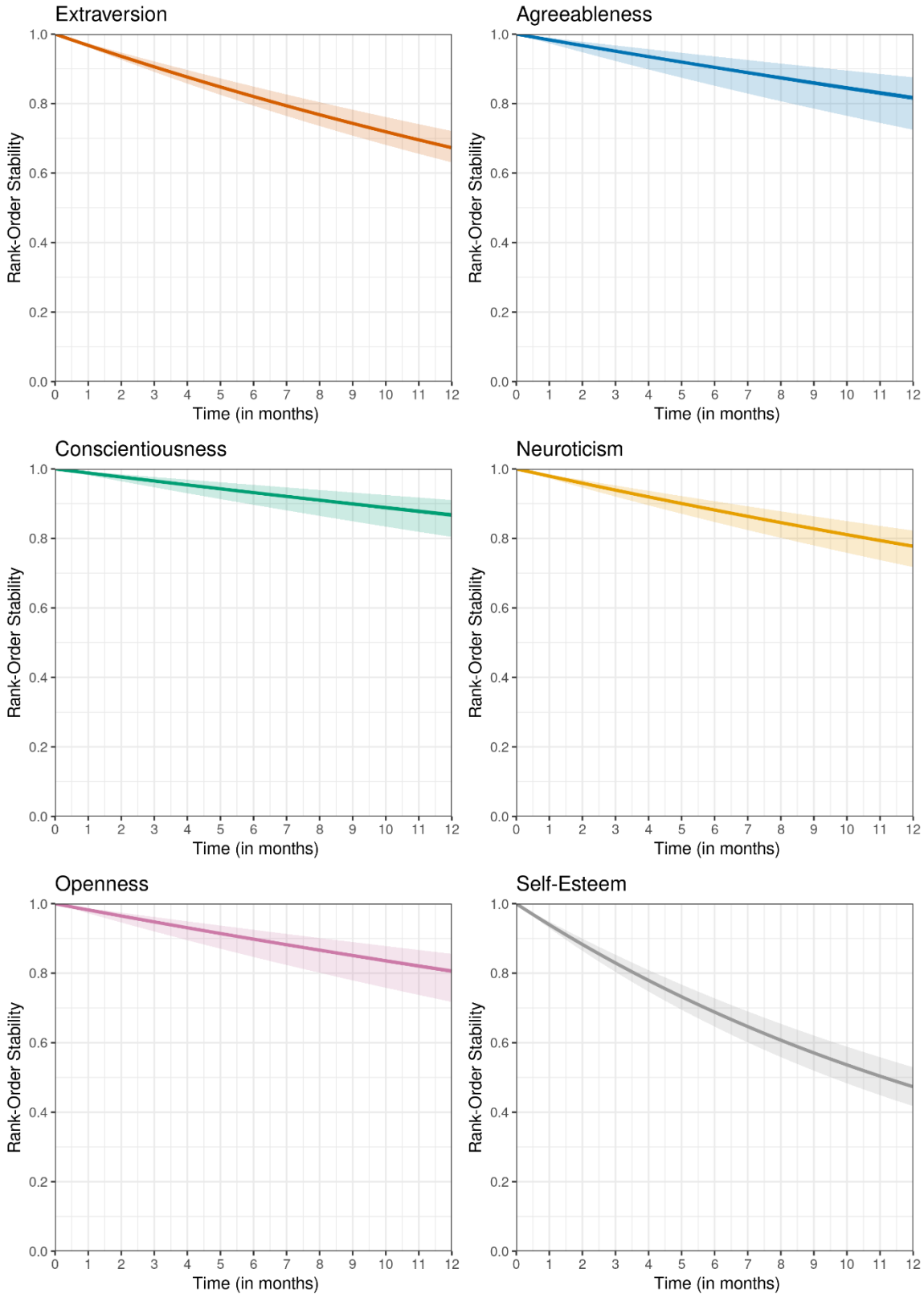
Acquaintance-reports. Lastly, we repeated all analyses using acquaintance-reports. Based on the fixed-intercept CTM for each Big Five trait as well as self-esteem, we first estimated rank-order stabilities for the acquaintance-reports of the SELFIE and the SchoCo

study. Table OS10 in the OSM shows the continuous time auto-effects as well as the one-, six-, and twelve-months discrete time autoregressive effects and Figure 6 displays the discrete time autoregressive parameters for different interval lengths. Replicating patterns of self-reports, all personality characteristics had moderate to high auto-effects, self-esteem showed a statistically significant lower rank-order stability compared to Big Five traits, and rank-order stabilities were significantly lower for longer time intervals. Rank-order stabilities derived from acquaintance-reports tended to be a little lower than those derived from self-report but were overall comparable.

Looking at the longitudinal interplay between Big Five traits and self-esteem, we also found a similar albeit not identical pattern for the acquaintance-reports and the self-reported personality characteristics. In line with our results from the self-reports, we found positive reciprocal associations between extraversion and self-esteem, as well as positive effects from agreeableness and conscientiousness, respectively. However, this effect was reciprocal in the acquaintance-reports but one-sided in the self-reports. Also, we found a negative effect from neuroticism on later values of self-esteem. However, this effect was one-sided for the acquaintance-reports but reciprocal for the self-reports. Lastly, we found a positive reciprocal association between openness and self-esteem. Most effects were small in size. However, the effects from conscientiousness, neuroticism, and openness on self-esteem were medium-sized. Comparing the bivariate models with freely estimated cross-effects to models with equality constraints on the cross-effects using a deviancy test on 2 Log-Likelihood statistics (Δ-2LL) supported these conclusions by showing that the more complex model with freely estimated cross-effects from conscientiousness, neuroticism, and openness on self-esteem showed significantly better model fit that the simpler models with equal cross-effects (i.e., all p-values $< .05$). Lastly, and in contrast to our results from the self-reports, Figure 7 suggests that the effects of conscientiousness, neuroticism, and openness on subsequent self-esteem peak later and extend beyond the 12-month span. The corresponding continuous time cross-effects can be found in Table 6 and the discrete time effects are displayed in Figure 5.

Figure 6

Discrete Time Autoregressive Effects for Different Time Intervals Lengths (Acquaintance-Reports)



Note. N = 553. Colored areas around lines display 99%-confidence intervals.

Table 6

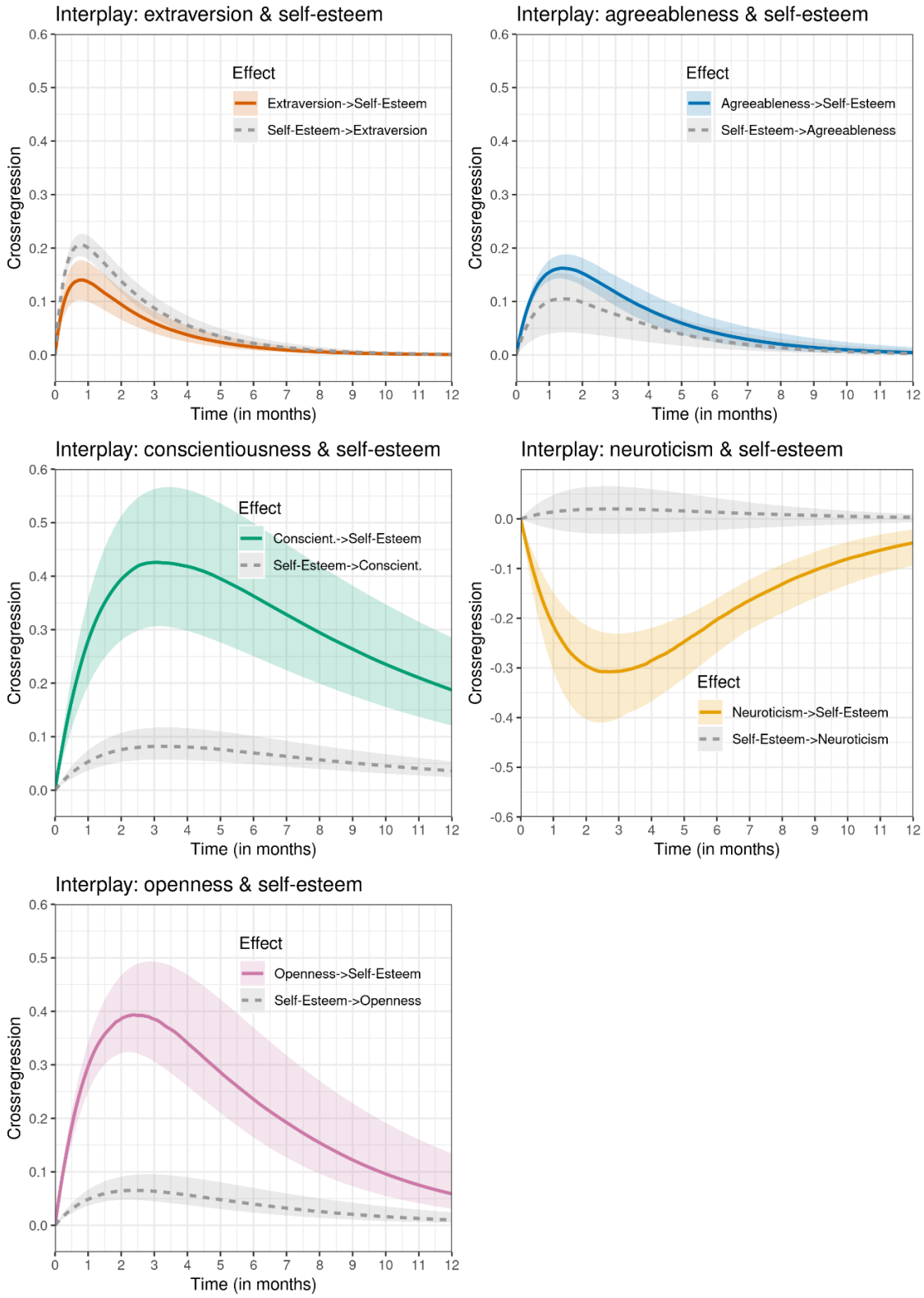
Continuous Time Cross-Effects Between Big Five traits and Self-Esteem Measured via Acquaintance-Reports

	Continuous time cross-effects Big Five on self-esteem		Continuous time cross-effects self-esteem on Big Five		Log-Likelihood
	α_{21}	99%-CI	α_{12}	99%-CI	
Extraversion	0.562	[0.381 0.747]	0.813	[0.735;0.896]	-827.384
Agreeableness	0.337	[0.297; 0.381]	0.215	[0.072; 0.350]	-926.436
Conscientiousness	0.395	[0.254; 0.528]	0.080	[0.051; 0.108]	-1002.455
Neuroticism	-0.319	[-0.440; -0.208]	0.022	[-0.030; 0.076]	-963. 010
Openness	0.455	[0.359; 0.553]	0.076	[0.054; 0.101]	-961.151

Note. α_{21} = continuous time cross-effect from respective Big Five trait ($_1$) on self-esteem ($_2$); α_{12} = continuous time cross-effect from self-esteem ($_2$) on respective Big Five trait ($_1$). The direction of effects should be interpreted from column to row (i.e., α_{21} is read as the effect of changes in the respective Big Five traits on later values of self-esteem). All effects except the effect from self-esteem on neuroticism are significant at $p < .01$.

Figure 7

Representation of Discrete Time Cross-Lagged Effects Between Big Five Traits and Self-Esteem Measured via Acquaintance-Reports Across Time Intervals of 12 Months



Note. N = 553. Colored areas around the lines display 99%-confidence intervals.

Discussion

In this study, we aimed for a better understanding of the longitudinal interplay between Big Five traits and self-esteem in the developmentally turbulent phase of middle and late adolescence. We did so by integrating data from three longitudinal studies and applying hierarchical Bayesian continuous time dynamic modeling (Driver & Voelkle, 2018). Our results yielded four main findings: First, rank-order stabilities of Big Five traits and self-esteem in adolescence were overall high over a twelve-month period but appeared higher for most Big Five traits compared to self-esteem. Second, the developmental interplay between Big Five traits and self-esteem can be characterized as reciprocal for extraversion, neuroticism, openness, and self-esteem but one-sided from agreeableness and conscientiousness on self-esteem. Third, the reciprocal effects peaked after short periods of two to four weeks but mostly faded after about two months. Fourth, most of these longitudinal associations were found in a similar way for boys and girls, younger and older adolescents, across samples used, and across personality raters (self- vs. acquaintance-reports). In the following, we discuss the implications of these findings in more detail and further describe future avenues for personality development research in adolescence.

Rank-Order Stabilities of Big Five Traits and Self-Esteem in Adolescence

We started with an examination of rank-order stabilities and found overall high stability for all six self-reported personality characteristics. The rank-order stabilities of Big Five traits and self-esteem found in our sample are consistent with previous findings from discrete time models that used latent measures of the respective constructs in adolescence and early adulthood (e.g., Borghuis et al., 2017; Chung et al., 2017; Hutteman et al., 2015). Compared to findings from adult samples that also used continuous time modeling (de Moor et al., 2021; Haehner et al., 2022), rank-order stabilities are slightly lower in adolescence. Again, such findings are consistent with past studies that found lower rank-order stabilities of Big Five traits and self-esteem in adolescence than during later periods in life using discrete time models (Mõttus et al., 2019; Orth & Robins, 2014; Roberts & DelVecchio, 2000; Trzesniewski et al., 2003).

Our analyses suggest that self-esteem might be less stable than most Big Five traits. This difference in rank-order stabilities over time is not due to differential reliabilities as all measures in our study demonstrated high reliability. Again, this finding is mainly consistent with previous work (Anusic & Schimmack, 2016). Given that adolescents have been found to be more prone to social feedback (Somerville, 2013), and social feedback is assumed as one key source for the development of people's self-esteem (Harris & Orth, 2020; Leary & Baumeister, 2000),

adolescents' own perception of their worth might be more volatile in this turbulent phase. In contrast, the supposedly higher stability of Big Five traits compared to self-esteem might be considered to speak in favor of the core perspective. That is, Big Five traits show to be less malleable. Following this argument, Big Five should –in theoretical and based on our empirical accounts– more likely regarded as drivers for change in less stable characteristics, such as self-esteem that the other way around.

Some Evidence for the Reciprocal Interplay Between Big Five Traits and Self-Esteem in Adolescence

Inconsistent with generalized one-sided interpretations of both the core and the filter perspective, but in line with our expectations of reciprocal relations, we found evidence for a mutual interplay between some Big Five trait and self-esteem development. Adolescents who increased in extraversion and decreased in neuroticism, increased in later values of self-esteem and vice versa. What can we learn from this reciprocal interplay during adolescence?

With respect to extraversion and self-esteem, our reciprocal longitudinal findings nicely fit with previous theoretical and empirical notions illustrating the strong interplay between diverse indicators of satisfactory social relationships and self-esteem (Harris & Orth, 2020). Theoretically, these respective associations between extraversion and self-esteem can, on the one hand, be understood in terms of sociometer theory (Leary & Baumeister, 2000): That is, when adolescents are more extraverted than usual, for example, more outgoing, talkative, or energetic, their sense of social inclusion may increase as a by-product of these behaviors, which in turn reflects positively on their subsequent self-esteem. As outlined, adolescence constitutes a time of many changes. Social changes (e.g., tightening peer relationships, the social standing among classmates, or first romantic encounters), in particular, are of central importance to adolescents. It is therefore plausible to assume that the satisfactory navigation of social relationships constitutes a vital source of self-esteem for adolescents. On the other hand, the self-broadcasting perspective—suggesting that internal self-evaluations are observably "self-broadcasted" and thus shape the functioning of social relationships (Srivastava & Beer, 2005)—might explain the other direction of effects: That is, when adolescents have higher self-esteem than usual, they might express this heightened self-evaluation in subsequent increases of extraverted behaviors. In sum, our results support the assumption about extraversion and self-esteem development acting as respective and mutually reinforcing resources for each other's development.

In addition to positive reciprocal associations between extraversion and self-esteem, negative reciprocal associations were found between self-esteem and neuroticism. Also, we

found positive predictive effects from agreeableness and conscientiousness development on self-esteem development. Thus, our explanation and argument on the role of developmental tasks as potential drivers of longitudinal associations (i.e., the maturity principle; Roberts & Wood, 2006) between Big Five and self-esteem development appear to be supported by some results. Specifically, becoming more mature in terms of Big Five traits (i.e., becoming more agreeable, more conscientious, and less neurotic) might be beneficial for the accomplishment of developmental tasks, such as picking up a part-time job or beginning a romantic relationship and this appears to be true already during adolescence. The successful accomplishment of developmental tasks might in turn increase adolescents' self-esteem, potentially by fostering independence and feelings of mastery. In contrast, self-esteem development, which might be linked to a higher probability of accomplishing developmental tasks in the first place, seems to only contribute to less neurotic patterns of thinking, feeling, and behaving but show no effect with regard to more agreeable or conscientiousness patterns. Although the explanation with reference to developmental tasks seems plausible in light of some of our results, the exact mechanism needs to be tested in future studies. Such future studies should include personality variables as well as information on the (temporal) occurrence and subjective perceptions of developmental tasks and other life events (Luhmann et al., 2021). In addition to these overall patterns, we would like to highlight the difference in effect sizes for the effects between neuroticism and self-esteem. That is, whereas effects between the other Big Five traits and self-esteem were comparable in size (albeit not always significant), only effects from neuroticism on self-esteem were significantly stronger than the other way around. Stronger predictive effects from Big Five traits on self-esteem than from self-esteem on Big Five traits are consistent with less rigid, mostly newer, interpretations of the core perspective (Asendorpf & Motti–Stefanidi, 2018; DeYoung, 2015; Kandler & Rauthmann, 2022; McAdams & Pals, 2006). These do not rule out influences of surface characteristics on core traits but assume that changes in core traits should have bigger effects on subsequent changes in surface characteristics than the other way around.

Comparing our observed result pattern in adolescents to available studies with adult samples points to both similarities and differences: Whereas our one-sided effects from agreeableness and conscientiousness on self-esteem speak more in favor of the core-perspective, Fetvadjiev and He (2019) observed reciprocal effects with stronger effects from agreeableness and conscientiousness on self-esteem than vice versa, speaking in favor of a less rigid core perspective, and – similar to us – stronger negative effects from neuroticism on self-esteem than vice versa. Weidmann et al. (2018) paint an even more complex picture with

negative one-sided effects from agreeableness on self-esteem for adult males, positive one sided positive effects from self-esteem on agreeableness for adult females but no effects for adolescents and young adults. They further observed reciprocal effects between conscientiousness and self-esteem in adult females and similar-sized reciprocal negative effects between neuroticism and self-esteem (Weidmann et al., 2018).

Overall, discrepancies between Fetvadjiev and He's (2019) as well as between Weidmann et al.'s (2018) and our findings might be driven by differences in sample characteristics (i.e., adolescents vs. mainly adults). In our sample, self-esteem appeared to be less stable compared to the Big Five traits and, thus, potentially more malleable which could be explained and considered with regard to the life phase. Agreeableness and neuroticism (along with extraversion, the role of which has already been discussed above), for example, are considered to be the central "social" Big Five traits by promoting more prosocial and less socially anxious patterns of behaving, thinking, and feeling (Jensen-Campbell et al., 2002; Tov et al., 2016; Wieczorek, Humberg, et al., 2021). Given the pronounced importance of positive social relationships during adolescence, changes in agreeableness and neuroticism as "social traits" could, in particular, relate more strongly to subsequent changes in self-esteem than vice versa. Also, in contrast to Weidmann et al. (2018), we did not find any different longitudinal effects between personality characteristics for boys and girls. At least in our sample, it appears that differences across individuals which are not already accounted for by the within-person approach cannot be further simplified to binary gender categories. Another reason for our divergent results when compared with those of Weidmann et al. (2018) could be due to modeling differences (between-person vs. within-person perspective). For example, not accounting for stable between-person differences can manifest in the form of temporal cross-lagged effects (Hamaker et al., 2015).

Lastly, a reciprocal but diametrical association emerged from the exploratory analysis of the longitudinal interplay between openness and self-esteem in our sample: Here, we found increases in openness to predict later decreases in self-esteem whereas increases in self-esteem predicted later increases in openness. One possible explanation for this diametrical association could be that individuals who have experienced an increase in their self-esteem are afterwards more open to new experiences as they have more confidence in themselves. In turn, it could be that an increase in openness leads people to step out of their "comfort zone" more often and expose themselves to new situations (e.g., start a new hobby or sign up for a student exchange program) which might overwhelm them at least temporarily. Importantly, the effects between

openness and self-esteem were particularly small and faded out rather rapidly. Future studies are needed to replicate and further explore this finding.

In sum, our findings emphasize that a differentiated point of view is needed to understand the interplay of personality characteristics as sources of the development of other personality characteristics. Whereas the result pattern between agreeableness and self-esteem as well as conscientiousness and self-esteem are in line with the core perspective (McCrae & Costa, 2008), the longitudinal pattern between neuroticism and self-esteem seems more consistent with newer, less rigid perspectives on core and surface characteristics (Asendorpf & Motti–Stefanidi, 2018; DeYoung, 2015; Kandler & Rauthmann, 2022; McAdams & Pals, 2006). For two combinations of Big Five traits, namely extraversion and openness, with self-esteem, we found evidence for mutuality and, thus, no dominant characteristic driving the respective reciprocal interplay. Taken together, our findings underscore conclusions from previous works that argue for nuanced and integrative views of personality across different layers (e.g., Bleidorn et al., 2010; Fetvadjiev & He, 2019; Kandler & Rauthmann, 2022).

These theoretical advances might in turn be beneficial and have practical implications for the conceptualization of interventions in adolescent samples. Reflecting on our results, one could conclude that interventions targeted at changes in Big Five traits by promoting certain patterns of acting, thinking, and feelings (see Roberts et al., 2017 for a systematic review) should have positive side-effects on self-esteem change. So, if adolescents change something about their typical patterns of behavior, the typical way they think about the world, or feel in social interactions, they should also perceive themselves differently. In contrast, interventions that are primarily targeted at changes in self-esteem (see Niveau et al., 2021 for a systematic meta-analysis) are likely to exert simultaneous effects on extraversion and openness but no or not robust effects on other Big Five traits. So, if adolescents feel more valuable, they should be more likely to have the confidence to interact with other people or explore the world. But it may not change how neatly or disciplined they get things done or how polite and compassionate they are to other people. However, future studies are needed to test these assumptions.

Longitudinal Interplay also Observed in Acquaintance-Reports

Our study contributes to the literature with its findings on longitudinal acquaintance-reports for adolescent personality development and the longitudinal interplay between different personality characteristics. Overall, the pattern of our results was similar though not identical between self- and acquaintance-reports. This fits with previous studies that had already pointed to a substantial overlap between self- and other-reports of Big Five traits (Kim et al., 2019) and self-esteem (Hirschmüller et al., 2018; Zeigler-Hill et al., 2013). Our results demonstrate that

the direction of effects between the Big Five traits and self-esteem is mainly consistent across self- and acquaintance-reports. Yet, unexpectedly, we see that the overall pattern of results appears to be robust, but we also observed more significant effects in the acquaintance-reports than in the self-reports. Reflecting on our pattern of findings across raters might suggest that acquaintances performed a more global evaluation of the adolescents' personalities (i.e., "is overall mature/has matured" or "is not overall mature/has not overall matured"). Such general evaluations might have contributed to more pronounced longitudinal reciprocal associations between most Big Five traits and self-esteem.

In addition, there are some differences between self- and acquaintance-reports in the magnitude and timeline of effects. Whereas the reciprocal small effects between extraversion and agreeableness with self-esteem is rather balanced, the medium-sized effects of conscientiousness and openness on self-esteem speak in favor of a less rigid core-perspective. At the same time, we observed a temporal delay in acquaintance-reports: the longitudinal interplay between Big Five traits and self-esteem unfolds later in time than in the self-reports. Various aspects can contribute to remaining discrepancies. In general, acquaintances might find certain personality characteristics harder or easier to observe (Funder, 2012; Vazire, 2010) and use more or less valid cues for their judgements (Hirschmüller et al., 2013). Traits that are higher in visibility (e.g., extraversion) should principally offer more (valid) cues for raters to observe. Having less access to valid cues or relying on invalid cues for personality ratings should overall decrease observable longitudinal associations with other personality characteristics. However, other people can also have access to information which remains hidden to the target person (Alicke & Sedikides, 2009; Beer & Vazire, 2017), pointing to a complementary nature of self- and acquaintance-reports of personality characteristics (e.g., Brandt et al., 2021; Luan et al., 2019; Vazire & Mehl, 2008).

Most notable differences in our sample were medium-sized effects of conscientiousness and openness on self-esteem in the acquaintance-reports compared to the small effects in the self-reports. Regarding observability of different personality characteristics, salient tasks in adolescence might contribute to or even change the observability of different traits compared to adulthood. For example, adolescents are confronted with increasing academic demands that might challenge inter-individual differences in traits with particular relevance for academic success, such as conscientiousness and openness (e.g., Mammadov, 2022). On this basis, one could further assume that the academic context offers more opportunities for others to observe differences and developments in conscientiousness and openness compared to other contexts (Brandt et al., 2021). As adolescents spend most of their time at school surrounded by friends

and peers —which contributed to half of the acquaintance-reports in our sample— differences in conscientiousness and openness might be particularly visible to these raters. The potentially higher visibility might in turn contribute to the use of more valid cues in acquaintance ratings and thus to stronger predictive effects of conscientiousness and openness on self-esteem.

Regarding the longer lasting effects with later peaks in acquaintance-reports compared to self-reports in our study, one could think of a temporal delay between self-observed and externally observed changes in personality. Own personality perceptions can be continuously updated, acquaintances might take longer to notice respective changes. This temporal delay could explain, for example, why there is no short-term negative effect of openness on self-esteem as found for self-reports. To our knowledge, there has been no research on the temporal ordering of self- and acquaintance-reported changes in personality so far. The use of time-sensitive approaches, such as CTM, might shed light on this question. Also, one could simultaneously take moderators, such as relationship type and quality or number and duration of interactions, into account as these factors have been shown to be associated with the degree of self-other agreement of personality ratings (Allik et al., 2016; Connolly et al., 2007). Lastly, it might be interesting to investigate if and how personality development might be predicted across rater perspectives. Does, for example, self-reported change in extraversion predict changes in self-esteem reported by acquaintances?

To sum up, our results demonstrate that the direction of effects between Big Five traits and self-esteem show consistencies across self- and acquaintance-reports which emphasizes the robustness of our findings. However, differences between self- and acquaintance-reports in the magnitude and timeline of effects suggest implications for the determination of study length in longitudinal research.

The Role of Time: Clock Time, Lifetime, and Historical Time

Considering the role of time in personality development research holds the promising potential for a better connection of theories and empirical findings (Hopwood et al., 2022; Luhmann et al., 2014; Mitchell & James, 2001). However, intentionally addressing different levels of time is still far from being common practice in psychological research. In our study, we used CTM to get more insight into temporal dynamics of adolescent personality development. We thereby scaled time in terms of clock time (i.e., how much time has passed since the initial measurement) to derive information about the duration of effects. In addition, we considered the role of lifetime by including age as a covariate. Lastly, we tentatively reflect on the role of historical time as two of our three study samples were assessed during the COVID-19 pandemic.

In our sample, cross-lagged effects between Big Five traits and self-esteem peaked after time intervals of two to four weeks. This means that initial changes in Big Five traits had the strongest predictive effect on later values of self-esteem (and vice versa) after these medium length time spans. Looking further, cross-lagged effects faded after about two months. Only cross-lagged effects between neuroticism and self-esteem remained for a period of up to six months. Our result pattern matches the common understanding of this life period as being fast-moving and rich in changes. Nevertheless, some passing of time seems necessary before predictive effects can unfold their maximal potential. Moreover, our results suggest a slightly different time course (i.e., longer lasting) of reciprocal effects between Big Five traits and self-esteem for acquaintance-reports. Future studies should expand on our results by including both, more fine-grained (i.e., shorter) and longer time intervals.

In addition to clock time, time can also be considered in the context of the human lifespan. It is known from previous studies that Big Five (Roberts et al., 2006) and self-esteem (Donnellan et al., 2011) show age-differential developmental trajectories. However, zooming into the life phase of adolescence, we found no age-differential effects, suggesting that the pattern of longitudinal reciprocal associations between Big Five traits and self-esteem development is similar along middle and late adolescence. Future studies could extend our analyses to early adolescence as this life phase has been shown to be characterized by so-called maturational dips (Borghuis et al., 2017; Denissen, 2014; Göllner et al., 2017; Luan et al., 2017; Soto & Tackett, 2015) which might affect the longitudinal interplay between personality characteristics.

Controlling for study origin did not change our results substantially. We thus consider our findings as robust in this respect. As one exception, we found that the negative effect from openness on self-esteem was slightly stronger in the SELFIE study than in the SchoCo study. A possible explanation for these differences could be that all measurement points of the SchoCo study but only parts of the third measurement point of SELFIE were collected during a special time, namely, the COVID-19 pandemic. Regarding the specific effect at hand, that is, differences in the positive effect of self-esteem on openness, it may be possible that increases in openness among participants in the SELFIE study (without the limitations of a global pandemic) could manifest itself more effortlessly and therefore be more noticeable to participants and thus easier to report. In a more general perspective, our results emphasize that our effects do not vary systematically between samples that were assessed during the COVID-19 pandemic and those (largely) assessed before the pandemic. This might be due to the fact that the vast majority of data collections waves across studies did not include so-called

"COVID-19 lockdowns". Specifically, despite some COVID measures in place, the adolescents were able to attend school during all data collection waves, where they met their peers. Furthermore, most research during the Corona pandemic did not manifest strong effects on patterns of personality development (e.g., Sutin et al., 2022). Overall, we consider our findings robust and explaining the few sample differences through impacts of the pandemic remains hypothetical and is outside the focus of this study.

All in all, our findings underline the previously expressed demand for time-sensitive considerations and study designs. Specifically, the use of CTM in our study points to the importance of measurement interval length when studying the longitudinal interplay between personality characteristics: a conclusion that could have been overseen within a less time-sensitive modeling approach.

Limitations and Outlook

No previous study so far has investigated the longitudinal interplay between Big Five traits and self-esteem in adolescence. Our combination of three longitudinal samples within a CTM framework provides time-sensitive insights into developmental sources of personality characteristics during a rather understudied life phase. Despite these strengths, we acknowledge several limitations.

First, we had a demographically selective sample with a surplus of girls from the highest academic track of the German school system. It remains unclear how our findings generalize to the more diverse population of all adolescents. Although we used all information available in the datasets and do not have a theoretically-derived hypothesis to assume that the investigated longitudinal dynamics vary between adolescents from different academic tracks, it cannot be concluded to what extent the longitudinal, partially non-random, dropout might have impacted the results in our analyses. Therefore, future studies are needed to replicate our findings in more heterogenous samples and across longer time intervals.

Second, as is the case with observational data, causal inferences about the relationship between the assessed personality characteristics cannot be drawn. To get closer to potential causal mechanisms, future studies should target the processes we proposed on a theoretical level but cannot investigate in more detail with the available data. That is, the interplay between extraversion and self-esteem in the context of sociometer theory and self-broadcasting perspective or the interplay between agreeableness, conscientiousness, and neuroticism with self-esteem within a developmental task framework.

Third, to further explore interindividual differences in within-person cross-effects, we allowed for individual variation of drift parameters. Allowing for simultaneous interindividual

variation of all drift parameters yielded largely inconsistent results. That is, the estimated average within-person effects differed between models with and without individually varying drift parameters, casting some doubt on the reliability of the results of the more complex models. To date, there are few empirical examples in which this more complex type of modeling has been used (for an exception, see Marciano et al., 2022). From these examples we infer, however, that the simultaneous variation of so many parameters has exceeded the models' capacities given our data structure (i.e., maximum of three observations per participant). For the interested reader, we nevertheless report findings from these analyses in the OSM (Table OS7).

Fourth, regarding the comparison between results derived from self-reports versus acquaintance-reports, it must be taken into account that raters could switch across measurements. Unfortunately, the respective data do not provide information on the proportion of switched raters across measurements. Looking at rank-order stabilities and self-other agreement across time, however, one could speculate that raters switched rarely, or that different raters came to very similar conclusions about the same participant. Further, averaging personality ratings when multiple ratings were available per person might have contributed to the observed stabilities across time. Nevertheless, this aspect should be further investigated in future studies.

Fifth, to reduce complexity, we modeled each Big Five/self-esteem combination in separate models. Considering our sample size and number of observations per participants, more complex models (i.e., including more parameters) would have likely resulted in convergence problems. However, given that the Big Five share some variance (van der Linden et al., 2010), it remains open if all found effects would remain robust after accounting for this shared variance or if the observed effects are primarily driven by certain traits.

Sixth, even though time is modeled continuously in our analyses, it has to be noted that the underlying data structure is not measured continuously. Thus, it might not be fine-grained enough to make precise statements about shorter time intervals (e.g., at the weekly level) and our results for these time spans should be interpreted as average estimates. The use of CTM approaches on different time scales might thereby be a valuable extension to further uncover temporal dynamics of personality developmental processes. At this point, for example, the combination of CTM with ESM designs could contribute to a higher temporal resolution (e.g., Hecht et al., 2022). Furthermore, extending the measurement intervals to more than one year would also be a valuable addition to broaden the perspective to longer time intervals and investigate if the effects add up over time.

Lastly, it has recently been argued that the additional inclusion of average trends might be important, even if one is primarily interested in longitudinal dynamics between constructs (Asparouhov et al., 2018; Falkenström et al., 2023; Núñez-Regueiro et al., 2022). There are first studies that model trends in addition to auto- and cross-effects in a continuous time framework (Lohmann et al., 2024; Lohmann et al., 2022). Future research could explore how the inclusion of average trends might complement our understanding of longitudinal dynamics between different personality characteristics.

Conclusion

The longitudinal interplay between Big Five and self-esteem developments appears reciprocal for some traits and Big-Five rather than self-esteem driven for others. Our study suggests that adolescents who become more mature are more likely to become more confident, whereas the reversed statement is only partially supported. A change in self-esteem seems to have a less global effect on behaviors, ways of thinking and feeling, many of which are more outwardly directed (i.e., toward the material world or other people), whereas there appear to be more access points for changing inwardly directed evaluations of the self. These findings add an important piece to the puzzle of understanding sources in adolescent personality development. This interplay appears to unfold most strongly after a few weeks and can be observed not only in self- but also in acquaintance-reports. Enriching our time-sensitive approach, future studies should apply CTM approaches on different time scales covering both very short or even daily assessments up to very long intervals of more than one year to further uncover temporal dynamics of these personality developmental processes. Furthermore, the use of CTM in samples of adolescents who face developmental tasks in the near future holds the potential to get closer to possible mechanisms of adolescent personality development and to link findings more closely with existing theoretical considerations about the sources of personality development.

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Supplemental Material Study II

Table OS1

Derivations From the Preregistration

Registered plan	Deviation	Reason for deviation
We pre-registered a sample size of 1018.	We analyzed data from 1088 participants.	When writing the preregistration, we referred to the sample overviews in the available codebooks. There, only the participants with complete data sets for T1 were listed ($N = 1018$). However, for our analyses, we decided to include all participants with observations on the variables we were interested in, regardless of completeness to make use of the maximum of available data.
We pre-registered a significance level of $p < .05$	We report the main findings with 99%-CIs and only discuss and interpret findings that are statistically significant at $p < .01$.	A reviewer pointed to the issue of multiple testing in our study and suggested to adjust the significance threshold. We agree with the concern and decided to adjust our inference criterion.
We pre-registered the analyses for the acquaintance-reports as "robustness checks"	We added a paragraph in the theory section for the acquaintance reports	In the process of manuscript preparation and revision, it became clear that the acquaintance reports are also interesting from a theoretical perspective. No hypotheses were subsequently added.
We did not pre-register a strategy to compare cross-effects.	To test whether cross-effects within the same model differed in size, we compared each model with freely estimated cross-effects to a model with cross-effects constrained to equality using a deviancy test on the 2 Log-Likelihood statistics (Δ-2LL).	A reviewer pointed to the need for an inferential hypothesis test to evaluate whether cross-effects differ in size.

Descriptions of Single Studies Used

The Personality and Self-Esteem in Everyday Life (SELFIE) Study

The SELFIE study was conducted by a collaboration of researchers from the University of Hamburg, the Humboldt-Universität zu Berlin, and the Leibniz Institute for Science and Mathematics Education. The aim of the SELFIE study was to investigate how people's personality and self-esteem change during important life transitions and how these transitions are experienced in everyday life. Therefore, data was collected from adolescents close to high school graduation and adults close to retirement at three measurement points with six-month-intervals in between assessments via self- and acquaintance reports. We only used data from the adolescent sample for the present study. Also, two time-based assessments were included to record everyday experiences and social interactions over a period of one week each. However, these data were not used for the present study. Participants were recruited via different forms of online advertisement and received monetary compensation (the amount depended on their participation rate). More information is available on the study's OSF page: https://osf.io/4gnz9/.

The School and Life During Corona (SchoCo) Study

The SchoCo study was conducted by researchers from the University of Hamburg. The aim of the SchoCo study was to investigate the impact of lasting changes during the COVID-19-pandemic on everyday experiences and behavior in adolescence at three measurement points with three-month-intervals in between assessments. For this purpose, self- and acquaintance reports were collected. In addition, there were two experience-sampling phases. However, we only used data from the self- and acquaintance reports but not from the experience-sampling phases for the present study. Participants were recruited via online advertisements and via direct contact with schools. They received monetary compensation (depending on their participation rate). More information is available on the study's OSF page: https://osf.io/r5gjx/.

The Social Interaction and Adolescent Personality (SNAP) Study

The SNAP study was conducted by researchers from the University of Hamburg. The aim of the SNAP study was to investigate the interplay of people's personalities and social interactions during adolescence at three measurement points with one-month-intervals in between assessments. In addition, adolescents participated in a digital interactive session, filled out daily diary questionnaires for a period of two weeks and were asked twice to collect acquaintance reports on personality variables. We did not use the acquaintance reports from SNAP as we considered a maximum of two reports with potentially varying raters across

measurements as insufficient for reliable measurements. Adolescents were recruited via online advertisements and social media platforms. They received monetary compensation depending on their participation rate. More information is available on the study's OSF page: https://osf.io/w4nmj/.

Table OS2

Sample Characteristics for Each Study

	SELFIE study T1 (n = 237)		
	M	*SD*	Rel
Extraversion	4.69	0.95	0.89
Agreeableness	4.86	0.69	0.85
Conscientiousness	4.42	0.95	0.89
Neuroticism	3.87	1.07	0.91
Openness	4.98	0.94	0.87
Self-esteem	4.88	1.53	0.93
Age	17.73	1.02	
Gender	0.24	0.43	
School type	1.00	0.00	
Born in Germany	0.95	0.23	
	SchoCo study T1 (n = 353)		
Extraversion	4.26	0.92	0.86
Agreeableness	4.58	0.76	0.85
Conscientiousness	4.41	0.93	0.87
Neuroticism	4.20	0.94	0.88
Openness	4.76	0.91	0.85
Self-esteem	4.23	1.40	0.89
Age	15.91	1.21	
Gender	0.15	0.36	
School type	0.74	0.44	
Born in Germany	0.95	0.21	
	SNAP study T1 (n = 498)		
Extraversion	4.47	0.96	0.87
Agreeableness	4.68	0.74	0.85
Conscientiousness	4.44	0.99	0.89
Neuroticism	3.99	0.99	0.88
Openness	4.79	0.94	0.84
Self-esteem	4.45	1.54	0.90
Age	15.76	1.27	
Gender	0.38	0.49	
School type	0.79	0.41	
Born in Germany	0.91	0.29	

Note. Rel = Reliability. We report McDonald's ω as the reliability measure. The variables gender (1 = male), school type (1 = highest academic track), and born in Germany (1 = yes) were dummy coded.

Sample-Wise Attrition Analyses

SELFIE Study

Longitudinal attrition analyses showed that adolescents who participated at T1 only were slightly older (d = 0.14, p = .02), more extraverted (d = 0.34, p = .015), less neurotic (d = - 0.29, p = .036), and had higher self-esteem (d = 0.33, p = .016) compared to those who participated in at least two assessments. The two groups did not differ with regard to, gender, agreeableness, conscientiousness, openness, or academic track.

SchoCo Study

Longitudinal attrition analyses showed that adolescents who participated at T1 only were less extraverted (d = - 0.38, p = .001), less conscientious (d = - 0.46, p < .001), less open (d = - 0.50, p < .001), and had higher self-esteem (d = 0.33, p = .016) compared to those who participated in at least two assessments. The two groups did not differ with regard to age, gender, agreeableness, neuroticism, or academic track.

SNAP Study

Longitudinal attrition analyses showed that adolescents who participated at T1 only were less agreeable (d = - 0.22, p = 0.016), less conscientious (d = - 0.21, p = .018), less open (d = - 0.21, p < .021), had lower self-esteem (d = - 0.19, p = .033), and were less likely to come from the academic school tracks (OR = 0.48, p = .001) compared to those who participated in at least two assessments. The two groups did not differ with regard to age, gender, extraversion and neuroticism.

Matrix Specification Fixed-Intercept Model (Rank-Order Stabilities)

Subject parameter distribution:
$$\underbrace{\left[\text{extra\_mm}_i\right]}_{\boldsymbol{\phi}(i)} \sim \text{tform}\left\{\text{N}\left(\left[\text{raw\_extra\_mm}\right], \left[\text{rawPCov\_1\_1}\right]\right)\right\}$$

Initial latent state:
$$\underbrace{\left[\text{Extraversion}\right](t_0)}_{\boldsymbol{\eta}(t_0)} \sim \text{N}\left(\underbrace{\left[\text{extra\_mm}\right]}_{\text{T0MEANS}}, \underbrace{UcorSDtoCov\left\{\left[0\right]\right\}}_{\underbrace{\mathbf{Q}^*{}_{t0}}_{\text{T0VAR}}}\right)$$

Deterministic change:
$$\underbrace{\text{d}\left[\text{Extraversion}\right](t)}_{\text{d}\boldsymbol{\eta}(t)} = \left(\underbrace{\left[\text{a}\right]}_{\underbrace{\mathbf{A}}_{\text{DRIFT}}} \underbrace{\left[\text{Extraversion}\right](t)}_{\boldsymbol{\eta}(t)} + \underbrace{\left[\text{b}\right]}_{\underbrace{\mathbf{b}}_{\text{CINT}}}\right)\text{d}t \quad +$$

Random change:
$$\underbrace{UcorSDtoChol\left\{\left[\text{e}\right]\right\}}_{\underbrace{\mathbf{G}}_{\text{DIFFUSION}}} \underbrace{\text{d}\left[W_1\right](t)}_{\text{d}\mathbf{W}(t)}$$

Observations:
$$\underbrace{\left[\text{Extraversion}\right](t)}_{\mathbf{Y}(t)} = \underbrace{\left[1\right]}_{\underbrace{\boldsymbol{\Lambda}}_{\text{LAMBDA}}} \underbrace{\left[\text{Extraversion}\right](t)}_{\boldsymbol{\eta}(t)} + \underbrace{\left[\text{mm\_extra}\right]}_{\underbrace{\boldsymbol{\tau}}_{\text{MANIFESTMEANS}}} \quad +$$

Observation noise:
$$\underbrace{\left[\text{mvarExtraversion}\right]}_{\underbrace{\boldsymbol{\Theta}}_{\text{MANIFESTVAR}}} \underbrace{\left[\epsilon_1\right](t)}_{\boldsymbol{\epsilon}(t)}$$

System noise distribution per time step: $\Delta\left[W_{j\in[1,1]}\right](t-u) \sim \text{N}(0, t-u)$

Observation noise distribution: $\left[\epsilon_{j\in[1,1]}\right](t) \sim \text{N}(0,1)$

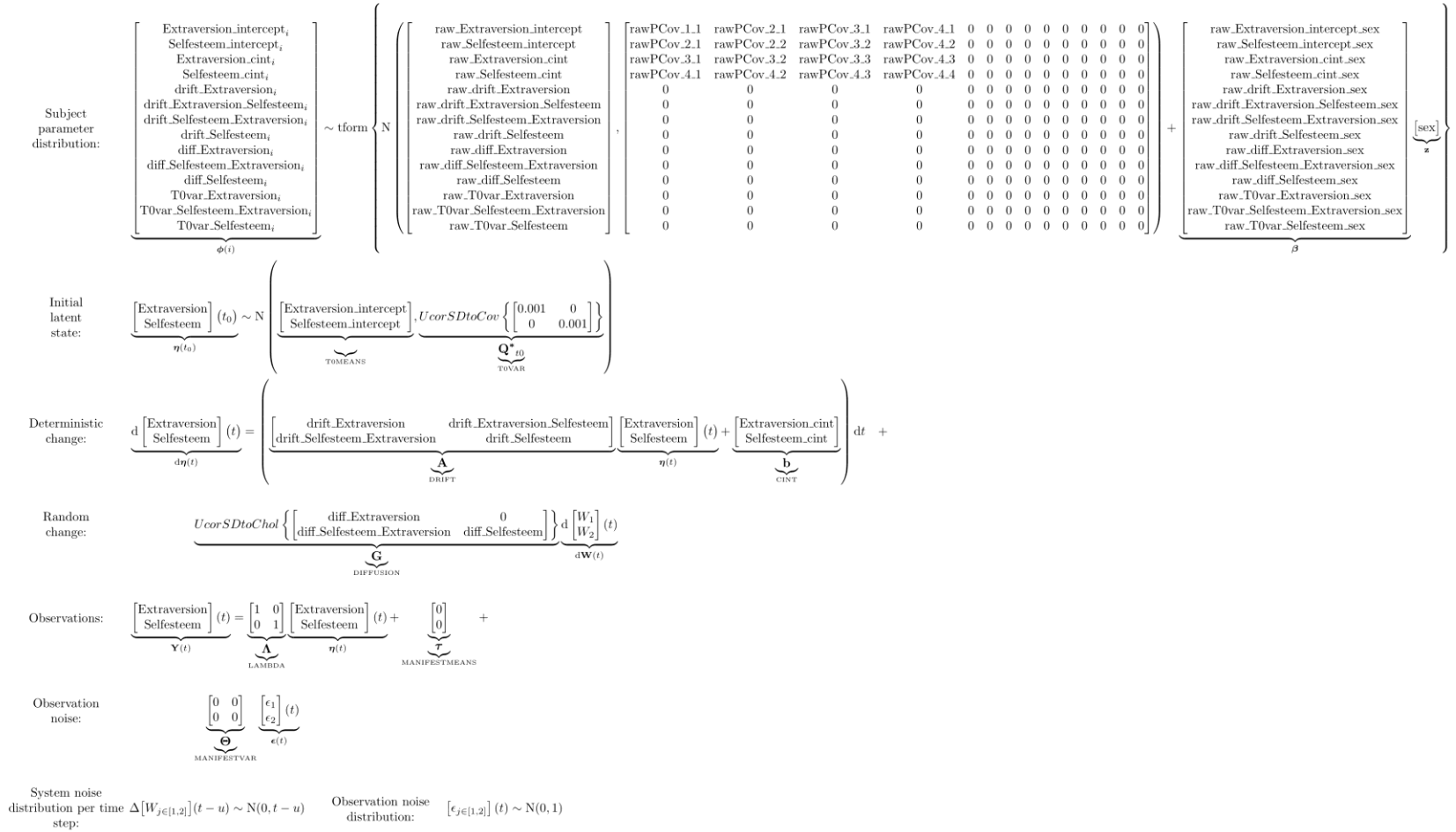
Note: $UcorSDtoChol$ converts lower tri matrix of standard deviations and unconstrained correlations to Cholesky factor, $UcorSDtoCov =$ transposed cross product of UcorSDtoChol, to give covariance, See Driver & Voelkle (2018) p11. Individual specific notation (subscript i) only shown for subject parameter distribution – pop. means shown elsewhere.

Matrix Specification Random-Intercept Model (Cross-Effects Model)

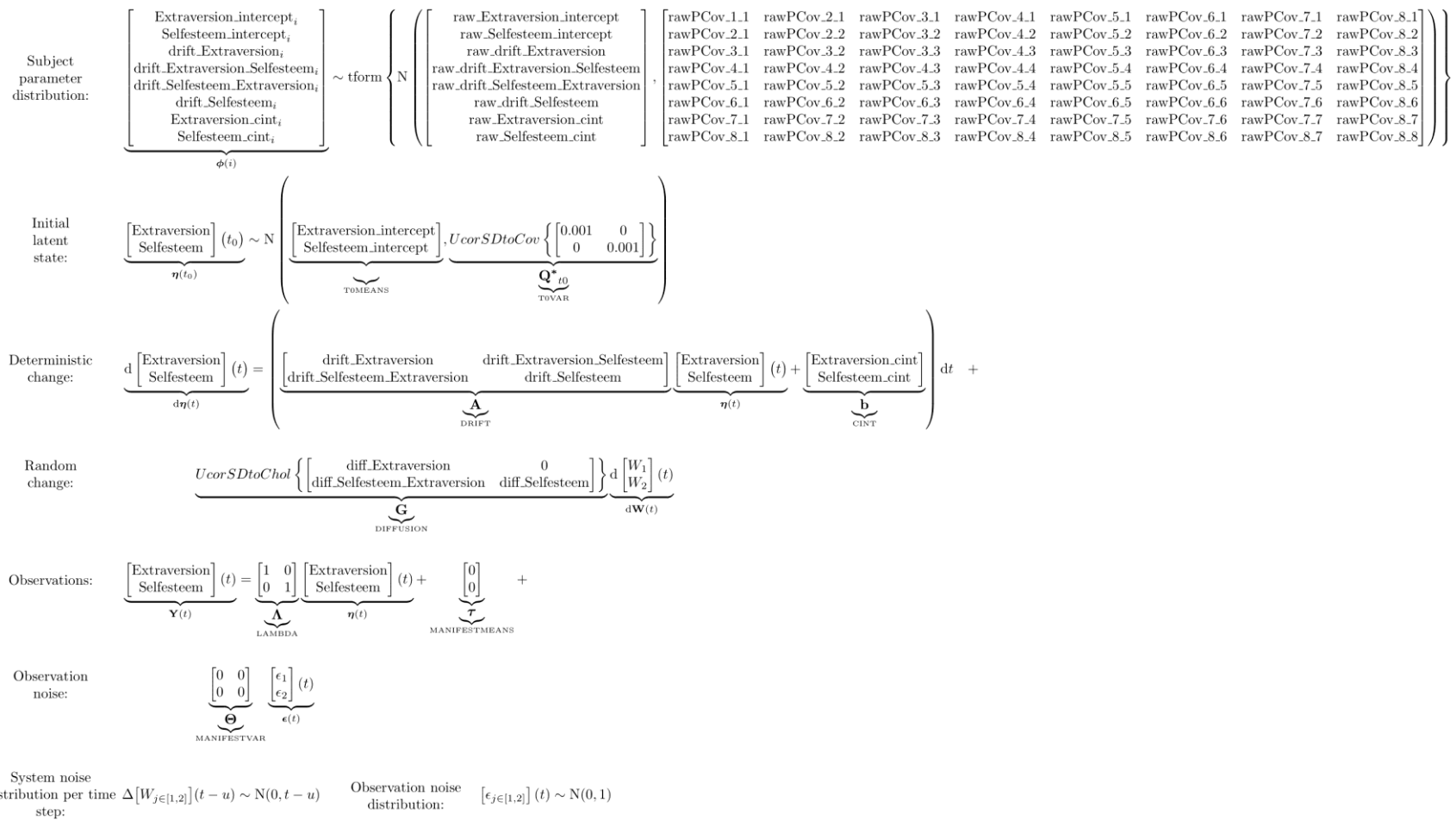
$$
\begin{aligned}
&\text{Subject parameter distribution:} && \underbrace{\begin{bmatrix}\text{Extraversion\_intercept}_i\\ \text{Selfesteem\_intercept}_i\\ \text{Extraversion\_cint}_i\\ \text{Selfesteem\_cint}_i\end{bmatrix}}_{\boldsymbol{\phi}(i)} \sim \text{tform}\left\{\text{N}\left(\begin{bmatrix}\text{raw\_Extraversion\_intercept}\\ \text{raw\_Selfesteem\_intercept}\\ \text{raw\_Extraversion\_cint}\\ \text{raw\_Selfesteem\_cint}\end{bmatrix}, \begin{bmatrix}\text{rawPCov\_1\_1} & \text{rawPCov\_2\_1} & \text{rawPCov\_3\_1} & \text{rawPCov\_4\_1}\\ \text{rawPCov\_2\_1} & \text{rawPCov\_2\_2} & \text{rawPCov\_3\_2} & \text{rawPCov\_4\_2}\\ \text{rawPCov\_3\_1} & \text{rawPCov\_3\_2} & \text{rawPCov\_3\_3} & \text{rawPCov\_4\_3}\\ \text{rawPCov\_4\_1} & \text{rawPCov\_4\_2} & \text{rawPCov\_4\_3} & \text{rawPCov\_4\_4}\end{bmatrix}\right)\right\}\\
&\text{Initial latent state:} && \underbrace{\begin{bmatrix}\text{Extraversion}\\ \text{Selfesteem}\end{bmatrix}(t_0)}_{\boldsymbol{\eta}(t_0)} \sim \text{N}\left(\underbrace{\begin{bmatrix}\text{Extraversion\_intercept}\\ \text{Selfesteem\_intercept}\end{bmatrix}}_{\text{T0MEANS}}, \underbrace{UcorSDtoCov\left\{\begin{bmatrix}0.001 & 0\\ 0 & 0.001\end{bmatrix}\right\}}_{\underset{\text{T0VAR}}{\mathbf{Q}^*_{t0}}}\right)\\
&\text{Deterministic change:} && \underbrace{\text{d}\begin{bmatrix}\text{Extraversion}\\ \text{Selfesteem}\end{bmatrix}(t)}_{\text{d}\boldsymbol{\eta}(t)} = \left(\underbrace{\begin{bmatrix}\text{drift\_Extraversion} & \text{drift\_Extraversion\_Selfesteem}\\ \text{drift\_Selfesteem\_Extraversion} & \text{drift\_Selfesteem}\end{bmatrix}}_{\underset{\text{DRIFT}}{\mathbf{A}}}\underbrace{\begin{bmatrix}\text{Extraversion}\\ \text{Selfesteem}\end{bmatrix}(t)}_{\boldsymbol{\eta}(t)} + \underbrace{\begin{bmatrix}\text{Extraversion\_cint}\\ \text{Selfesteem\_cint}\end{bmatrix}}_{\underset{\text{CINT}}{\mathbf{b}}}\right)\text{d}t \;+\\
&\text{Random change:} && \underbrace{UcorSDtoChol\left\{\begin{bmatrix}\text{diff\_Extraversion} & 0\\ \text{diff\_Selfesteem\_Extraversion} & \text{diff\_Selfesteem}\end{bmatrix}\right\}}_{\underset{\text{DIFFUSION}}{\mathbf{G}}}\underbrace{\text{d}\begin{bmatrix}W_1\\ W_2\end{bmatrix}(t)}_{\text{d}\mathbf{W}(t)}\\
&\text{Observations:} && \underbrace{\begin{bmatrix}\text{Extraversion}\\ \text{Selfesteem}\end{bmatrix}(t)}_{\mathbf{Y}(t)} = \underbrace{\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}}_{\underset{\text{LAMBDA}}{\boldsymbol{\Lambda}}}\underbrace{\begin{bmatrix}\text{Extraversion}\\ \text{Selfesteem}\end{bmatrix}(t)}_{\boldsymbol{\eta}(t)} + \underbrace{\begin{bmatrix}0\\ 0\end{bmatrix}}_{\underset{\text{MANIFESTMEANS}}{\boldsymbol{\tau}}} \;+\\
&\text{Observation noise:} && \underbrace{\begin{bmatrix}0 & 0\\ 0 & 0\end{bmatrix}}_{\underset{\text{MANIFESTVAR}}{\boldsymbol{\Theta}}}\underbrace{\begin{bmatrix}\epsilon_1\\ \epsilon_2\end{bmatrix}(t)}_{\boldsymbol{\epsilon}(t)}\\
&\text{System noise distribution per time step:} && \Delta\left[W_{j\in[1,2]}\right](t-u) \sim \text{N}(0, t-u) \qquad \text{Observation noise distribution:} \quad \left[\epsilon_{j\in[1,2]}\right](t) \sim \text{N}(0,1)
\end{aligned}
$$

Note: *UcorSDtoChol* converts lower tri matrix of standard deviations and unconstrained correlations to Cholesky factor, *UcorSDtoCov* = transposed cross product of UcorSDtoChol, to give covariance, See Driver & Voelkle (2018) p11.
Individual specific notation (subscript i) only shown for subject parameter distribution – pop. means shown elsewhere.

Matrix Specification Random-Intercept Model With Time-Invariant Covariate



Matrix Specification Random-Intercept Model with Individually Varying Drift Parameters



Note: *UcorSDtoChol* converts lower tri matrix of standard deviations and unconstrained correlations to Cholesky factor, *UcorSDtoCov* = transposed cross product of UcorSDtoChol, to give covariance, See Driver & Voelkle (2018) p11.
Individual specific notation (subscript i) only shown for subject parameter distribution – pop. means shown elsewhere.

Table OS3

Continuous Time Auto-Effects, Discrete Time Autoregressive Effects, and Model Fits for all Big Five Traits and Self-Esteem

	Continuous time auto-effects	Discrete time autoregressive effects			Log-Likelihood
	a [99%-CI]	a_1^* [99%-CI]	a_6^* [99%-CI]	a_{12}^* [99%-CI]	
Extraversion	-0.013 [-0.017; -0.010]	0.987 [0.983; 0.990]	0.925 [0.903; 0.943]	0.855 [0.815; 0.889]	-634.109
Agreeableness	-0.026 [-0.035; -0.018]	0.975 [0.966; 0.982]	0.858 [0.811; 0.895]	0.736 [0.658; 0.802]	-537.480
Conscientiousness	-0.012 [-0.018; -0.008]	0.988 [0.983; 0.992]	0.931 [0.900; 0.954]	0.868 [0.811; 0.911]	-889.508
Neuroticism	-0.020 [-0.026; -0.017]	0.980 [0.974; 0.984]	0.885 [0.856; 0.978]	0.782 [0.733; 0.828]	-1126.585
Openness	-0.008 [-0.014; -0.004]	0.993 [0.986; 0.996]	0.956 [0.920; 0.979]	0.915 [0.846; 0.958]	-531.414
Self-Esteem	-0.036 [-0.044; -0.029]	0.965 [0.957; 0.972]	0.808 [0.769; 0.842]	0.654 [0.591; 0.709]	-3206.091

Note. α = continuous time auto-effect; a_1^* = one-month discrete time autoregressive effect; a_6^* = six-months discrete time autoregressive effect; a_{12}^* twelve-months discrete time autoregressive effect. All effects are significant at $p < .01$.

Covariate Analyses

Table OS4

Effects of Gender on Cross-Effects.

	Effect of gender on continuous time cross-effects from personality on self-esteem [95%-CI]		Effect of gender on continuous time cross-effects from self-esteem on personality [95%-CI]		Log-Likelihood
Extraversion	-0.132	[-0.344; 0.071]	0.076	[-0.024; 0.174]	-3545.030
Agreeableness	-0.194	[-0.414; 0.019]	0.052	[-0.057; 0.157]	-3315.055
Conscientiousness	-0.029	[-0.187; 0.126]	0.095	[-0.606; 0.260]	-3692.965
Neuroticism	-0.096	[-0.293; 0.091]	-0.015	[-0.056; 0.024]	-3742.472
Openness	0.118	[-0.080; 0.305]	0.103	[-0.026; 0.235]	-3408.442

Note. 0 = female, 1 = male.

Table OS 5

Effects of Age on Cross-Effects.

	Effect of age on continuous time cross-effects from personality on self-esteem [95%-CI]		Effect of age on continuous time cross-effects from self-esteem on personality [95%-CI]		Log-Likelihood
Extraversion	0.007	[-0.052; 0.063]	-0.004	[-0.034; 0.029]	-3554.328
Agreeableness	0.053	[-0.040; 0.144]	0.014	[-0.018; 0.046]	-3345.813
Conscientiousness	0.033	[-0.020; 0.087]	0.041	[-0.007; 0.089]	-3702.710
Neuroticism	0.037	[-0.020; 0.095]	0.003	[-0.006; 0.013]	-3774.332
Openness	-0.000	[-0.055; 0.060]	0.029	[-0.013; 0.070]	-3417.846

Note. Age was centered before entered into the models.

Table OS 6

Effects of Original Study Sample on Cross-Effects.

	Effect of study sample on continuous time cross-effects from personality on self-esteem [95%-CI]		Effect of study sample on continuous time cross-effects from self-esteem on personality [95%-CI]		Log-Likelihood
Extraversion					
SchoCo	0.063	[-0.108; 0.214]	0.010	[-0.011; 0.029]	-3328.014
SNAP	0.083	[-0.043; 0.200]	0.004	[-0.015; 0.023]	
Agreeableness					
SchoCo	0.007	[-0.054; 0.069]	0.094	[-0.059; 0.245]	-3183.269
SNAP	-0.073	[-0.154; 0.013]	-0.054	[-0.128; 0.022]	
Conscientiousness					
SchoCo	-0.069	[-0.126; -0.013]	0.097	[-0.065; 0.251]	-3520.354
SNAP	-0.005	[-0.083; 0.065]	-0.036	[-0.168; 0.090]	
Neuroticism					
SchoCo	-0.052	[-0.128; 0.020]	-0.000	[-0.011; 0.011]	-3484.010
SNAP	-0.067	[-0.156; 0.014]	-0.020	[-0.036; -0.004]	
Openness					
SchoCo	**0.084**	**[0.144; -0.026]**	0.013	[-0.118; 0.145]	-3236.457
SNAP	0.033	[-0.043; 0.109]	0.014	[-0.109; 0.138]	

Note. SELFIE study = baseline; Bold font indicates statistical significance at $p < .01$.

Table OS 7

Medians, Interquartile Ranges, and Model Fits of CTMs with Individually Varying Drift Parameters

	Continuous time cross-effect from personality on self-esteem		Continuous time cross-effect from self-esteem on personality		Log-Likelihood
	Median	IQR	Median	IQR	
Extraversion	-0.112	[-0.187; -0.044]	1.059	[0.879; 1.198]	-3508.179
Agreeableness	0.541	[0.345; 0.729]	-0.054	[-0.115; 0.004]	-3268.040
Conscientiousness	-9.087	[-9.293; -8.806]	1.215	[1.0245; 1.390]	-3233.141
Neuroticism	-2.865	[-3.067; -2.584]	2.184	[2.076; 2.314]	-3609.3766
Openness	-0.559	[-0.697; -0.412]	0.007	[-0.016; 0.030]	-2841.671

Note. ICR = interquartile range.

Table OS8

Continuous Off-Diagonal Covariance Diffusion Parameters

Big Five/Self-Esteem Combination	q_{21}	99%-CI
diff_Selfesteem_Extraversion	- .041	[- .169; .096]
diff_Selfesteem_Agreeableness	.076	[- .060; .202]
diff_Selfesteem_Conscientiousness	- .015	[- .204; .239]
diff_Selfesteem_Neuroticism	**- .146**	**[- .195; - .094]**
diff_Selfesteem_Openness	- .012	[- .097; .055]

Note. q_{21} = continuous time covariance diffusion parameter between self-esteem $_{(2)}$ and the respective Big Five trait $_{(1)}$. Bold font indicates statistical significance at $p < .01$.

Table OS9

Means, Standard Deviations, and Correlations of Acquaintance-Reports of Manifest Personality Traits and Self-Esteem.

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. T1 Extravers.	4.59	0.92																	
2. T1 Agreeabl.	4.93	0.72	.19**																
3. T1 Conscient.	4.74	0.99	.16**	.30**															
4. T1 Neurot.	3.73	0.98	-.39**	-.41**	-.29**														
5. T1 Openness	5.10	0.90	.30**	.29**	.32**	-.12*													
6. T1 Self-Est.	4.94	1.32	.45**	.30**	.28**	-.72**	.16**												
7. T2 Extravers.	4.70	0.84	.76**	.09	.10	-.24**	.21*	.29**											
8. T2 Agreeabl.	4.97	0.67	.04	.64**	.03	-.30**	.20*	.16	.07										
9. T2 Conscient.	4.80	0.95	.06	.06	.81**	-.22*	.23*	.22*	.02	.19*									
10. T2 Neurot.	3.63	0.92	-.15	-.26**	-.22*	.74**	-.08	-.57**	-.32**	-.29**	-.29**								
11. T2 Openness	5.19	0.88	.25**	.18	.20*	-.20*	.71**	.17	.29**	.33**	.25**	-.21*							
12. T2 Self-Est.	5.11	1.16	.31**	.15	.20*	-.58**	.09	.65**	.45**	.12	.28**	-.70**	.18*						
13. T3 Extravers.	4.71	0.81	.77**	.11	.06	-.27*	.25*	.38**	.68**	.03	.01	-.24	.34**	.32**					
14. T3 Agreeabl.	5.05	0.58	.07	.59**	.10	-.25*	.29**	.15	.06	.68**	.17	-.42**	.41**	.32**	.21*				
15. T3 Conscient.	4.92	0.95	.08	.22	.77**	-.19	.27*	.12	.05	.13	.79**	-.23	.16	.13	.08	.28**			
16. T3 Neurot.	3.48	0.97	-.20	-.27*	-.23*	.69**	-.09	-.59**	-.20	-.15	-.27*	.81**	-.22	-.60**	-.33**	-.34**	-.28**		
17. T3 Openness	5.30	0.84	.19	.21	.25*	-.16	.75**	.10	.11	.28*	.16	-.15	.78**	.10	.27*	.44**	.23*	-.18	
18. T3 Self-Est.	5.38	1.04	.40**	.28*	.18	-.58**	.20	.61**	.35**	.17	.30*	-.60**	.30*	.66**	.53**	.36**	.29**	-.76**	.31**

Table OS10

Continuous Time Auto-Effects, Discrete Time Autoregressive Effects, and Model Fits for all Big Five Traits and Self-Esteem Measured via

	Continuous time auto-effects	**Discrete time autoregressive effects**			**Log-Likelihood**
	a [99%-CI]	a_1^* [99%-CI]	a_6^* [99%-CI]	a_{12}^* [99%-CI]	
Extraversion	-0.033 [-0.039; -0.028]	0.968 [0.962; 0.973]	0.822 [0.791; 0.846]	0.675 [0.626; 0.716]	-175.341
Agreeableness	-0.018 [-0.029; -0.010]	0.982 [0.971; 0.990]	0.899 [0.839; 0.940]	0.809 [0.704; 0.883]	-175.579
Conscientiousness	-0.012 [-0.019; -0.008]	0.988 [0.981; 0.992]	0.929 [0.893; 0.955]	0.863 [0.798; 0.911]	-240.539
Neuroticism	-0.022 [-0.029; -0.016]	0.979 [0.971; 0.98]	0.879 [0.834; 0.910]	0.773 [0.704; 0.828]	-405.411
Openness	-0.018 [-0.027; -0.012]	0.982 [0.974; 0.988]	0.895 [0.852; 0.929]	0.802 [0.725; 0.864]	-186.734
Self-Esteem	-0.063[-0.075; -0.052]	0.933 [0.928; 0.949]	0.686 [0.637; 0.732]	0.471 [0.405; 0.536]	-827.507

Acquaintance-Reports

Note. α = continuous time auto-effect; a_1^* = one-month discrete time autoregressive effect; a_6^* = six-months discrete time autoregressive effect; a_{12}^* = twelve-months discrete time autoregressive effect. All effects are significant at $p <$

4. Study III: Perfectionism and (Mal)adjustment

Striving Toward Perfection as a Pursuit of Happiness? A Longitudinal Perspective On Striving Toward Perfection vs. Excellence in Adolescence

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Bien, K., Wagner, J., Grund, S., & Brandt, N. D. (2025). Striving Toward perfection as a pursuit of happiness? A longitudinal perspective on striving toward perfection versus excellence in adolescence. [Manuscript in preparation].

Abstract

Adolescence involves significant academic, social, and psychological changes that require continuous adjustment. One factor linked to (mal)adjustment across different life domains is perfectionism. However, many studies do not distinguish between the rigid striving toward perfection and the more flexible striving toward excellence, potentially obscuring their distinct effects on adolescents' psychosocial (mal)adjustment. Using structural equation modeling, we analyzed three-wave longitudinal data from 931 10th-grade students (Mage = 15.46 years, SD = 0.62 years) to examine (1) the stability and trajectories of striving for perfection and excellence, (2) their longitudinal interplay with indicators of maladjustment from the academic (procrastination), the social (loneliness), and mental health domain (depressive symptoms), and (3) the mediating role of perfectionistic concerns. Both striving toward perfection and striving toward excellence showed moderate rank-order stability and small average declines, with significant interindividual differences. We found neither evidence that striving toward perfection versus excellence predicted psychosocial maladjustment nor that perfectionistic concerns mediated these relationships. However, procrastination was negatively associated with later striving toward perfection and excellence. While our findings possibly reflect normative shifts in self-perception of increasing external pressures across one school year, they did not support differential effects of striving toward perfection versus excellence on psychosocial maladjustment in adolescence. We discuss theoretical and methodological explanations for our null-findings and outline directions for future research.

Keywords: Perfectionism, Excellencism, Psychosocial Adjustment, Developmental Interplay

Striving Toward Perfection as a Pursuit of Happiness? A Longitudinal Perspective On Striving Toward Perfection vs. Excellence in Adolescence

Perfectionism is characterized by the tendency to strive toward unrealistically high standards, i.e., striving toward perfection (Gaudreau, 2019; Lo et al., 2020). Based on the common belief that striving for more naturally leads to better outcomes, teenagers with higher perfectionism are thought to excel at managing academic demands. But is it that simple? And how about associations with psychosocial (mal)adjustment in other life domains? Are adolescents' strivings toward perfection related to feeling socially included or to their mental health? Current work highlights the need to distinguish between the rigid striving toward perfection and the determined but more flexible striving toward excellence (Adderholdt & Goldberg, 1999; Flett et al., 2017; Gaudreau, 2019; Wade, 2017). A student who strives toward excellence sets high but achievable goals and works diligently by doing their classwork regularly and to the best of their abilities. While this description might resonate with a perfectionistic peer, a "truly" perfectionistic student strives "toward idealized, flawless, and excessively high standards in a relentless manner" (Gaudreau, 2019, p. 200), such as achieving perfect grades in every subject and feeling dissatisfied with anything less (Molnar et al., 2023).

Earlier studies did not separate relentless striving toward perfection from determined but realistic striving toward excellence, which may have obscured harmful aspects of striving toward perfection (Gaudreau et al., 2022; Goulet-Pelletier et al., 2022; Tape et al., 2024). Further, the newly developed Model of Excellencism and Perfectionism (MEP; Gaudreau, 2019) and first empirical findings (Bien et al., 2025; Gaudreau et al., 2022; Tape et al., 2024) suggest that, after accounting for their mutual and positive association, only striving toward perfection but not excellence uniquely relates to perfectionistic concerns, as these overly critical self-evaluations, the fear of failure, or doubts about one's actions, which are a well-known predictor of psychosocial maladjustment (e.g., Limburg et al., 2017; Lunn et al., 2023; Xie et al., 2018). Despite these theoretical advancements, no longitudinal study so far has investigated the developmental trends of striving toward perfection versus excellence in adolescence in line with the MEP. It thus remains an open question, how stable they are during this phase of life and how much their stabilities differ across adolescents. Furthermore, predictive effects from striving toward perfection and excellence on subsequent psychosocial (mal)adjustment across central life domains during adolescence remain unexplored, as well as the underlying processes that connect striving toward perfection and psychosocial (mal)adjustment.

To address these gaps, the present study investigates three interrelated research questions: First, we examine stability and change of striving toward perfection and striving

toward excellence as measured by the newly developed Scale of Excellencism and Perfectionism (SCOPE; Gaudreau et al., 2022) in adolescence. Second, to evaluate whether striving toward perfection beyond excellence turns out to be beneficial, irrelevant, or harmful, we examine predictive effects across three domains of psychosocial maladjustment[1], namely the academic domain, represented by procrastination, the social domain, represented by loneliness, and the mental health domain, represented by depressive symptoms. Third, drawing on theoretical considerations from the MEP (Gaudreau, 2019), we investigate whether perfectionistic concerns mediate longitudinal effects from striving toward perfection on these three indicators of psychosocial maladjustment.

The Development of Perfectionism in Adolescence: Investigating Stability and Change

Adolescence is considered to be a particularly sensitive period for the development of perfectionism (Flett & Hewitt, 2022; Flett et al., 2002) due to elevated expectations from society, institutions, and caregivers (Havighurst, 1948; Masten & Coatsworth, 1998) as well as adolescents' heightened awareness of others evaluating them (Harter, 2012; Somerville, 2013). Cross-temporal analyses further indicate that living in increasingly performance-oriented societies across the globe seems to drive rising levels of perfectionism among current generations of young people (Curran & Hill, 2019). Yet, few studies have explicitly focused on the examination of stability and change across different dimensions of perfectionism in adolescence. Furthermore, the few available findings do not differentiate between striving toward perfection and excellence (for available results on rank-order stabilities and mean-level changes, see Damian et al., 2022; Endleman et al., 2022; Vecchione et al., 2023, for example).

Within the MEP, striving toward perfection and excellence are regarded as "characteristic adaptations" (Gaudreau, 2019). This implies that, while they should remain relatively stable across time, both forms of striving might be influenced and potentially altered through different socialization effects. So far, there is one longitudinal study that examines rank-order stabilities but not mean-level changes of striving toward perfection and excellence in adults (Gaudreau et al., 2022). Namely, striving toward perfection and excellence display moderate to high rank-order stabilities over the course of three to four months (i.e., rs ranging from .48 for striving toward excellence to .78 for striving toward perfection; Gaudreau et al.,

[1] We use the term "psychosocial (mal)adjustment" to collectively refer to previously reported links of perfectionism with both positive and negative indicators of psychosocial adjustment in the literature. To ensure precision, we use the term "psychosocial maladjustment" when discussing our research questions as the present study focuses exclusively on negative indicators of psychosocial adjustment. We acknowledge that categorizing certain behaviors or experiences as "maladjustment" may oversimplify the complexities of adolescents' motivations and the contextual significance these behaviors or experiences may hold for specific subgroups or settings.

2022). The higher stability of striving toward perfection might be attributed to its inherently rigid and unflexible nature which, in turn, could contribute to its maintenance (Gaudreau et al., 2022).

However, we know from other personality characteristics, such as the Big Five personality traits, that rank-order stabilities are lower in adolescence than adulthood (Bleidorn et al., 2022; Roberts & DelVecchio, 2000). Similar patterns might be observable for the standards to which adolescents hold themselves as they might be more susceptible to changes in their environment or more inclined to change their priorities. To illustrate, adolescents might experience phases with more or less academic pressure across a school year or might lower their personal performance standards when they engage in a romantic relationship for the first time. The current study is the first to investigate rank-order stabilities as well as mean-level trends and interindividual differences in developmental trajectories of striving toward perfection and excellence in an adolescent sample of German high school students.

Better Perfect Than Excellent? Effects From Striving Toward Perfection vs. Excellence on Psychosocial (Mal)Adjustment

Overall, striving toward perfection shows heterogeneous associations with indicators of psychosocial adjustment (e.g., Damian et al., 2021; Madigan, 2019) and maladjustment (e.g., Boone et al., 2010; Smith et al., 2021). Along these lines, a lingering issue in the study of perfectionism has been the evaluation of whether striving toward perfection is harmful, irrelevant, or beneficial. To address this question, scholars have called for a clearer distinction between striving toward perfection and excellence, arguing that their conflation might have obscured harmful aspects of striving toward perfection in past studies (Blasberg et al., 2016; Gaudreau, 2019, 2021; Osenk et al., 2020; Wade, 2017). Validiation studies confirm the conceptual and functional distinctiveness between striving toward perfection and excellence in adulthood (Gaudreau et al., 2022) and adolescence (Bien et al., 2025; Gaudreau et al., 2022; Tape et al., 2024), suggesting that striving toward excellence cannot simply be regarded as a milder form of striving toward perfection. Further, the MEP proposes striving toward excellence as a benchmark to evaluate if striving toward perfection beyond excellence yields any positive returns. To do so, predictive effects from striving toward perfection on any outcome (e.g., the tendency to procrastinate or feel lonely) should be evaluated in a multivariate framework, thereby accounting for the positive correlation between striving toward perfection and excellence (Gaudreau et al., 2023).

In the present study, we examine the effects of striving toward perfection and excellence across three key domains in adolescents' lives: the academic, the social, and the mental health

domain. With this focus, we aim to cover the broadness of the psychosocial adjustment concept (Madariaga et al., 2014), concentrating on procrastination as an indicator for the academic domain, loneliness as an indicator for the social domain, and depressive symptoms as an indicator for the mental health domain.

Perfectionism in the Academic Domain: Investigating Effects on Procrastination

A large body of research has found associations between perfectionism and achievement (e.g., Damian et al., 2017; Endleman et al., 2022; Madigan, 2019; Sirois et al., 2017; Ståhlberg et al., 2021; Vecchione & Vacca, 2021; Xie et al., 2018). Specifically, perfectionistic concerns appeared to be disadvantageous for achievement, whereas striving toward perfection related positively to various achievement-related indicators. However, when differentiating between striving toward perfection and excellence, Gaudreau et al. (2022) found that striving toward perfection was either unrelated or negatively related to later academic achievement in university students. In contrast, striving toward excellence predicted higher academic achievement. Similarly, Tape et al. (2024) investigated cross-sectional associations of striving toward perfection and excellence with academic achievement in adolescents, controlling one for the other, and found no association for striving toward perfection and positive associations for striving toward excellence. These results indicate that formerly reported beneficial effects of perfectionism on achievement-related variables might have been driven by striving toward excellence rather than perfection itself. Improving our understanding about the role of striving toward perfection for achievement-related variables is of special interest during adolescence, a time period where academic settings exert increased requirements, demands, and competitiveness (Eccles & Roeser, 2011).

Reflecting on these past and recent results, one might ask if striving toward perfection vs. excellence might play different roles not only for actual achievement but also for how students engage in academic tasks. In the current study, we extend current research by evaluating effects on procrastination, the irrational delay of things one intends to do (Klingsieck, 2013). Procrastination is a common phenomenon in adolescence which not only relates to lower achievement but also to elevated levels of stress, depressive symptoms, and anxiety (Beutel et al., 2016). In line with different motivational theories (e.g., Bandura, 1977; Locke & Latham, 2013; Ryan & Deci, 2000), unrealistically high goals might decrease motivation, thereby fostering the postponement or avoidance of engaging in a task. In contrast, striving toward excellence rather than perfection might motivate adolescents to engage in working on their tasks and keep going when challenges occur as they are striving toward realistic goals.

Perfectionism in the Social Domain: Investigating Effects on Loneliness

Theoretical notions (Gaudreau, 2013; Hewitt et al., 2006; Hewitt et al., 2003) and empirical findings (e.g., Magson et al., 2019; Smith et al., 2020) propose an interplay between perfectionism and interpersonal aspects. However, to our knowledge, no existing study examined the associations between the new differentiated conceptualization striving toward perfection and excellence with interpersonal outcomes.

In adolescence, significant changes in social relationships, reorganizations of social networks (Rubin et al., 2008; Wrzus et al., 2013), and identity formation processes can contribute to feelings of isolation or disconnection (Laursen & Hartl, 2013). Loneliness, the distressing feeling that accompanies the perceived discrepancy between desired and actual quality or quantity of social relationships (Hawkley & Cacioppo, 2010), is a central indicator of perceived social disconnection. Therefore, adolescents are considered to be particularly prone to feelings of loneliness (Laursen & Hartl, 2013). Positive interpersonal relationships often require a level of vulnerability, where individuals feel safe to share personal thoughts and feelings (Costello et al., 2024; Reis, 2017). Adolescents who strive toward perfection might be especially vulnerable for feeling lonely as they might avoid authentic self-disclosure due to fear that revealing any flaws or weaknesses will lead to rejection. This lack of social authenticity can hinder the deepening of relationships, contributing to a feeling of isolation and loneliness. In contrast, striving toward excellence is associated with higher levels of openness to experience and self-esteem in adolescents and adults (Bien et al., 2025; Gaudreau et al., 2022). Being more open to new experiences, including those involving social interactions, could make individuals who strive toward excellence more likely to engage in social activities, see value in diverse interactions, and thus, have more opportunities to build and maintain friendships. Further, higher levels of self-esteem could make adolescents more comfortable with self-disclosure, thereby fostering closer and more supportive social relationships.

Perfectionism in the Mental Health Domain: Investigating Effects on Depressive Symptoms

Adolescent years mark the peak onset of most mental disorders (Solmi et al., 2022). It is, thus, of great interest to identify individual characteristics that pose vulnerabilities for or act as protective factors against the development of mental disorders. Perfectionism has been described as a transdiagnostic process that contributes to the etiology and maintenance of different psychopathologies (Egan et al., 2011). Meta-analytic findings indicate robust cross-sectional associations of perfectionistic concerns with different psychopathologies among children, adolescents, and young adults (Lunn et al., 2023). With regard to striving toward perfection, smaller and less consistent links were found (Lunn et al., 2023).

In the current study, we extend current research by examining the longitudinal effects of striving toward perfection vs. excellence on depressive symptoms. Depressive symptoms, including sadness, hopelessness, poor concentration, or feelings of worthlessness have high prevalence in adolescence, with symptoms being likely to continue into adulthood (Johnson et al., 2018; Polanczyk et al., 2015). Previous cross-sectional findings indicate that striving toward excellence relates to lower levels of depressive symptoms (Tape et al., 2024). However, with regard to striving toward perfection, Tape et al. (2024) observed positive cross-sectional associations with depressive symptoms in adolescents, while Gaudreau et al. (2022) found no longitudinal link for adults. This discrepancy might be interpreted through the lens of the diathesis-stress model (Flett et al., 1995), which posits that certain predispositions, such as perfectionism, can render individuals more susceptible to psychological maladjustments under stressful conditions. Adolescence, characterized by rapid developmental changes and heightened emotional challenges, might constitute such a susceptible, stressful period for many individuals (Arnett, 1999). The discrepancy between study results might also be due to differences in the study designs (cross-sectional vs. longitudinal).

Perfectionistic Concerns as a Mediator between Perfectionism and Psychosocial Maladjustment

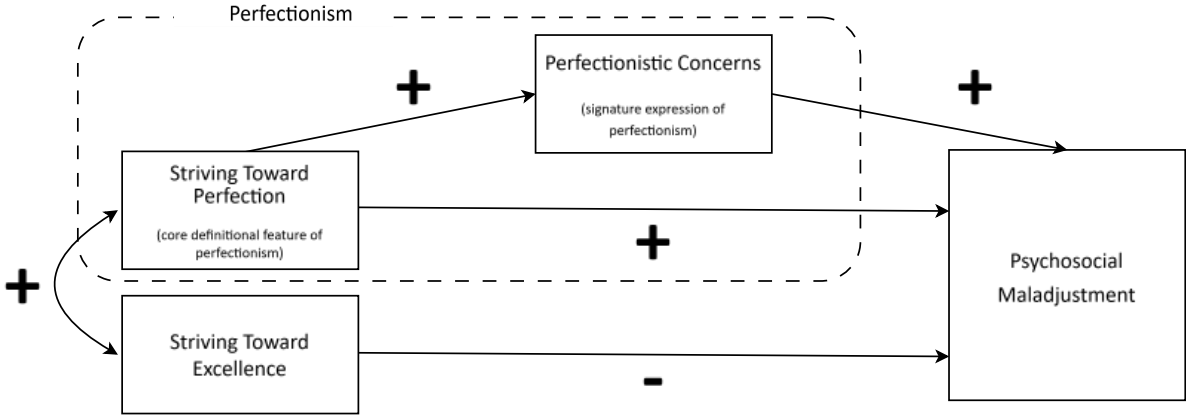
While predictive effects of striving toward perfection on indicators of psychosocial (mal)adjustment are the main focus of previous work (see Smith et al., 2022, for a review), identifying psychological processes that might explain the observed links is an urgent need. A promising avenue has been proposed by the MEP itself: The MEP regards striving toward perfection as the definitional core of perfectionism and perfectionistic concerns as signature expressions of perfectionism that follow from striving toward perfection (Gaudreau, 2019, 2021). In contrast, perfectionistic concerns are considered to be unrelated to striving toward excellence, which has been corroborated by cross-sectional results in adult and adolescent samples (Bien et al., 2025; Gaudreau et al., 2022; Tape et al., 2024).

How could a pathway from striving toward perfection, mediated through perfectionistic concerns, look like more specifically for the effects on procrastination, loneliness, and depressive symptoms in adolescents? The relentless pursuit of unrealistically high goals, which are inherent to striving toward perfection (e.g., having perfect grades in every subject) might activate the fear of failing these goals (Stoeber & Otto, 2006). Looking at procrastination, delaying tasks that are associated with these unrealistic goals (e.g., learning for an exam) could be characterized as an avoidance or coping behavior to elevate fears of failure (Moroz & Dunkley, 2019; Sirois & Kitner, 2015). Further, one might delay tasks in hopes of finding the

"perfect moment" to begin or execute them flawlessly. With regard to loneliness, striving toward perfection in social relations might activate perfectionistic concerns, such as the perception that they will only be liked by others when they are perfect (i.e., a form of conditional self-worth) or the fear that others might notice their imperfections and, therefore, respond with rejection (Visvalingam et al., 2023). As perfectionistic adolescents strive for an unattainable ideal self, they might withdraw from social interactions, such as meeting up after school or going to parties, to avoid exposing their perceived flaws or failures. This withdrawal might, however, not only reduce their chances of facing criticism but paradoxically increase their feelings of loneliness, as they miss out on social support and meaningful connections (Watson & Nesdale, 2012). Lastly, perfectionistic concerns activated by striving toward perfection, such as doubting own actions and ruminating about potential mistakes, pose a vulnerability factor for the development of depressive symptoms due to their role in perpetuating and exacerbating negative emotional states (Abela & Hankin, 2011; Hankin, 2008). Figure 1 illustrates the proposed mediational pathway between striving toward perfection and psychosocial maladjustment via perfectionistic concerns.

Figure 1

Mediated Pathway From Striving Toward Perfection to Psychosocial Maladjustment via Perfectionistic Concerns



Note. This is a schematic (not a statistical) representation of the pathways between striving toward perfection, striving toward excellence, perfectionistic concerns, and psychosocial maladjustment.

In sum, perfectionistic concerns might be regarded as a possible mechanism, linking striving toward perfection with psychosocial maladjustment. Building on this consideration, the present study is the first to investigate whether predictive effects from striving toward perfection on different indicators of psychosocial maladjustment might be mediated by

perfectionistic concerns, after controlling for the positive association between striving toward perfection and excellence.

The Present Study

How do striving toward perfection and excellence differ in terms of their role for the development of perfectionism and psychosocial maladjustment in adolescence? We use three-wave longitudinal data from 931 adolescents to examine three main preregistered research questions. First, we investigate stability and change of striving toward perfection and of striving toward excellence in middle to late adolescence as measured with the newly developed SCOPE (Gaudreau et al., 2022) presented in a German version (Bien et al., 2025). Using latent variable modeling, we expect high (> .5) rank-order stabilities for striving toward perfection (H1) and medium to high rank-order (> .4) stabilities for striving toward excellence (H2) across one school year. Further, we have no explicit hypotheses on the average trajectories of both constructs but expect statistically significant interindividual variance around the average trajectories (H3 and H4).

Second, we investigate prospective effects of striving toward perfection and excellence on four indicators of psychological maladjustment, that is, procrastination, emotional and social loneliness, and depressive symptoms. Although the effects from strivings on adjustment are the focus of the current study, we do not rule out potential reciprocal effects between constructs. We therefore take a dynamic interplay into account using (random-intercept) cross-lagged panel models (Campbell & Kenny, 2002; Hamaker et al., 2015; Rogosa, 1988). In the case of significant stable between-person differences, between- and within-person effects can differ with regard to presence, direction, and strength (Dietvorst et al., 2018; Hamaker et al., 2015; Keijsers, 2016). We therefore investigate predictive effects on both the within-and the between-person level. On the between-person level, we expect small to medium positive effects from striving toward perfection on the three indicators of psychosocial maladjustment (H5a-H5c). We further expect small to medium negative effects from striving toward excellence on the three indicators of psychosocial maladjustment (H6a-H6c). On the within-person level, we also expect small to medium positive effects from striving toward perfection on the three indicators of psychosocial maladjustment (H7a-H7c) and small to medium negative effects from striving toward excellence (H8a-H8c) on the three indicators of psychosocial maladjustment.

Third, we investigate whether perfectionistic concerns mediate longitudinal associations between striving toward perfection and any of the three indicators of psychosocial maladjustment in adolescence. Drawing on theoretical considerations of the MEP (Gaudreau, 2021), we hypothesize that possible between-person effects of striving toward perfection on

procrastination (H9a), loneliness (H9b), and depressive symptoms (H9c) are partially mediated by perfectionistic concerns (see Figure 1).

Method

We used data from three measurement points of the SEED project. The overarching aim of the SEED project is the investigation of adolescents' personal and educational development with a special focus on contributing individual and contextual factors. Data collection was approved by the local School Authority and the local ethics committee of the faculty of psychology and human movement at the University of Hamburg (protocol code: 2022_045). Data for the first two measurement points was collected from adolescents in 10th grade. Data for the last measurement point was collected after adolescents' transition to 11th grade. The project had a drop-in design; participants who did not participate in T1 could enter the study at T2 or T3. We refer the interested reader to the preregistration for a flowchart of participation in the project (page 6). For the present study, we used longitudinal student self-report data from all three measurement points. The respective questionnaires were presented via the m-Path App (www.m-Path.io) on students' private mobile devices. Participation was voluntary and all participants provided informed consent.

Transparency and Openness

The present study is considered a secondary analysis of existing data. The present study is not classified as a replication or registered report. All hypotheses along with the analytic plan were pre-registered before data analysis. The data, analysis codes, and research materials to reproduce the reported results are available on the Open Science Framework (OSF; https://osf.io/m49yg/?view_only=f14e03cfb1d448cb804ef0d1d56d72a8). We report how we determine the sample size and all study measures. We describe all derivations from the pre-registration in Table OS1 in the online supplementary materials (OSM).

Participants

Overall, 1,131 students (M_{ageT1} = 15.49, *SD* = 0.68 years) from twelve different schools participated in any part of the data collection. The sample was balanced in terms of gender (50% female), migration background (45% first- or second-generation immigrants), and school track (54% students from academic track). Prior to the analyses, we screened the data for low-effort responses in two ways: First, we checked for participants who indicated that they did not fill in the questionnaire truthfully or clicked through it mindlessly (*n* = 192). Second, we checked for participants who showed no to very little variance (below 0.2) across all measured study variables combined (*n* = 19) to identify participants who checked the same response on nearly

every question. Based on these two steps, we ended up with a final sample of $N = 931$ students ($M_{ageT1} = 15.46$, $SD = 0.62$ years). Around half of them (51%) were female, 43% reported to have a migration background and 55% came from an academic-track school. All results in the main manuscript are based on this final sample. Participants that were removed from the final sample were less frequently from the academic track (Cohen's $d = -0.28$, $p < .001$), had lower levels of striving toward excellence (Cohen's $d = -0.33$, $p < .001$) and of procrastination (Cohen's $d = -0.20$, $p = .005$), and higher levels of social loneliness (Cohen's $d = 0.35$, $p < .001$) compared to students from the final sample. As a robustness check, we, therefore, repeated all steps from the main analyses with the full sample and report the respective results in the OSM.

Of the 931 students from the final sample, 98 (10%) participated at all three measurement points, an additional 185 (20%) participated at two measurement points, and 648 students (70%) participated only once. The large proportion of missing data can be traced back to two main structural factors that were independent from students' individual reasons of participation. First, because data collection took place at schools, it needed to be approved by the respective school principals. Principals from five schools (one comprehensive school and four academic-track schools) decided to stop their participation after the first or second measurement due to time constraints. As a result, students from these schools could not participate in the upcoming measurement points. Second, due to technical reasons of the study app, only fully completed questionnaires were saved at each measurement point.

Longitudinal attrition analyses showed that students who participated only once were slightly older (Cohen's $d = 0.39$, $p < .001$), more often male (Cohen's $d = -0.22$, $p = .002$), more likely to have a migration background (Cohen's $d = 0.33$, $p < .001$), and were less often on the academic track (Cohen's $d = -0.50$, $p < .001$) than students who participated more than once. Also, they reported lower levels of procrastination (Cohen's $d = -0.19$, $p = .007$) but did not differ with regard to any other study variable. We assume that the data are missing at random (MAR) otherwise.

Because data had already been collected, the sample size was predetermined. We performed a simulation-based power analysis to estimate statistical power for detecting anticipated effects between striving toward perfection or striving toward excellence (respectively controlled for one another) and the respective outcome variables in a random-intercept cross-lagged panel model, the most complex model type we used. To do so, we used the R package *powRICLPM* (Mulder, 2023). Due to the lack of previous studies, we set a range of plausible population parameters for the power simulations: $\beta = .40$, .50, and .60 for the autoregressive effects, $r = .30$ and .40 for the within-time correlations, $r = .20$, .30, and .40 for

the random-intercepts correlations, and ICC = .40 and .50 for intraclass correlations. Effect sizes of .15 for the cross-lagged paths consistently resulted in at least 80% power across different simulation conditions. Effect sizes of .10 or .12 resulted in power estimates that ranged from 55% to 79%. The code for the sensitivity analysis and the corresponding results can be retrieved from the OSF.

Measures

In the SEED project, multiple variables were assessed. For an overview of all measures, we refer the interested reader to the codebook (https://osf.io/xyf8c/wiki/home/).

Striving toward perfection and **striving toward excellence** were assessed with a German version (Bien et al., 2025) of the Scale of Excellencism and Perfectionism (SCOPE; Gaudreau et al., 2022). The SCOPE consists of 22 items (11 items per factor) that were rated on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Perfectionistic concerns were assessed with the concern over mistakes subscale from the German version (Stoeber, 1995) of the Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990). The subscale consisted of nine items. All items were rated on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Procrastination was assessed with all nine items from the German short version (Klingsieck & Fries, 2018) of the General Procrastination Scale (GPS; Lay, 1986). All items were rated on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Loneliness was assessed with German translations of four items from the revised University of California Los Angeles (UCLA) Loneliness Scale (Russell et al., 1980). All items were rated on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). We differentiated between emotional and social loneliness. Emotional loneliness was assessed with two items (“I lack companionship” and “I feel left out”) and social loneliness with two reverse-coded items (“there are people I can turn to” and “there are people I can talk to”).

Depressive symptoms were assessed with ten items from the German version (Hautzinger, 1988) of the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). All items were rated on a 4-point scale ranging from 1 (*never or almost never, less than one day in the last week*) to 4 (*mostly or all the time, 5-7 days in the last week*).

Control Variables

School type was coded as a dichotomous variable that differentiates between comprehensive schools (German: “Gesamtschule”, coded with 0) and academic track schools (German: “Gymnasium”, coded with 1).

Gender was assessed by a dichotomous forced choice item (i.e., male coded with 0 or female coded with 1) with the additional instruction to select the option with which one identifies most ("If uncertain, please choose the sex that you can identify with the most.").

Analytic Strategy

To test our three research goals, we estimated a sequence of latent variable models. For all model types, we used robust maximum likelihood estimation (MLR). Further, all latent variables were identified using the effect-coding method (Little et al., 2006). All analyses were conducted in *R* version 4.4.2 (R Core Team, 2023) with main analyses performed with the *lavaan* package (version 0.6-19; Rosseel, 2012) and the *semTools* package (version 0.5-6; Jorgensen et al., 2016). Multiple imputation was applied as implemented in the *mice* package (version 3.16; van Buuren et al., 2006) and the *mitml* package (version 0.4-5Grund et al., 2016).

Pre-Analysis Steps

As a fist preanalytical step, we aggregated multiple items to parcels based on the item-to-construct balancing technique (Little, 2013). For emotional and social loneliness, we used the respective two items as manifest indicators. We used established indices to evaluate the goodness of model fit with values above .95/.90 for good/acceptable fit in terms of the comparative fit index (CFI), values below .05/.08 for good/acceptable fit in terms of the root mean square error of approximation (RMSEA), and values below .08/.11 for good/acceptable fit in terms of the standardized root mean square residual (SRMR), and differences in fit indices across models (ΔCFI <.01, ΔRMSEA <.015, and ΔSRMR <.030; Hu & Bentler, 1999; Schermelleh-Engel et al., 2003).

We then aimed to establish scalar measurement invariance across time for all constructs (Little, 2013). We evaluated the model fits of increasingly restrictive models starting with a configural model (equal factor structure across measurement points), before testing metric invariance (equal factor loadings), and scalar invariance (equal factor loadings and equal intercepts). We were able to establish strong measurement invariance across study variables (see Table 1). The models had acceptable to excellent model fit. One exception was the procrastination model with a RMSEA value that was slightly above the cut-off. However, given that this model was still the most well-fitting invariance model, and the other parameters were below the pre-defined cut-off values, we decided to proceed with the specified models.

Table 1

Longitudinal Measurement Invariance Across Study Variables

Model	χ^2	*df*	CFI	ΔCFI	RMSEA	ΔRMSEA	SRMR	ΔSRMR
	Striving Toward Perfection							
Configural	84.602**	39	.992		.050		.024	
Metric	89.847**	45	.992	.000	.048	-.002	.028	.004
Scalar	99.099**	51	.991	-.001	.046	-.002	.028	.000
	Striving Toward Excellence							
Configural	93.789**	39	.982		.072		.036	
Metric	99.512**	45	.983	.001	.065	-.007	.037	.001
Scalar	112.777**	51	.981	-.002	.065	.000	.038	.001
	Procrastination							
Configural	37.676**	15	.978		.109		.032	
Metric	45.877**	19	.977	-.001	.098	-.011	.034	.002
Scalar	48.952**	23	.978	.001	.088	-.010	.034	.000
	Emotional Loneliness							
Configural	2.124	4	1.00		.000		.012	
Metric	11.601	7	.998	-.002	.023	.023	.023	.011
Scalar	11.695	9	1.00	.002	.000	.000	.023	.000
	Social Loneliness							
Configural	7.253	4	1.00		.000		.029	
Metric	15.606	7	1.00	.000	.000	.000	.015	-.014
Scalar	17.484	9	1.00	.000	.000	.000	.016	.001
	Depressive symptoms							
Configural	32.853	39	1.00		.000		.025	
Metric	38.021	45	1.00	.000	.000	.000	.030	.005
Scalar	46.008	51	1.00	.000	.000	.000	.031	.001
	Perfectionistic Concerns							
Configural	11.731	15	1.00		.000		.017	
Metric	12.071	19	1.00	.000	.000	.000	.017	.000
Scalar	24.670	23	1.00	.000	.000	.000	.021	.004

Note. ** $p < .01$.

Handling of Missing Data

We handled missing data at the parcel level by applying the Full Information Maximum Likelihood approach (FIML; Arbuckle, 1996). We included migration background, fluid reasoning, and the grade from the last German report as auxiliary variables in all models (Graham, 2003). As a robustness check, we further conducted all main analyses with 100

multiply imputed data sets and report the respective results (together with the results that are based on the full sample) in the OSM. Multiple imputation was performed at the item level with passive imputation of scale means and the Big Five personality traits and further demographic variables as additional auxiliary variables (Eekhout et al., 2014).

Main Analyses

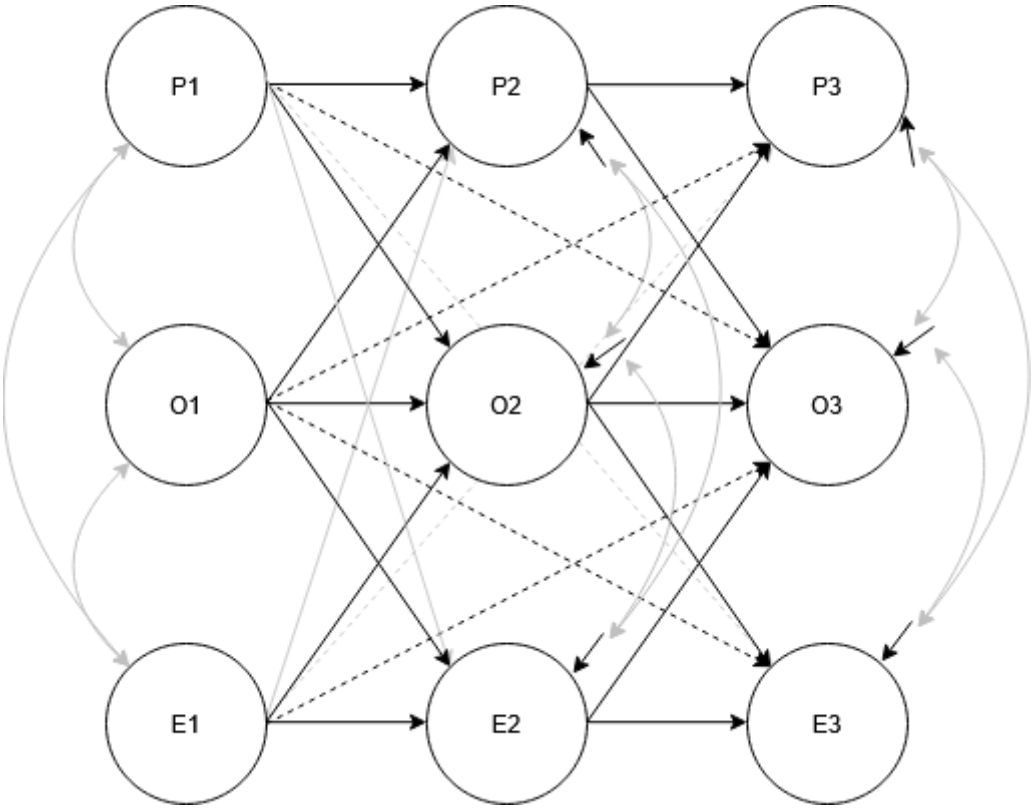
The models from the measurement invariance testing were used as input for the following steps: To address our first research question on stability and change, we derived latent rank-order stabilities for striving toward perfection and excellence by investigating latent correlations across the three measurement points. Further, to evaluate the longitudinal trajectories of striving toward perfection and excellence, we computed second-order univariate LGCMs. In all LGCMs, the (second-order) intercept factors were defined by fixing the loadings of the three time-specific first-order factors to one (i.e., representing the initial level of the respective latent variable at T1). To investigate linear change, the (second-order) slope factors were defined by fixing the loadings of the first-order factors to zero (at T1), one (at T2), and two (at T3), respectively. We further modelled interindividual differences both in the intercept (random intercepts) and in the slope factor (random slopes) and estimated their covariance.

Second, to evaluate predictive effects of strivings on maladjustment, we initially specified a trivariate cross-lagged panel model (CLPM) for each maladjustment indicator separately (Campbell & Kenny, 2002; Rogosa, 1988). All CLPMs estimated lag-1 and lag-2 effects (Lüdtke & Robitzsch, 2022). As proposed by the MEP (Gaudreau et al., 2023), we accounted for the positive associations between striving toward perfection and striving toward excellence when modeling the respective prospective effects on the different indicators of psychosocial maladjustment. Figure 2 depicts a schematic representation of a CLPM as specified in our analyses. We then extended the CLPM with random intercepts for each construct (RI-CLPM; Hamaker et al., 2015). In RI-CLPMs, time-ordered effects are located at the within-person level, while controlling for stable between-person differences.

As a third step, we investigated whether perfectionistic concerns mediate the effect of perfectionistic strivings on maladjustment indicators by adding perfectionistic concerns as a mediator into our models. Finally, we added gender and school type as covariates into all analytical models (i.e., we fitted all models first without and then with covariates).

Figure 2

Exemplary Cross-Lagged Panel Model



Note. This is a simplified version without covariates and measurement models. P = striving toward perfection, O = Outcome (i.e., procrastination, emotional or social loneliness, or depressive symptoms), E = striving toward excellence.

Results

Descriptive statistics and bivariate manifest correlations for all study variables can be found in Table 2. All constructs showed satisfactory reliability as indicated by measures of internal consistency (McDonald's omega). There were consistent negative cross-sectional and longitudinal correlations of both types of strivings with procrastination and consistent negative associations with perfectionistic concerns. Regarding emotional loneliness, social loneliness, and depressive symptoms, correlations showed to be mostly positive with striving toward perfection and mostly negative with striving toward excellence. However, these associations were not consistent across measurement points and mostly not statistically significant.

In the following, we first turn to our first research question and report latent rank-order stabilities for striving toward perfection and excellence as well as their mean-level trajectories. We then address our second research question and report the results from the CLPMs and the RI-CLPMs. Finally, with regard to our third research question, we report findings on models with mediation effects.

Table 2

Means, Standard Deviations, Reliabilities and Manifest Correlations Among all Study Variables

Var	*M*	*SD*	Rel	Per1	Per2	Per3	Exc1	Exc2	Exc3	Pro1	Pro2	Pro3	EL1	EL2	EL3	SL1	SL2	SL3	Dp1	Dp2	Dp2	PC1	PC2
Per1	4.89	1.34	.95																				
Per2	4.50	1.47	.96	**.64**																			
Per3	4.60	1.42	.96	**.53**	**.74**																		
Exc1	5.60	0.95	.93	**.62**	**.41**	**.36**																	
Exc2	5.36	1.11	.94	**.44**	**.65**	**.46**	**.57**																
Exc3	5.49	1.05	.95	**.36**	**.43**	**.59**	**.43**	**.67**															
Pro1	4.72	1.23	.91	-.09	**-.23**	**-.26**	-.06	-.16	-.08														
Pro2	4.66	1.25	.93	-.08	**-.22**	-.14	-.15	**-.19**	-.12	**.67**													
Pro3	4.55	1.27	.93	-.11	-.17	**-.22**	**-.22**	-.18	**-.24**	**.67**	**.71**												
EL1	3.04	1.52	.64	**.11**	.18	.09	-.00	.07	-.02	**.15**	.07	-.06											
EL2	2.87	1.51	.63	.11	.10	.08	.08	-.03	.00	.09	.06	.01	**.62**										
EL3	2.83	1.49	.70	.18	-.04	-.01	.02	-.19	**-.15**	.13	-.04	.10	**.50**	**.60**									
SL1	2.51	1.61	.88	.09	.08	.03	.03	-.08	-.07	**.12**	.15	.04	**.43**	**.31**	**.45**								
SL2	2.51	1.55	.82	.10	.03	.05	.02	-.12	-.09	.16	.02	.14	**.22**	**.39**	**.34**	**.30**							
SL3	2.25	1.45	.85	.04	.03	-.03	.01	-.05	-.08	.02	.02	-.02	**.38**	**.41**	**.42**	**.43**	**.62**						
Dp1	2.37	0.65	.90	**.14**	.12	.09	.01	.05	-.01	**.32**	**.30**	.19	**.49**	**.38**	.14	**.28**	**.26**	.25					
Dp2	2.18	0.60	.89	.17	.09	-.07	.11	.06	-.15	**.23**	**.21**	**.23**	**.44**	**.46**	**.39**	**.19**	**.22**	**.32**	**.65**				
Dp3	2.21	0.60	.89	.20	.07	.04	.02	-.06	-.01	**.37**	.19	**.25**	**.31**	**.38**	**.48**	**.25**	**.24**	**.29**	**.60**	**.62**			
PC1	3.68	1.40	.91	**.41**	**.40**	**.22**	**.29**	**.32**	.08	.08	-.01	.03	**.36**	**.26**	**.07**	**.24**	.13	.11	**.43**	**.38**	**.42**		
PC2	3.45	1.39	.92	**.45**	**.45**	**.41**	**.38**	**.33**	**.27**	.01	.04	-.05	**.29**	**.38**	.08	.15	**.20**	.14	**.40**	**.42**	**.29**	**.66**	
PC3	3.68	1.26	.90	**.32**	**.47**	**.39**	.23	**.28**	**.27**	.11	.02	.06	**.23**	.22	**.26**	.15	.13	**.17**	.18	**.26**	**.36**	**.56**	**.65**

Note. Var = Variable, *M* = Mean, *SD* = Standard Deviation, Rel = Reliability, Per = Striving Toward Perfection, Exc = Striving Toward Excellence, Pro = Procrastination, EL = Emotional Loneliness, SL = Social Loneliness, Dp = Depressive symptoms, PC = Perfectionistic Concerns; the numbers (i.e., 1, 2, 3) indicate the measurement occasion; McDonald's Omega was used as an indicator for reliability of all constructs except emotional and social loneliness, for which split-half reliabilities were calculated. Bold font indicates statistical significance $p < .01$.

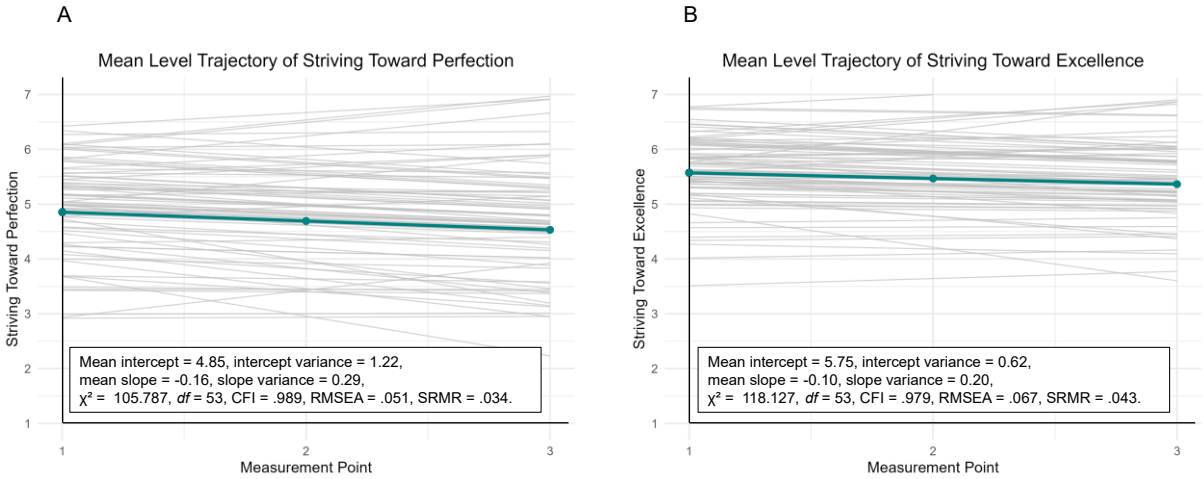
Rank-Order Stabilities and Mean-Level Changes of Striving Toward Perfection and Excellence

In line with Hypotheses H1 and H2, we observed medium-sized rank-order stabilities across one school year (i.e., approximately nine months between T1 and T3) for striving toward perfection ($r_{T1\text{-}T3}$ = .55, p < .001) and striving toward excellence ($r_{T1\text{-}T3}$ = .47, p < .001). We additionally computed rank-order stabilities between neighboring measurement points to investigate rank-order stabilities in shorter time intervals and found comparable estimates for both striving toward perfection ($r_{T1\text{-}T2}$ = .57, p < .001; $r_{T2\text{-}T3}$ = .76, p < .001) and striving toward excellence ($r_{T1\text{-}T2}$ = .57, p < .001; $r_{T2\text{-}T3}$ = .74, p < .001).

Based on univariate latent growth-curve models, we found small average decreases of striving toward perfection (mean slope = - 0.16; p < .001) and striving toward excellence (mean slope = - 0.10; p < .001) over time. Furthermore, we found statistically significant interindividual differences around these average trajectories (slope variance = 0.29 for striving toward perfection, p = .001; slope variance = 0.20 for striving toward excellence, p = .005). That is, in line with our Hypotheses H3 and H4, individuals differed with regard to the rate of change in their striving toward perfection and excellence over time. Specifically, while the average trend indicated a small decrease, some students showed steeper declines and some more gradual declines, while others exhibited stable or increasing trajectories as is illustrated in Figure 4. The 95% plausible value range (PVR; Raudenbush & Bryk, 2002) for the slope ranged from -1.22 to 0.90 for striving toward perfection and from -0.98 to 0.77. The results remained statistically significant after including school type and gender as time-invariant covariates (see Table OS4 in the OSM). Corresponding results based on the full and the multiply imputed data can also be found in Tables OS5 and OS6 in the OSM.

Figure 4

Average and Individual Trajectories of Striving Toward Perfection (A) and Striving Toward Excellence (B) Across the Three Measurement Points



Note. The bold line represents the average mean-level trajectory across all participants, the thinner grey lines are model-implied individual mean-level trajectories based on their respective factor scores from a randomly selected subset of 93 participants (10% of the whole sample).

Neither Evidence for Predictive Between-Person Effects nor Mediation via Perfectionistic Concerns From Striving Toward Perfection vs. Excellence on Psychosocial Maladjustment

To investigate predictive effects from striving toward perfection vs. excellence on psychosocial maladjustment, we fitted a series of trivariate CLPMs, always including striving toward perfection and striving toward excellence together with one indicator of psychosocial maladjustment from different domains of life (i.e., procrastination, emotional loneliness, social loneliness, or depressive symptoms). All models had at least acceptable model fit (see Table 4). All measured constructs showed medium to high stabilities as indicated by their positive auto-regressive effects ranging from 0.45 for social loneliness to 0.91 for emotional loneliness (all *p*-values < .001). However, contrary to our Hypotheses H5a-H6c, we found no evidence for predictive effects of striving toward perfection or striving toward excellence on psychosocial maladjustment (or vice versa) as indicated by the non-significant cross-lagged effects across models (see Table 3). Two exceptions occurred: Procrastination at the first measurement point showed negative predictive effects on striving toward perfection and striving toward excellence at the second measurement point. That is, students with higher average procrastination scores in the middle of 10th grade were more likely to report lower levels of striving toward perfection and excellence at the end of 10th grade. Noteworthy are the wide 99% confidence intervals around all lagged effects, indicating a high degree of uncertainty in the estimated parameters.

We address potential reasons for this in the discussion section. The inclusion of school type and gender did not change the interpretation of most effects (see Tables OS7 to OS10 in the OSM). Further, corresponding results based on the full sample and the multiply imputed data can be found in Tables OS11 to OS18 in the OSM.

We then moved to our final research question on the mediating role of perfectionistic concerns. Including perfectionistic concerns as a mediator showed no evidence of indirect (mediated) effects across the four models, contradicting Hypotheses H9a-H9c. The parameter estimates from the mediation models can be found in Tables OS19 to OS22 in the OSM.

Table 3

Standardized parameter estimates for the cross-lagged panel models (CLPMs)

CLPM with Procrastination				CLPM with Emotional Loneliness				CLPM with Social Loneliness				CLPM with Depressive Symptoms			
	Est.	*p*	99% CI		Est.	*p*	99% CI		Est.	*p*	99% CI		Est.	*p*	99% CI
Stability Effects				Stability Effects				Stability Effects				Stability Effects			
Per1→Per2	**.58**	< .001	[.40; .77]	Per1→Per2	**.57**	< .001	[.37; .77]	Per1→Per2	**.58**	< .001	[.38; .78]	Per1→Per2	**.60**	< .001	[.39; .81]
Per2→Per3	**.70**	< .001	[.45; .95]	Per2→Per3	**.72**	< .001	[.47; .98]	Per2→Per3	**.70**	< .001	[.45; .96]	Per2→Per3	**.71**	< .001	[.47; .95]
Exc1→Exc2	**.47**	< .001	[.17; .77]	Exc1→Exc2	**.46**	< .001	[.17; .74]	Exc1→Exc2	**.47**	< .001	[.18; .75]	Exc1→Exc2	**.48**	< .001	[.19; .77]
Exc2→Exc3	**.69**	< .001	[.47; .92]	Exc2→Exc3	**.72**	< .001	[.49; .94]	Exc2→Exc3	**.70**	< .001	[.46; .94]	Exc2→Exc3	**.73**	< .001	[.52; .94]
Pro1→Pro2	**.72**	< .001	[.61; .84]	EL1→EL2	**.91**	< .001	[.67; 1.14]	SL1→SL2	**.45**	< .001	[.23; .68]	DP1→DP2	**.71**	< .001	[.54; .87]
Pro2→Pro3	**.72**	< .001	[.58; .87]	EL2→EL3	**.79**	< .001	[.59; 1.00]	SL2→SL3	**.86**	< .001	[.66; 1.05]	DP2→DP3	**.75**	< .001	[.63; .87]
Cross-Effects (Lag 1)				Cross-Effects (Lag 1)				Cross-Effects (Lag 1)				Cross-Effects (Lag 1)			
Per1→Pro2	.11	.189	[-.11; .33]	Per1→EL2	-.08	.579	[-.44; .28]	Per1→SL2	.08	.426	[-.17; .32]	Per1→DP2	-.15	.147	[-.41; .11]
Per2→Pro3	-.02	.896	[-.32; .29]	Per2→EL3	-.17	.245	[-.56; .21]	Per2→SL3	-.17	.188	[-.51; .17]	Per2→DP3	-.02	.876	[-.39; .34]
Pro1→Per2	**-.18**	.001	[-.33; -.04]	EL1→Per2	.05	.493	[-.15; .26]	SL1→Per2	-.01	.889	[-.17; .15]	DP1→Per2	-.08	.289	[-.28; .12]
Pro2→Per3	.03	.754	[-.21; .27]	EL2→Per3	-.21	.615	[-1.31; .88]	SL2→Per3	-.01	.943	[-.23; .21]	DP2→Per3	-.19	.019	[-.40; .02]
Exc1→Pro1	-.18	.058	[-.43; .06]	Exc1→EL1	.08	.602	[-.32; .48]	Exc1→SL1	-.02	.841	[-.30; .26]	Exc1→DP1	.21	.058	[-.07; .49]
Exc2→Pro3	.10	.454	[-.25; .46]	Exc2→EL3	-.08	.640	[-.55; .38]	Exc2→SL3	.30	.038	[-.07; .67]	Exc2→DP3	.09	.541	[-.28; .46]
Pro1→Exc2	**-.15**	.009	[-.31; -.00]	EL1→Exc2	.00	.993	[-.22; .22]	SL1→Exc2	-.10	.180	[-.30; .09]	DP1→Exc2	.01	.906	[-.20; .22]
Pro2→Exc3	-.11	.307	[-.39; .17]	EL2→Exc3	.29	.461	[-.72; 1.30]	SL2→Exc3	.00	.960	[-.21; .22]	DP2→Exc3	-.20	.082	[-.49; .10]
Per1→Exc2	.14	.201	[-.15; .44]	Per1→Exc2	.17	.130	[-.12; .45]	Per1→Exc2	.16	.130	[-.11; .44]	Per1→Exc2	.14	.210	[-.15; .43]
Per2→Exc3	-.03	.797	[-.38; .31]	Per2→Exc3	-.06	.644	[-.41; .29]	Per2→Exc3	-.05	.707	[-.39; .29]	Per2→Exc3	-.08	.501	[-.40; .24]
Exc1→Per2	.05	.542	[-.15; .25]	Exc1→Per2	.06	.458	[-.15; .27]	Exc1→Per2	.06	.491	[-.16; .27]	Exc1→Per2	.05	.583	[-.18; .27]
Exc2→Per3	-.03	.818	[-.36; .30]	Exc2→Per3	-.06	.640	[-.39; .27]	Exc2→Per3	-.02	.875	[-.38; .34]	Exc2→Per3	-.01	.942	[-.33; .31]
Cross-Effects (Lag 2)				Cross-Effects (Lag 2)				Cross-Effects (Lag 2)				Cross-Effects (Lag 2)			
Per1→Pro3	.01	.961	[-.32; .33]	Per1→EL3	.31	.043	[-.09; .71]	Per1→SL3	.08	.508	[-.25; .41]	Per1→DP3	.35	.020	[-.04; .75]
Pro1→Per3	-.07	.498	[-.32; .19]	EL1→Per3	.23	.595	[-.89; 1.35]	SL1→Per3	.01	.882	[-.21; .23]	DP1→Per3	.16	.082	[-.08; .40]
Exc1→Pro3	-.22	.164	[-.63; .19]	Exc1→EL3	-.18	.301	[-.63; .27]	Exc1→SL3	-.16	.260	[-.52; .20]	Exc1→DP3	-.39	.023	[-.82; .05]
Pro1→Exc3	.15	.205	[-.15; .45]	EL1→Exc3	-.24	.529	[-1.24; .76]	SL1→Exc3	.04	.691	[-.21; .28]	DP1→Exc3	.03	.789	[-.25; .31]
Per1→Exc3	.16	.216	[-.17; .48]	Per1→Exc3	.15	.183	[-.14; .45]	Per1→Exc3	.15	.248	[-.19; .49]	Per1→Exc3	.19	.099	[-.11; .50]
Exc1→Per3	.15	.164	[-.13; .43]	Exc1→Per3	.17	.085	[-.09; .43]	Exc1→Per3	.15	.192	[-.15; .46]	Exc1→Per3	.16	.131	[-.11; .43]

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, Pro = Procrastination, EL = Emotional Loneliness, SL = Social Loneliness, DP = Depressive Symptoms. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table 4

Model fits for the cross-lagged panel models (CLPMs)

Model	Model Fit Indices				
	χ^2	*df*	CFI	RMSEA	SRMR
CLPM with Procrastination	**930.319**	461	.967	.048	.046
CLPM with Emotional Loneliness	**785.244**	371	.960	.045	.042
CLPM with Social Loneliness	**794.827**	371	.983	.036	.042
CLPM with Depressive Symptoms	**879.619**	461	.979	.037	.043

Note. CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual.

Within-Person Effects From Striving Toward Perfection vs. Excellence on Psychosocial Maladjustment

We further extended the CLMPs to RI-CLPMs (Hamaker et al., 2015) to examine within-person associations between strivings and maladjustment. While all models converged, the model estimated negative variances of within-person parameters, indicating that the decomposition of observed variance into between- and within-person components might not have been feasible in this sample. Also, there was no significant variance in random intercepts in any of our models. Including a random intercept in such a model is regarded to introduce unnecessary complexity to the model relative to the data (Mulder & Hamaker, 2021). We therefore decided to refrain from reporting the corresponding results in detail here.

Nevertheless, as preregistered, we calculated the RI-CLPMs but, again, found no statistically significant cross-lagged effects. The code and the respective outputs can be retrieved from the paper's OSF page (https://osf.io/m49yg/?view_only=f14e03cfb1d448cb804ef0d1d56d72a8).

Discussion

In this work, we used a longitudinal approach on striving toward perfection accounting for striving toward excellence to better understand its positive or negative effects on adjustment during adolescence. We first explored stability and change in striving toward perfection and excellence across one school year and found medium-high rank-order stabilities and small decreases in mean levels for both striving types. However, regarding our second and third research aims, we found no evidence for predictive effects from striving toward perfection or excellence on psychosocial maladjustment or mediating effects of perfectionistic concerns. In the following, we discuss these findings and reflect on considerations that should be taken into account, when studying predictive effects of striving toward perfection vs. excellence in a longitudinal study with adolescent populations.

Comparable Trends in Stability and Change of Striving Toward Perfection and Excellence

Our analysis of rank-order stabilities over a nine-month period indicated that both striving toward perfection and striving toward excellence remained moderately stable. As anticipated, shorter intervals showed even higher stability. Our findings for striving toward perfection are comparable with those from the only other longitudinal study on the MEP in a (young) adult college sample (Gaudreau et al., 2022, Study 5). However, other than Gaudreau et al. (2022), we did not observe a pronounced difference in rank-order stabilities between

striving toward perfection and excellence in our adolescent sample. That is, rank-order stabilities were comparably high for both types of strivings across all measurement intervals in our sample. One reason for this might be the higher intercorrelation between striving toward perfection and striving toward excellence in our adolescent sample. Our results suggest that the differentiation between striving toward perfection and striving toward excellence might be less pronounced in younger samples. Although perfectionism and excellencism are already conceptually distinguishable and relate differently to diverse outcome variables in adolescence (Bien et al., 2025; Tape et al., 2024), their differentiation might still be under development, with similar differentiation processes that have also been reported for other personality constructs, such as the Big Five personality traits (Brandt et al., 2020; van der Linden et al., 2010).

Regarding mean levels, we observed small linear decreases for both types of strivings from the middle of 10th to the beginning of 11th grade. This result pattern nicely aligns with previous findings showing a decrease in most motivational and performance-related characteristics such as academic motivation as students move through adolescence (Eccles et al., 1993; Otis et al., 2005). In addition, we observed interindividual differences in the development of striving toward perfection and excellence, highlighting that despite such general trends some students might show quite distinct result patterns.

Interestingly, previous studies emphasize that specific time and contextual information needs to be regarded when interpreting mean-level changes across and within school years (Cohen et al., 2023; Corpus et al., 2009). Along these lines, one should consider that the three measurement points in our study were scheduled at different times during the school year: The first measurement took place in the middle of 10th grade, a time that is characterized by high academic demands and involves a great number of exams. In contrast, the second measurement point took place at the end of 10th grade, shortly before the summer break, a time that is typically characterized by less academic pressure, as final grades are mostly set by then. Finally, the third measurement point took place at the beginning of eleventh grade, with the transition from 10th to 11th grade typically involving a rearrangement of class compositions at German schools. Thus, students could still be occupied with adjusting to a new class that comes along with new peers and teachers. Such contextual changes might influence students' striving toward perfection or excellence, possibly due to changing reference groups or a perceived change of teachers' grading standards.

Striving Toward Perfection vs. Excellence Neither Predict Psychosocial Maladjustment nor are Associations Mediated by Perfectionistic Concerns

Building on the idea that striving toward perfection and striving toward excellence should relate differently to psychosocial (mal)adjustment when their shared variance is taken into account (Blasberg et al., 2016; Gaudreau et al., 2023; Osenk et al., 2020), we investigated their longitudinal associations with procrastination, loneliness, and depressive symptoms. Contrary to our preregistered hypotheses, we did not find any evidence of predictive effects from striving toward perfection vs. excellence on psychosocial maladjustment in adolescence. Also, we did not find that perfectionistic concerns mediated effects between striving toward perfection and psychosocial maladjustment. In the following, we discuss theoretical and methodological explanations for the absence of the anticipated result pattern in our sample while reflecting on the limitations of the present study.

Theoretical Explanations for the Absence of Expected

From a theoretical perspective, a strong interpretation of the overall absence of predictive effects on psychosocial maladjustment can suggest that (changes in) striving toward perfection or excellence are irrelevant for (changes in) procrastination, loneliness, and depressive symptoms in adolescence. However, this interpretation contradicts theoretical notions (Gaudreau, 2019, 2021) and empirical results from cross-sectional (Gaudreau et al., 2022, Study II; Goulet-Pelletier et al., 2022; Schellenberg et al., 2025; Tape et al., 2024) and longitudinal studies in adult samples (Gaudreau et al., 2022, Studies 4 and 5). One reason for the absence of predictive effects in our study might be the existence of counteracting processes between striving toward perfection and psychosocial maladjustment. Whereas some aspects of striving toward perfection might contribute to psychosocial maladjustment across different life domains, others could dampen these associations, illustrating why perfectionism has previously been labeled a “double-edged sword” (Stoeber, 2014). On the one hand, high levels of striving toward perfection can foster a strong sense of discipline, motivating adolescents to meticulously plan and prioritize their tasks. This behavior may provide a sense of purpose and achievement, potentially promoting their adjustment in certain domains. On the other hand, the same high standards may lead to excessive self-criticism, fear of failure, and difficulty in coping with setbacks, which can contribute to feelings of stress and inadequacy. Similarly, while striving toward perfection in social relationships might encourage adolescents to be attentive and supportive, it could also heighten anxiety about meeting others' expectations or lead to overextending themselves, ultimately straining the quality of social relationships or adolescents’ mental health. These opposing processes may neutralize each other, explaining the lack of clear predictive effects in the current study.

Second, we cannot rule out the effects of other relevant but unmeasured moderator variables that might have had an influence on the investigated associations. Self-compassion (i.e., responding to one's difficulties or general suffering with empathy and kindness), for example, has recently been found to buffer associations between striving toward perfection and psychological distress (With et al., 2024). Along these lines, students who strive toward perfection beyond excellence might, for example, engage more strongly in other compensatory behaviors, such as seeking social validation or engaging in structured routines that might mitigate psychosocial maladjustment to some extent.

Third, whereas the existence of potential counteracting or buffering processes can explain the absence of predictive effects from striving toward perfection on procrastination, loneliness, and depressive symptoms in our study, they do not explain the lack of effects for striving toward excellence. Alternatively, rather than counteracting psychosocial maladjustment, striving toward excellence might foster psychosocial adjustment and, therefore, relate more strongly with positive indicators of psychosocial adjustment, such as higher grades, school satisfaction, social inclusion, or positive affect.

Finally, regarding the investigation of perfectionistic concerns as a mediator, we treated them as a general indicator of perfectionistic signature expressions that might link striving toward perfection and the three different indicators of psychosocial maladjustment (i.e., procrastination, loneliness, and depressive symptoms) but found no evidence for a partial or full mediation. We did so based on the large body of research that showed predictive effects of perfectionistic concerns on our three respective outcome variables (Lunn et al., 2023; Magson et al., 2019; Sirois et al., 2017; Smith et al., 2020). However, one might argue for the inclusion of different, more outcome-specific perfectionistic signature expressions. The MEP introduces three types of perfectionistic signatures expressions—cognitive, socio-cognitive, and socio-behavioral (Gaudreau, 2019)—that might be related to our outcomes in different ways. For instance, cognitive signature expressions like "all-or-nothing" thinking or rumination might be more closely related to procrastination and depressive symptoms. Socio-cognitive or socio-behavioral signature expressions like socially-prescribed perfectionism (i.e., the belief that others expect one to be perfect) or perfectionistic self-representation, by contrast, might be closer related to different facets of loneliness.

A major challenge for future research will be the differentiation of theoretical assumptions and psychological processes that allow for a clear delineation of specific mediators and outcomes to further our understanding of strivings toward perfection and excellence across adolescence.

Methodological Explanations for the Absence of Expected Effects

From a methodological perspective, a first important study characteristic to consider is the temporal design of the study, including both the interval length between assessments and the total time span covered. Choosing the optimal time lag in panel studies keeps being a debated topic in longitudinal research as the strength of cross-lagged effects varies across time (Bien et al., 2024; Dormann & Griffin, 2015; Hopwood et al., 2022; Kuiper & Ryan, 2018; Luhmann et al., 2014). In this study, we were constrained by pragmatic reasons (i.e., the schools' capacities) to ensure that students could participate at similar points in time. However, it is possible that longer measurement intervals are needed to detect effects between striving toward perfection versus excellence and psychosocial maladjustment. For instance, striving toward perfection may only contribute to higher levels of procrastination, loneliness, and depressive symptoms in the long run. Alternatively, striving toward perfection could also lead to short-term benefits that diminish over time, as the energy and effort required to pursue perfectionistic goals may not be sustainable over an extended period of time. To investigate such temporal dynamics, one might need a measurement-burst design that combines several short-term (e.g., shorter daily measures) across longer-term intervals that span the period of a whole school year. Beyond interval length, the total time span of the study may also play a crucial role in capturing the full developmental effects of striving toward perfection. While shorter intervals generally increase construct stability and reduce cross-lagged effects, a longer overall time span (e.g., exceeding one year) may be particularly relevant for detecting the total effects of striving toward perfection on psychosocial maladjustment. Additionally, a larger number of repeated assessments could improve the estimation of within-person processes in (RI-)CLPMs by enhancing the reliability of variance decomposition. Future research should consider both the number of measurement occasions and the total observation period when designing longitudinal studies to ensure robust estimation of within- and between-person effects.

Second, we were restricted to test linear trajectories in the LGCMs due to having only three measurement points (McArdle, 2009). This prevented us from examining more complex developmental patterns (e.g., quadratic or cubic) that might characterize striving toward perfection or excellence across the school year. The latter also applies for the CLMPs, independent of the number of measurement points.

Third, compared to the only other existing longitudinal studies on the MEP from Gaudreau et al., (2022, Studies 4 and 5), we applied a comparably strict criterion for the identification of predictive effects as we simultaneously controlled for all auto-regressive effects and for potential reciprocal effects between constructs. While this does not necessarily

lead to smaller effect sizes, it adds complexity and might also slightly alter the interpretation of effects, calling for larger samples to be able to estimate cross-lagged effects with less uncertainty.

Finally, a relatively high amount of longitudinal dropout occurred due to principals' decisions and software constraints. This attrition reduced the power of our initially large sample to detect effects against chance. The pattern of missing data resulted in limited overlap between participants across different time points, which likely created additional challenges for estimating more flexible models, such as the (RI-)CLPM. Although we employed state-of-the-art procedures to handle missing data—using FIML with auxiliary variables and multiple imputation—parameter estimates still had wide confidence intervals, indicating a high degree of uncertainty, particularly for the cross-lagged effects in models addressing our second and third research questions. Future studies should aim for strategies that minimize dropout and ensure better overlap across measurement occasions to improve model robustness.

Outlook and Future Research

The present, pre-registered study posits the first attempt to investigate the MEP from a longitudinal perspective in adolescence. However, future longitudinal studies on the application of the MEP in adolescents should address both methodological and conceptual challenges to advance the field. In the following, we want to emphasize three signature characteristics that have been particularly challenging for the current research: A first critical issue is ensuring sufficient sample sizes in school-based research, as participation constraints can limit statistical power and the generalizability of findings. It is crucial to communicate the value of longitudinal research to schools, emphasizing how such studies can inform educational and developmental practices. In our study, despite efforts to recruit a diverse sample by reaching out to over 150 secondary schools, only 12 schools participated, with many citing time constraints as the primary barrier. To enhance participation in future studies, researchers might integrate data collection into existing curricula (e.g., psychology classes), simplify protocols, or engage teachers as advocates to facilitate recruitment and retention. While these practical strategies address feasibility, they also open the door to more intensive research designs, such as daily diary studies or ecological momentary assessments, which could capture short-term fluctuations in striving toward perfection and its effects.

Second, future research must navigate the challenge of conducting school-based data collection within the legal and ethical restrictions set by local school authorities, such as the prohibition of monetary or material incentives for participants. Following the guidelines of the Local School Authority, we were not allowed to provide monetary or other incentives for the

adolescent participants in the present study (i.e., neither at the individual nor at the class- or school-level). While it is crucial to adhere to these regulations and to uphold the principle of voluntary participation, particularly when working with underaged individuals, researchers also highlight the importance of acknowledging the time and effort invested by young participants (Afkinich & Blachman-Demner, 2020; Crane & Broome, 2017). Evidence suggests that recognizing participants' contributions, whether through non-monetary means or other ethically sound approaches, can enhance engagement and data quality (Oh et al., 2021). Balancing these requirements with innovative strategies to foster participation will be essential for future studies seeking to work effectively within school environments. Future research should explore creative, law-compliant strategies to enhance school and student participation in longitudinal studies. For example, gamifying certain aspects of the study could make participation more engaging and enjoyable for students. Furthermore, research ambassadors—students or teachers who champion the study—might help build trust and enthusiasm within schools.

Third, another important avenue for future research is further expanding the sample beyond German-speaking adolescents. While the present study contributes to addressing the often-cited need for more diverse, non-English-speaking samples (Smith et al., 2022), cultural differences in perfectionistic striving and its consequences remain underexplored. Investigating these dynamics across different cultural and educational contexts would help determine whether the observed associations generalize beyond the current study population.

Conclusion

The present study showed medium-sized stabilities in adolescents rank-orders of striving toward perfection and excellence and small decreases of mean-levels in both constructs from the middle of 10th grade to the beginning of 11th grade. Our findings emphasize that the conceptual and developmental distinctiveness between perfectionism and excellencism already emerge in adolescence but is still smaller as compared to young adults. Our study further hints on the importance of study-related behaviors (i.e., procrastination) for the development of striving toward perfection and excellence. In our sample, neither striving toward perfection nor striving toward excellence predicted psychosocial maladjustment in the academic, social, or health domain, and no mediating effects of perfectionistic concerns were found. In sum, future studies are needed to further investigate potential differential effects of striving toward perfection and striving toward excellence on psychosocial (mal)adjustment in adolescence using larger adolescent populations.

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Supplemental Material Study III

Table OS1

Deviations From The Pre-Registration

Pre-Registered Plan	Deviation	Reasons for Deviation
We pre-registered to handle missing data with multiple imputation (MI). We planned to perform MI at the item-level. In the event of convergence, we pre-registered	We handled missing data by applying the Full Information Maximum Likelihood Approach (FIML; Arbuckle, 1996). We now report results derived from multiply imputed data at the item-level as robustness checks in the OSM.	For the presentation of the results, we focus on FIML, because the MI procedure was extremely slow to converge and required the item-level data to be aggregated into scale scores at each imputation step. The results obtained with MI are provided in the online supplemental materials
We pre-registered to assess loneliness as a global construct with four items as manifest indicators.	We decided to differentiate between emotional and social loneliness. Each subfactor is measured with two items.	We could not establish longitudinal measurement invariance for a global loneliness construct. The differentiation between emotional and social loneliness is in line with a widely accepted conceptualization proposed by Weiss (1975) and has been supported by different empirical works (e.g., Buecker et al., 2020; Green et al., 2001; Salo et al., 2020; Soest et al., 2020).

Table OS2

Longitudinal Measurement Invariance Across Study Variables Based on "Uncleaned" Sample

Model	χ^2	*df*	CFI	ΔCFI	RMSEA	ΔRMSEA	SRMR	ΔSRMR
					Striving Toward Perfection			
Configural	100.705**	39	.986		.065		.026	
Metric	111.098**	45	.984	-.002	.065	.000	.030	.004
Scalar	122.099	51	.984	.000	.062	.003	.031	.001
					Striving Toward Excellence			
Configural	90.375**	39	.992		.047		.028	
Metric	95.178**	45	.993	.001	.041	-.006	.030	.002
Scalar	112.214**	51	.991	-.002	.046	.005	.031	.001
					Procrastination			
Configural	25.693*	15	.996		.042		.035	
Metric	31.090*	19	.995	-.001	.042	.000	.028	-.007
Scalar	32.114	23	.996	.001	.033	-.009	.028	.000
					Emotional Loneliness			
Configural	3.569	4	.999		.025		.014	
Metric	14.800	7	.991	-.008	.050	.025	.024	.010
Scalar	14.876	9	.994	.003	.036	-.014	.024	.000
					Social Loneliness			
Configural	9.356	4	.995		.061		.034	
Metric	23.617	7	.998	.003	.031	-.030	.015	-.019
Scalar	27.808	9	.996	-.002	.037	.006	.017	.002
					Depression			
Configural	51.086	39	.998		.021		.030	
Metric	61.741*	45	.997	-.001	.022	.001	.036	.006
Scalar	73.460*	51	.995	-.002	.026	.004	.037	.001
					Perfectionistic Concerns			
Configural	11.949	15	1.00		.000		.016	
Metric	12.843	19	1.00	.000	.000	.000	.016	.000
Scalar	30.259	23	1.00	.000	.000	.000	.020	.004

Note. CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual.

Table OS3

Longitudinal Measurement Invariance Across all Study Variables Based on 100 Multiply Imputed Samples

Model	χ^2	*df*	CFI	ΔCFI	RMSEA	ΔRMSEA	SRMR	ΔSRMR
	Striving Toward Perfection							
Configural	46.872	39	.999		.010		.062	
Metric	53.305	45	.999	.000	.011	.001	.063	.001
Scalar	59.579	51	.998	-.001	.011	.000	.061	.002
	Striving Toward Excellence							
Configural	54.274	39	.997		.016		.057	
Metric	54.986	45	.999	.002	.008	-.008	.054	-.003
Scalar	70.053	51	.996	-.003	.016	.008	.051	-.003
	Procrastination							
Configural	4.214	15	1.00		.000		.035	
Metric	8.396	19	1.00	.000	.000	.000	.037	.002
Scalar	9.211	23	1.00	.000	.000	.000	.037	.000
	Emotional Loneliness							
Metric	10.398	7	.991		.022		.066	
Scalar	10.639	9	.996	.007	.013	-.009	.060	-.006
	Social Loneliness							
Metric	14.566	7	.975		.043		.046	
Scalar	18.165	9	.972		.040	-.003	.047	.001
	Depression							
Configural	21.211	39	1.00		.000		.052	
Metric	29.067	45	1.00	.000	.000	.000	.053	.001
Scalar	45.681	51	1.00	.000	.000	.000	.055	.002
	Perfectionistic Concerns							
Configural	8.954	15	1.00		.000		.028	
Metric	9.678	19	1.00	.000	.000	.000	.027	-.001
Scalar	21.500	23	1.00	.000	.000	.000	.031	.004

Note. CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual.

Table OS4

Parameter Estimates From the Univariate Latent Growth-Curve Models with School Type and Gender as Time-Invariant Covariates

	Intercept				Slope				school type→intercept		school type→Slope		gender→intercept		gender→slope	
	*M*I	*p*	σ^2_I	*p*	*M*S	*p*	σ^2_S	*p*	β_{school_I}	*p*	β_{school_S}	*p*	β_{gender_I}	*p*	β_{gender_S}	*p*
Per	**4.97**	< .001	**1.16**	< .001	**-0.20**	.008	**0.29**	< .001	**-.32**	.002	.06	.479	.15	.128	.01	.954
Exc	**5.55**	< .001	**0.61**	< .001	**-0.17**	< .001	**0.19**	.009	-.03	.668	.09	.163	.08	.238	.03	.563

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, I = intercept, S = slope. School type is coded as 0 = comprehensive school track and 1 = academic school track. Gender is coded as 0 = boys and 1 = girls. Model fit for Model with Striving Toward Perfection: χ^2 = 151.215; *df* = 73, CFI = .988; RMSEA = .046; SRMR = .032. Model fit for Model with Striving Toward Excellence: χ^2 = 177.459; *df* = 73; CFI = .974; RMSEA = .064; SRMR = .043. Bold font indicates statistical significance at $p < .01$.

Table OS5

Parameter Estimates From the Univariate Latent Growth-Curve Models based on the "Uncleaned" Sample

	Intercept				Slope				Model Fit				
	*M*I	*p*	σ^2_I	*p*	*M*S	*p*	σ^2_S	*p*	χ^2	*df*	CFI	RMSEA	SRMR
Per	**4.85**	< .001	**1.39**	< .001	**-0.17**	< .001	**0.36**	< .001	132.398	53	.980	.068	.040
Exc	**5.51**	< .001	**0.76**	< .001	**- 0.10**	.002	**0.23**	.001	126.008	53	.986	.055	.042

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, I = intercept, S = slope.

Table OS6

Parameter Estimates From the Univariate Latent Growth-Curve Models based on 100 Multiply Imputed Sample

	Initial status				Change				Model Fit				
	*M*I	*p*	σ^2_I	*p*	*M*S	*p*	σ^2_S	*p*	χ^2	*df*	CFI	RMSEA	SRMR
Per	**4.74**	< .001	**1.60**	< .001	-0.06	.154	**0.45**	< .001	64.858	53	.997	.014	.064
Exc	**5.39**	< .001	**1.15**	< .001	0.04	.338	**0.35**	< .001	74.568	53	.996	.018	.049

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, I = intercept, S = slope.

Table OS7

Standardized Parameter Estimates From the CLPM with Procrastination with School Type and Gender as Time-Invariant Covariates

	Estimate	*p*	99% CI
Stability Effects			
Per1→Per2	**.58**	< .001	[.40; .77]
Per2→Per3	**.70**	< .001	[.45; .95]
Exc1→Exc2	**.49**	< .001	[.20; .78]
Exc2→Exc3	**.69**	< .001	[.46; .92]
Pro1→Pro2	**.73**	< .001	[.61; .84]
Pro2→Pro3	**.72**	< .001	[.58; .87]
Cross-Effects (Lag 1)			
Per1→Pro2	.10	.227	[-.11; .31]
Per2→Pro3	-.04	.714	[-.34; .25]
Pro1→Per2	**-.18**	.001	[-.32; -.04]
Pro2→Per3	.02	.827	[-.22; .26]
Exc1→Pro1	-.17	.064	[-.41; .07]
Exc2→Pro3	.13	.339	[-.22; .48]
Pro1→Exc2	-.14	.016	[-.29; .01]
Pro2→Exc3	-.14	.204	[-.41; .14]
Per1→Exc2	.13	.249	[-.16; .41]
Per2→Exc3	-.04	.791	[-.39; .32]
Exc1→Per2	.06	.474	[-.15; .26]
Exc2→Per3	-.02	.865	[-.34; .30]
Cross-Effects (Lag 2)			
Per1→Pro3	.03	.813	[-.29; .35]
Pro1→Per3	-.06	.570	[-.31; .20]
Exc1→Pro3	-.26	.088	[-.65; .13]
Pro1→Exc3	.17	.144	[-.13; .47]
Per1→Exc3	.17	.192	[-.16; .49]
Exc1→Per3	.15	.166	[-.13; .43]

Model Fit				
χ^2	*df*	CFI	RMSEA	SRMR
1061.923	521	.964	.048	.046

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, Pro = Procrastination; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS8

Standardized Parameter Estimates From the CLPM with Emotional Loneliness with School Type and Gender as Time-Invariant Covariates

	Estimate	*p*	99% CI
Stability Effects			
Per1→Per2	**.61**	< .001	[.43; .79]
Per2→Per3	**.65**	< .001	[.39; .90]
Exc1→Exc2	**.47**	< .001	[.20; .74]
Exc2→Exc3	**.70**	< .001	[.46; .93]
EL1→EL2	**.76**	< .001	[.52; .99]
EL2→EL3	**.78**	< .001	[.57; .98]
Cross-Effects (Lag 1)			
Per1→EL2	-.02	.880	[-.32; .28]
Per2→EL3	-.20	.171	[-.58; .18]
EL1→Per2	.09	.175	[-.08; .27]
EL2→Per3	.10	.483	[-.28; .49]
Exc1→EL1	.04	.749	[-.29; .37]
Exc2→EL3	.01	.962	[-.41; .43]
EL1→Exc2	-.02	.823	[-.20; .17]
EL2→Exc3	.21	.309	[-.32; .75]
Per1→Exc2	.15	.157	[-.12; .41]
Per2→Exc3	-.04	.751	[-.34; .26]
Exc1→Per2	.01	.932	[-.19; .20]
Exc2→Per3	-.04	.757	[-.38; .30]
Cross-Effects (Lag 2)			
Per1→EL3	.19	.221	[-.21; .59]
EL1→Per3	-.09	.572	[-.48; .31]
Exc1→EL3	-.17	.330	[-.62; .28]
EL1→Exc3	-.18	.429	[-.75; .40]
Per1→Exc3	.10	.381	[-.19; .38]
Exc1→Per3	.14	.226	[-.16; .44]

Model Fit				
χ^2	*df*	CFI	RMSEA	SRMR
983.867**	425	.969	.045	.042

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, EL = Emotional Loneliness; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS9

Standardized Parameter Estimates From the CLPM with Social Loneliness with School Type and Gender as Time-Invariant Covariates

	Estimate	*p*	99% CI
Stability Effects			
Per1→Per2	**.59**	< .001	[.40; .78]
Per2→Per3	**.70**	< .001	[.44; .96]
Exc1→Exc2	**.48**	< .001	[.20; .76]
Exc2→Exc3	**.70**	< .001	[.46; .94]
SL1→SL2	**.47**	< .001	[.25; .69]
SL2→SL3	**.85**	< .001	[.65; 1.06]
Cross-Effects (Lag 1)			
Per1→SL2	.09	.361	[-.16; .33]
Per2→SL3	-.18	.167	[-.53; .16]
SL1→Per2	-.03	.672	[-.18; .13]
SL2→Per3	-.00	.969	[-.23; .22]
Exc1→SL1	-.03	.751	[-.32; .25]
Exc2→SL3	.31	.040	[-.08; .69]
SL1→Exc2	-.12	.114	[-.31; .07]
SL2→Exc3	.01	.910	[-.21; .23]
Per1→Exc2	.15	.144	[-.12; .42]
Per2→Exc3	-.05	.700	[-.41; .30]
Exc1→Per2	.06	.498	[-.16; .27]
Exc2→Per3	-.01	.916	[-.38; .35]
Cross-Effects (Lag 2)			
Per1→SL3	.10	.460	[-.24; .43]
SL1→Per3	.01	.887	[-.22; .24]
Exc1→SL3	-.16	.267	[-.54; .22]
SL1→Exc3	.04	.701	[-.21; .28]
Per1→Exc3	.15	.249	[-.19; .50]
Exc1→Per3	.15	.200	[-.15; .46]

Model Fit

χ^2	*df*	CFI	RMSEA	SRMR
914.549**	425	.979	.038	.044

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, SL = Social Loneliness; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS10

Standardized Parameter Estimates From the CLPM with Depression with School Type and Gender as Time-Invariant Covariates

	Estimate	*p*	99% CI
Stability Effects			
Per1→Per2	**.60**	< .001	[.39; .80]
Per2→Per3	**.71**	< .001	[.46; .95]
Exc1→Exc2	**.50**	< .001	[.22; .78]
Exc2→Exc3	**.71**	< .001	[.50; .93]
DP1→DP2	**.72**	< .001	[.56; .88]
DP2→DP3	**.76**	< .001	[.64; .87]
Cross-Effects (Lag 1)			
Per1→DP2	-.16	.112	[-.42; .10]
Per2→DP3	-.02	.893	[-.39; .35]
DP1→Per2	-.05	.538	[-.25; .15]
DP2→Per3	-.18	.034	[-.39; .04]
Exc1→DP1	.21	.051	[-.07; .49]
Exc2→DP3	.09	.528	[-.29; .47]
DP1→Exc2	.03	.722	[-.18; .24]
DP2→Exc3	-.18	.136	[-.49; .13]
Per1→Exc2	.12	.279	[-.16; .40]
Per2→Exc3	-.08	.535	[-.40; .25]
Exc1→Per2	.06	.516	[-.17; .28]
Exc2→Per3	-.01	.923	[-.34; .31]
Cross-Effects (Lag 2)			
Per1→DP3	.34	.028	[-.06; .74]
DP1→Per3	.14	.149	[-.11; .39]
Exc1→DP3	-.37	.032	[-.82; .07]
DP1→Exc3	.02	.897	[-.29; .32]
Per1→Exc3	.20	.096	[-.11; .51]
Exc1→Per3	.16	.129	[-.11; .43]

Model Fit				
χ^2	*df*	CFI	RMSEA	SRMR
1042.150	521	.977	.036	.045

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, Dp = Depression; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS11

Standardized Parameter Estimates From the CLPM with Procrastination Based on the "Uncleaned" Sample

	Estimate	*p*	99% CI
Stability Effects			
Per1→Per2	**.61**	< .001	[.44; .79]
Per2→Per3	**.63**	< .001	[.38; .88]
Exc1→Exc2	**.47**	< .001	[.18; .75]
Exc2→Exc3	**.69**	< .001	[.47; .92]
Pro1→Pro2	**.67**	< .001	[.55; .79]
Pro2→Pro3	**.71**	< .001	[.57; .85]
Cross-Effects (Lag 1)			
Per1→Pro2	.10	.240	[-.11; .30]
Per2→Pro3	-.03	.785	[-.30; .25]
Pro1→Per2	**-.20**	< .001	[-.33; -.08]
Pro2→Per3	.01	.899	[-.20; .22]
Exc1→Pro1	-.13	.140	[-.37; .10]
Exc2→Pro3	.01	.949	[-.35; .37]
Pro1→Exc2	-.09	.105	[-.25; .06]
Pro2→Exc3	.01	.947	[-.26; .28]
Per1→Exc2	.14	.186	[-.13; .42]
Per2→Exc3	-.05	.665	[-.34; .24]
Exc1→Per2	.00	.954	[-.19; .20]
Exc2→Per3	-.03	.804	[-.34; .28]
Cross-Effects (Lag 2)			
Per1→Pro3	-.06	.620	[-.36; .24]
Pro1→Per3	-.07	.418	[-.29; .15]
Exc1→Pro3	-.09	.576	[-.48; .31]
Pro1→Exc3	-.01	.921	[-.32; .30]
Per1→Exc3	.11	.333	[-.18; .40]
Exc1→Per3	.14	.202	[-.14; .43]

Model Fit				
χ^2	*df*	CFI	RMSEA	SRMR
1007.117**	461	.969	.047	.045

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, Pro = Procrastination; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS12

Standardized Parameter Estimates From the CLPM with Emotional Loneliness Based on the "Uncleaned" Sample

	Estimate	*p*	99% CI
Stability Effects			
Per1→Per2	**.60**	< .001	[.42; .79]
Per2→Per3	**.64**	< .001	[.39; .90]
Exc1→Exc2	**.46**	< .001	[.18; .74]
Exc2→Exc3	**.70**	< .001	[.46; .95]
EL1→EL2	**.75**	< .001	[.52; .97]
EL2→EL3	**.77**	< .001	[.57; .98]
Cross-Effects (Lag 1)			
Per1→EL2	.00	.990	[-.30; .30]
Per2→EL3	-.20	.170	[-.56; .17]
EL1→Per2	.09	.201	[-.09; .27]
EL2→Per3	.11	.440	[-.26; .49]
Exc1→EL1	.03	.831	[-.30; .36]
Exc2→EL3	.01	.959	[-.39; .41]
EL1→Exc2	-.01	.928	[-.20; .18]
EL2→Exc3	.20	.332	[-.33; .73]
Per1→Exc2	.15	.153	[-.12; .43]
Per2→Exc3	-.05	.673	[-.34; .25]
Exc1→Per2	.02	.846	[-.19; .22]
Exc2→Per3	-.04	.776	[-.38; .30]
Cross-Effects (Lag 2)			
Per1→EL3	.21	.163	[-.18; .60]
EL1→Per3	-.09	.546	[-.47; .29]
Exc1→EL3	-.21	.213	[-.63; .22]
EL1→Exc3	-.15	.490	[-.70; .41]
Per1→Exc3	.10	.358	[-.18; .38]
Exc1→Per3	.14	.221	[-.15; .43]

Model Fit				
χ^2	df	CFI	RMSEA	SRMR
856.022**	371	.971	.046	.041

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, EL = Emotional Loneliness; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS13

Standardized Parameter Estimates From the CLPM with Social Loneliness Based on the "Uncleaned" Sample

	Estimate	*p*	99% CI
Stability Effects			
Per1→Per2	**.62**	< .001	[.44; .80]
Per2→Per3	**.65**	< .001	[.40; .90]
Exc1→Exc2	**.45**	< .001	[.18; .73]
Exc2→Exc3	**.69**	< .001	[.45; .94]
SL1→SL2	**.45**	< .001	[.25; .65]
SL2→SL3	**.89**	< .001	[.67; 1.10]
Cross-Effects (Lag 1)			
Per1→SL2	.07	.445	[-.18; .33]
Per2→SL3	-.11	.368	[-.42; .20]
SL1→Per2	.01	.847	[-.14; .16]
SL2→Per3	.02	.803	[-.19; .24]
Exc1→SL1	-.07	.539	[-.35; .21]
Exc2→SL3	.20	.162	[-.17; .58]
SL1→Exc2	-.07	.303	[-.24; .10]
SL2→Exc3	.04	.591	[-.16; .24]
Per1→Exc2	.16	.126	[-.11; .43]
Per2→Exc3	-.04	.706	[-.33; .25]
Exc1→Per2	.00	.966	[-.20; .21]
Exc2→Per3	-.05	.741	[-.40; .31]
Cross-Effects (Lag 2)			
Per1→SL3	.05	.679	[-.28; .39]
SL1→Per3	-.03	.718	[-.23; .17]
Exc1→SL3	-.14	.343	[-.52; .24]
SL1→Exc3	-.04	.604	[-.26; .17]
Per1→Exc3	.11	.323	[-.18; .40]
Exc1→Per3	.15	.206	[-.15; .45]

Model Fit				
χ^2	*df*	CFI	RMSEA	SRMR
869.916**	371	.971	.047	.042

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, SL = Social Loneliness; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS14

Standardized Parameter Estimates From the CLPM with Depression Based on the "Uncleaned" Sample

	Estimate	*p*	99% CI
Stability Effects			
Per1→Per2	**.64**	< .001	[.46; .82]
Per2→Per3	**.65**	< .001	[.41; .89]
Exc1→Exc2	**.47**	< .001	[.20; .75]
Exc2→Exc3	**.70**	< .001	[.46; .93]
DP1→DP2	**.60**	< .001	[.42; .78]
DP2→DP3	**.74**	< .001	[.59; .88]
Cross-Effects (Lag 1)			
Per1→DP2	-.08	.460	[-.35; .19]
Per2→DP3	-.11	.415	[-.47; .24]
DP1→Per2	-.06	.367	[-.24; .12]
DP2→Per3	-.10	.211	[-.31; .11]
Exc1→DP1	.10	.379	[-.20; .40]
Exc2→DP3	.21	.166	[-.18; .61]
DP1→Exc2	.06	.421	[-.12; .24]
DP2→Exc3	-.13	.194	[-.40; .13]
Per1→Exc2	.12	.257	[-.16; .40]
Per2→Exc3	-.07	.497	[-.34; .20]
Exc1→Per2	-.00	.978	[-.21; .20]
Exc2→Per3	-.04	.719	[-.36; .27]
Cross-Effects (Lag 2)			
Per1→DP3	.29	.068	[-.12; .70]
DP1→Per3	.06	.500	[-.18; .30]
Exc1→DP3	-.39	.023	[-.84; .05]
DP1→Exc3	-.06	.547	[-.31; .19]
Per1→Exc3	.15	.153	[-.12; .43]
Exc1→Per3	.15	.180	[-.14; .43]

Model Fit				
χ^2	*df*	CFI	RMSEA	SRMR
965.353**	461	.969	.045	.043

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, Dp = Depression; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS15

Standardized Parameter Estimates From the CLPM with Procrastination Based on the Multiply Imputed Sample

	Estimate	*p*	99% CI
Stability Effects			
Per1→Per2	**.56**	< .001	[.34; .78]
Per2→Per3	**.62**	< .001	[.41; .83]
Exc1→Exc2	**.39**	< .001	[.15; .64]
Exc2→Exc3	**.54**	< .001	[.31; .76]
Pro1→Pro2	**.66**	< .001	[.56; .77]
Pro2→Pro3	**.68**	< .001	[.58; .79]
Cross-Effects (Lag 1)			
Per1→Pro2	.06	.496	[-.16; .27]
Per2→Pro3	-.02	.838	[-.26; .22]
Pro1→Per2	**-.20**	< .001	[-.34; -.06]
Pro2→Per3	-.06	.422	[-.25; .13]
Exc1→Pro1	-.10	.257	[-.32; .12]
Exc2→Pro3	.08	.376	[-.15; .31]
Pro1→Exc2	**-.13**	.023	[-.27; .02]
Pro2→Exc3	.00	.998	[-.20; .20]
Per1→Exc2	.13	.169	[-.11; .37]
Per2→Exc3	-.05	.634	[-.29; .20]
Exc1→Per2	-.05	.600	[-.29; .19]
Exc2→Per3	-.09	.335	[-.33; .15]
Cross-Effects (Lag 2)			
Per1→Pro3	-.00	.968	[-.24; .24]
Pro1→Per3	.01	.939	[-.19; .20]
Exc1→Pro3	-.10	.279	[-.34; .14]
Pro1→Exc3	-.02	.807	[-.22; .18]
Per1→Exc3	.10	.186	[-.09; .29]
Exc1→Per3	.11	.079	[-.05; .27]

Model Fit

χ^2	*df*	CFI	RMSEA	SRMR
403.438	461	1.00	.000	.052

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, Pro = Procrastination; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS16

Standardized Parameter Estimates From the CLPM with Emotional Loneliness Based on the Multiply Imputed Sample

	Estimate	*p*	99% CI
Stability Effects			
Per1→Per2	**.57**	.006	[.04; 1.10]
Per2→Per3	**.65**	.004	[.06; 1.24]
Exc1→Exc2	.38	.082	[-.18; .94]
Exc2→Exc3	.53	.012	[-.01; 1.07]
EL1→EL2	**.73**	< .001	[.27; 1.20]
EL2→EL3	**.83**	< .001	[.47; 1.19]
Cross-Effects (Lag 1)			
Per1→EL2	-.03	.919	[-.79; .73]
Per2→EL3	-.17	.512	[-.85; .51]
EL1→Per2	.04	.814	[-.36; .43]
EL2→Per3	-.09	.909	[-2.12; 1.94]
Exc1→EL1	.14	.626	[-.60; .88]
Exc2→EL3	.07	.785	[-.61; .75]
EL1→Exc2	-.04	.824	[-.45; .38]
EL2→Exc3	-.01	.976	[-1.00; .98]
Per1→Exc2	.15	.475	[-.40; .71]
Per2→Exc3	-.04	.869	[-.61; .54]
Exc1→Per2	-.05	.826	[-.61; .52]
Exc2→Per3	-.12	.685	[-.87; .63]
Cross-Effects (Lag 2)			
Per1→EL3	.18	.495	[-.50; .86]
EL1→Per3	.07	.928	[-1.83; 1.96]
Exc1→EL3	-.25	.336	[-.92; .42]
EL1→Exc3	-.02	.956	[-.98; .94]
Per1→Exc3	.11	.534	[-.34; .55]
Exc1→Per3	.13	.506	[-.37; .62]

Model Fit

χ^2	*df*	CFI	RMSEA	SRMR
336.619	371	1.00	.000	.052

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, EL = Emotional Loneliness; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS17

Standardized Parameter Estimates From the CLPM with Social Loneliness Based on the Multiply Imputed Sample

	Estimate	*p*	99% CI
Stability Effects			
Per1→Per2	**.58**	< .001	[.34; .81]
Per2→Per3	**.64**	< .001	[.42; .85]
Exc1→Exc2	**.38**	< .001	[.14; .63]
Exc2→Exc3	**.52**	< .001	[.28; .76]
SL1→SL2	**.41**	< .001	[.22; .59]
SL2→SL3	**.63**	< .001	[.44; .82]
Cross-Effects (Lag 1)			
Per1→SL2	-.04	.750	[-.33; .26]
Per2→SL3	.04	.499	[-.11; .18]
SL1→Per2	-.05	.512	[-.22; .13]
SL2→Per3	-.07	.492	[-.35; .20]
Exc1→SL1	.12	.334	[-.19; .43]
Exc2→SL3	-.04	.531	[-.19; .11]
SL1→Exc2	-.05	.516	[-.23; .14]
SL2→Exc3	.15	.113	[-.09; .39]
Per1→Exc2	-.04	.696	[-.29; .21]
Per2→Exc3	-.05	.593	[-.30; .20]
Exc1→Per2	-.11	.287	[-.37; .15]
Exc2→Per3			
Cross-Effects (Lag 2)			
Per1→SL3	.06	.614	[-.24; .36]
SL1→Per3	.03	.588	[-.13; .20]
Exc1→SL3	-.09	.412	[-.39; .20]
SL1→Exc3	.03	.610	[-.14; .20]
Per1→Exc3	.10	.163	[-.09; .30]
Exc1→Per3	.12	.063	[-.04; .28]

Model Fit				
χ^2	*df*	CFI	RMSEA	SRMR
353.266	371	1.00	.000	.051

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, SL = Social Loneliness; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS18

Standardized Parameter Estimates From the CLPM with Depression Based on the Multiply Imputed Sample

	Estimate	*p*	99% CI
Stability Effects			
Per1→Per2	**.59**	< .001	[.35; .83]
Per2→Per3	**.64**	< .001	[.43; .84]
Exc1→Exc2	**.39**	< .001	[.14; .64]
Exc2→Exc3	**.53**	< .001	[.30; .75]
DP1→DP2	**.63**	< .001	[.49; .77]
DP2→DP3	**.68**	< .001	[.55; .80]
Cross-Effects (Lag 1)			
Per1→DP2	-.02	.848	[-.27; .23]
Per2→DP3	-.07	.512	[-.33; .20]
DP1→Per2	-.03	.586	[-.19; .12]
DP2→Per3	-.11	.140	[-.31; .08]
Exc1→DP1	.01	.936	[-.24; .26]
Exc2→DP3	-.02	.832	[-.28; .24]
DP1→Exc2	-.01	.933	[-.17; .16]
DP2→Exc3	-.13	.102	[-.34; .08]
Per1→Exc2	.14	.135	[-.10; .39]
Per2→Exc3	-.03	.723	[-.28; .21]
Exc1→Per2	-.06	.515	[-.32; .19]
Exc2→Per3	-.10	.290	[-.34; .14]
Cross-Effects (Lag 2)			
Per1→DP3	.24	.031	[-.04; .51]
DP1→Per3	.08	.281	[-.12; .28]
Exc1→DP3	-.19	.070	[-.47; .08]
DP1→Exc3	.05	.518	[-.16; .26]
Per1→Exc3	.11	.160	[-.09; .30]
Exc1→Per3	.11	.071	[-.05; .27]

Model Fit

χ^2	*df*	CFI	RMSEA	SRMR
398.545	461	1.00	.000	.050

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, Dp = Depression; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS19

Standardized Estimates of Mediation Model for Procrastination With and Without Covariates

Effect		Without Covariates			With Covariates (school type and gender)		
		Beta	99% CI	*p*-value	Beta	99% CI	*p*-value
Direct Effect	PerT1→ProT3	-0.10	[-0.30; 0.09]	.169	-0.11	[-0.29; 0.08]	.139
Indirect Effect	(PerT1→PCT2) * (PCT2→ProT3)	0.01	[-0.03; 0.05]	.369	0.01	[-0.03; 0.06]	.401
Model Fit							
	χ^2		1493.563**			1752.268**	
	df		791			871	
	CFI		.961			.949	
	RMSEA		.045			.049	
	SRMR		.083			.106	

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, Pro = Procrastination; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS20

Standardized Estimates of Mediation Model for Emotional Loneliness With and Without Covariates

Effect		Without Covariates			With Covariate (school type and gender)		
		Beta	99% CI	*p*-value	Beta	99% CI	*p*-value
Direct Effect	PerT1→ELT3	0.22	[-0.02; 0.47]	.020	0.18	[-0.06; 0.42]	.056
Indirect Effect	(PerT1→PCT2) * (PCT2→ELT3)	-0.07	[-0.17; 0.02]	.049	-0.08	[-0.17; 0.02]	.039
Model Fit							
	χ^2		1285.884**			1510.006**	
	df		674			748	
	CFI		.968			.969	
	RMSEA		.041			.039	
	SRMR		.079			.100	

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, EL = Emotional Loneliness; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS21

Standardized Estimates of Mediation Model for Social Loneliness With and Without Covariates

Effect		Without Covariates			With Covariates (school type and gender)		
		Beta	99% CI	*p*-value	Beta	99% CI	*p*-value
Direct Effect	PerT1→SLT3	0.03	[-0.16; 0.22]	.683	.04	[-0.15; 0.23]	.559
Indirect Effect	(PerT1→PCT2) * (PCT2→SLT3)	0.00	[-0.03: 0.04]	.766	0.01	[-0.04; 0.05]	.321
Mode Fit							
	χ^2		1267.038**			1496.665**	
	df		674			748	
	CFI		.028			.961	
	RMSEA		.038			.043	
	SRMR		.077			.100	

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, SL = Social Loneliness; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

Table OS22

Standardized Estimates of Mediation Model for Depression With and Without Covariates

Effect		Without Covariates			With Covariates (school type and gender)		
		Beta	99%-CI	*p*-value	Beta	99%-CI	*p*-value
Direct Effect	PerT1→DpT3	0.11	[-0.09; 0.32]	.162	.034	[-0.15; 0.22]	.469
Indirect Effect	(PerT1→PCT2) * (PCT2→DpT3)	0.00	[-0.43; 0.42]	.995	.01	[-0.03; 0.04]	.545
Model Fit							
	χ^2		1392.054**			1602.671**	
	df		788			866	
	CFI		1.00			1.00	
	RMSEA		.000			.000	
	SRMR		.075			.075	

Note. Per = Striving Toward Perfection, Exc = Striving Toward Excellence, Dp = Depression; CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. The numbers (i.e., 1, 2, 3) indicate the measurement occasion. Bold font indicates statistical significance $p < .01$.

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5. General Discussion

The present dissertation aimed to broaden our understanding of adolescents' personalities, focusing on the (intertwined) developments of the Big Five, self-esteem, and perfectionism, as well as their associations with different indicators of psychosocial (mal)adjustment. It did so by posing three overarching research questions of which each was related to one developmental principle from lifespan psychology: (1) How can less established personality characteristics be embedded into the nomological network of other, more widely studied personality characteristics (multidimensionality)? (2) How do different personality characteristics develop on their own and in relation to each other (multidirectionality)? (3) How do adolescents' personality characteristics relate to different indicators of psychosocial (mal)adjustment (multifunctionality)? To answer these questions, I conducted three empirical studies: Study I lays the psychometric foundation to investigate striving toward perfection and striving toward excellence in German adolescents and situates the two characteristics in their respective nomological network of related personality characteristics. Study II uses a time-sensitive approach to investigate rank-order stabilities and dive into the developmental interplay between each Big Five trait with self-esteem. In addition, the study extends findings from adolescents' self-reported personality ratings by further taking a look at personality ratings that were obtained from other-reports. Finally, Study III takes a longitudinal perspective on striving toward perfection and excellence, investigating their stabilities and average developmental trajectories. It further broadens the construct space by looking at the respective interplays between striving toward perfection vs. excellence and different maladjustment indicators across central developmental task domains (i.e., social, academic, and mental health). In the following sections, I summarize the central findings from each study and discuss their theoretical, methodological, and practical implications. To conclude this chapter, I address the limitations that were encountered across the three studies and provide an outlook on future research in the field of personality and psychosocial (mal)adjustment in adolescence.

5.1. Central Findings

In line with the three overarching research questions of this dissertation, I first summarize and discuss the factorial structure and different positions of striving toward perfection and striving toward excellence in their nomological networks of associated personality characteristics. I then present the most important findings on the developments of the Big Five, self-esteem, and perfectionism, before turning to the developmental interplay between the Big Five and self-esteem. Finally, I reflect on cross-sectional and longitudinal

associations between different personality characteristics and indicators of psychosocial (mal)adjustment during adolescence.

5.1.1. Multidimensionality: Striving Toward Perfection and Excellence Are Distinguishable and Have Different Positions in the Nomological Networks

Study I investigated the multidimensional nature of personality by investigating (a) the conceptual distinctiveness and (b) the nomological network of striving toward perfectionism and excellence in a diverse sample of German 10th graders. Regarding (a) conceptual distinctiveness, Study I supported the two-factorial structure of striving toward perfection and striving toward excellence as proposed by the MEP (Gaudreau, 2019, 2021) and original clinical works (Adler, 1938; Hamachek, 1978). That is, despite their close empirical connection, they still emerged as two distinguishable latent factors. This finding aligns with research among Australian adolescents (Tape et al., 2024) and Canadian adult samples (Gaudreau et al., 2022, Study I). However, consistent with the findings from Tape et al. (2024), results from Study I indicated a significantly higher correlation between striving toward perfection and excellence in adolescents compared to adults (Gaudreau et al., 2022). This observation can be linked to the ongoing development of adolescents' self-concept that still appears to be less differentiated compared to later phases in life (Crone et al., 2022; Sebastian et al., 2008). Interestingly, Study I further pointed to higher levels of striving toward perfection among students from the comprehensive school track compared to students from the academic school track. One explanation may lie in the timing of Study I during 10th grade. For students in German comprehensive schools, exam results in 10th grade determine eligibility for continuing high school and further hold special importance for entering vocational training, potentially increasing academic pressure. In contrast, these exams carry less long-term impact for students in the academic track where the majority of students continues into 11th grade of high school.

Regarding (b) the nomological network, findings from Study I corroborate differential links with Big Five and self-esteem that have been observed in adult samples (Gaudreau et al., 2022, Study III). To illustrate, the two types of strivings were not only distinguishable on a conceptual level—as indicated by their loadings on separate latent factors in the confirmatory factor analysis—but also differed in their associative patterns with other personality characteristics in adolescence. Specifically, striving toward perfection beyond excellence was associated with higher levels of adolescents' neuroticism as well as lower levels of openness to experience and self-esteem. In contrast, striving toward excellence rather than perfection was associated with higher levels of adolescents' extraversion, agreeableness, conscientiousness, openness to experience, and self-esteem. Whereas most of these observed associations are

mirrored in Gaudreau et al.'s (2022) adult sample, some were unique to the adolescent sample in Study I. In line with previous research in adults (Gaudreau et al., 2022), striving toward perfection and striving toward excellence showed inverse associations with openness to experience. This finding further resonates with empirical results that point to lower achievements in creative thinking tasks among individuals that pursue perfection rather than excellence (Goulet-Pelletier et al., 2022). In contrast, the most noticeable difference was the inverse association pattern between striving toward perfection and striving toward excellence with self-esteem in adolescence: While there were no links with self-esteem in adults (Gaudreau et al., 2022), striving toward perfection and excellence showed the strongest associations with self-esteem out of all personality characteristics in Study I's adolescent sample. Together with the results on neuroticism, these findings point to adolescence as a potentially vulnerable phase for the predictive or co-occurring maladaptive effects of perfectionism (Flett et al., 1995). However, due to the cross-sectional nature of Study I, it remains unclear whether elevated striving toward perfection predicts lower levels of openness to experience, emotional stability, and self-esteem, precedes them, or only co-occurs with them.

Overall, the findings from Study I add nuance to previous meta-analytical results on the associations between perfectionism and other personality characteristics (Smith et al., 2019; Stricker, Buecker, et al., 2019). Further, the presented findings hint at potential age-differential associations between internalized performance standards and broader tendencies of thinking, feeling, and behaving, as well as the affective evaluation of the self.

5.1.2. Multidirectionality: Differential Stabilities and (Intertwined) Developments Across Personality Characteristics

Study II and III targeted different aspects of personality development in adolescence, focusing on either the Big Five and self-esteem or perfectionism, respectively. Together, they investigated the (multi)directionality of adolescents' personalities by looking at the developments of certain personality characteristics on their own and in relation to each other. The followingly presented findings are grouped into four broader sections.

First, both studies investigated rank-order stabilities, covering monthly to yearly intervals between assessments. Study II revealed that adolescents were rather stable in their relative ordering on the Big Five and self-esteem, with descriptively higher levels for the Big Five compared to self-esteem. This result pattern extends available findings from adult samples (Anusic & Schimmack, 2016; Fetvadjiev & He, 2019; Instinske & Kandler, 2024), suggesting that the Big Five might already be more stable than self-esteem in adolescence. One possible explanation for this could be that self-esteem is more malleable, as it is influenced more strongly

by ongoing self-evaluative processes, peer feedback, and identity formation during this time in life (Harter, 2012; Trzesniewski et al., 2003). In contrast, Study III showed comparable (moderately high) rank-order stabilities for both striving toward perfection and striving toward excellence over periods of three to nine months, complementing first longitudinal findings in adults (Gaudreau et al., 2022, Study 4).

Second, as the first empirical study to investigate mean-level changes of striving toward perfection and striving toward excellence, Study III showed that striving toward perfection and striving toward excellence decreased slightly across the period of an academic year. This aligns with previous findings that illustrate decreases in motivational and performance-related characteristics as adolescents get older (Eccles et al., 1993; Otis et al., 2005) as well as observable decreases across the academic year (Cohen et al., 2023; Corpus et al., 2009). However, adolescents in Study III differed significantly in their respective trajectories of striving toward perfection and striving toward excellence, pointing to interindividual differences in the development of self-related performance standards that do not necessarily adhere to a general downward trend.

Third, Study II broadened the picture by taking the developmental interplay between each Big Five trait with self-esteem into account. The findings demonstrated that within-person changes in all Big Five traits were predictive for self-esteem development. Specifically, increases in extraversion, agreeableness, and conscientiousness predicted subsequent increases in self-esteem, whereas increases in neuroticism, and self-esteem predicted subsequent decreases in self-esteem. Most of these effects peaked after a few weeks and faded after around six months. In turn, not all Big Five changes could be predicted by changes in self-esteem. Specifically, increases in self-esteem predicted subsequent increases in extraversion and openness to experiences as well as decreases in neuroticism, pointing to a reciprocal interplay between these three Big Five traits with self-esteem. All findings remained robust after taking school type and gender into account. As such, the findings from Study II extend and refine available results on the developmental interplay between the Big Five and self-esteem in adults (Fetvadjiev & He, 2019; Weidmann et al., 2018), illustrating a complex interplay between personality characteristics that appears reciprocal for some combinations of Big Five traits and self-esteem and more Big Five driven for others. This is further complemented by current insights from intervention research, showing that intervention-related changes in certain Big Five correlate with increases in people's self-esteem (Allemand et al., 2024). In light of these considerations, future research is needed to explore more specific experiences that might shed light on those processes that explain the interplays between Big Five and self-esteem

development in adolescence (e.g., the investment into new social roles; Roberts & Nickel, 2021; Roberts & Wood, 2006).

Finally, Study II also considered other-reports of adolescents' personality characteristics. Overall, most effects pointed in the same direction as the effects that were derived from self-reports (except for a positive effect from openness to experience on self-esteem in the other reports that was negative in the self-reports). As such, our findings extend previous insights that point to substantial overlaps between self- and other-reported personality characteristics in adolescents and adults (Kim et al., 2019). The most pronounced differences between self- and other-reports were observed for effects from changes in conscientiousness and openness to experience on subsequent changes in self-esteem. Specifically, the effects peaked later (i.e., after two to three months), lasted longer, and were overall stronger in other-reports compared to the respective effects derived from self-reports. Given that conscientiousness and openness to experience are of special interest for school-related experiences (Mammadov, 2022), one explanation for their pronounced effects may lie in their activation and higher observability in the school context (Brandt et al., 2021). Higher observability can increase the validity of personality other-reports (Funder, 2012; Vazire, 2010), which may account for the stronger and more persistent effects of conscientiousness and openness to experience on self-esteem compared to the other characteristics. The later and longer-lasting effects in other-reports may reflect a temporal delay in the recognition of personality changes. While individuals can update their self-perceptions quicker, others may require more time to detect and integrate these changes.

In summary, Study II and III further highlight adolescence as a developmental period marked by both stability and change across different personality characteristics (Hill & Edmonds, 2017; Soto & Tackett, 2015). Also, personality characteristics do not develop in isolation from each other but appear to be longitudinally intertwined. The inclusion of other-reports in Study II further hints at the value of cross-informant approaches for understanding personality development. Future research should therefore more systematically integrate cross-rater perspectives and, for example, try to understand how other-reported personality changes can explain self-perceived self-esteem development and how these patterns might vary across raters or contexts.

5.1.3. Multifunctionality: Associations Between Personality and Psychosocial (Mal)adjustment

All three studies investigate adolescents' personalities and their cross-sectional or longitudinal links to different aspects of psychosocial (mal)adjustment. Together, they address the principle of multifunctionality of adolescents' personalities from different angles.

First, as illustrated in Subsection 5.1.1., cross-sectional results from Study I showed that striving toward perfection and striving toward excellence were inversely related to self-esteem and also perfectionistic concerns. This suggests that adolescents with higher levels of striving toward perfection were more likely to display lower levels of self-esteem and higher levels of perfectionistic concerns compared to their less perfectionistic but equally excellence-oriented peers. Extending this cross-sectional perspective, Study II painted a nuanced picture of longitudinal within-person effects from Big Five on self-esteem (see Subsection 5.1.2.). That is, different Big Five traits predict increases in adolescents' self-esteem.

Finally, Study III further broadened the view by investigating the developmental interplay of striving toward perfection vs. excellence with procrastination, loneliness, and depressive symptoms on the between- and the within-person level. Specifically, Study III showed that students with higher average procrastination scores in the middle of 10th grade were more likely to report lower levels of striving toward perfection and excellence at the end of 10th grade, illustrating the importance of study-related behaviors for future self-related performance standards. However, none of the hypothesized predictive effects from striving toward perfection vs. excellence on different psychosocial (mal)adjustment indicators was found in Study III. Further, there was no evidence for a mediating effect from perfectionistic concerns. Whereas the absence of effects might indicate that neither form of striving has relevant effects on adolescents' procrastination, loneliness, or depressive symptoms, this conclusion would contradict theoretical notions (Gaudreau, 2019, 2021) and empirical results from cross-sectional (Gaudreau et al., 2022, Study II; Goulet-Pelletier et al., 2022; Tape et al., 2024) and longitudinal studies (Gaudreau et al., 2022, Studies 4 and 5). Along these lines, the absence of predictive effects in Study III can be explained by both theoretical and methodological reasons that are discussed in detail in the discussion section of Study III.

To sum up, the presented findings illustrate the complex associations between adolescents' Big Five and different forms of achievement striving with self-esteem that were consistent across genders and different school types. However, there was no evidence for diverging, longitudinal effects from striving toward perfection vs. excellence across different indicators of psychosocial (mal)adjustment. Along these lines, future research is needed to clarify predictive effects from striving toward perfection vs. excellence across different (mal)adjustment indicators from different life domains in adolescence.

5.2. Theoretical Implications

Together, the findings from the three empirical studies point to complex connections between personality characteristics with each other and different indicators of psychosocial (mal)adjustment in adolescence. By considering different personality characteristics simultaneously, this dissertation yields three theoretical implications that relate to the theoretical notions from the MEP (Gaudreau, 2019, 2021), the core vs. surface perspective on personality (Kandler et al., 2014; McCrae & Costa, 2008), and the usefulness of the broader developmental principles from lifespan psychology (Baltes, 1987; Baltes et al., 2006).

5.2.1. Extending the MEP

By corroborating the factorial and nomological distinctiveness of striving toward perfection vs. excellence, the findings from Study I support two basic propositions of the MEP (Gaudreau, 2019, 2021). Accordingly, this dissertation adds to the growing body of research that points to the importance of differentiating between the two types of striving (Gaudreau et al., 2022; Goulet-Pelletier et al., 2022; Tape et al., 2024; With et al., 2024). Study III further illustrates moderately high rank-order stabilities of striving toward perfection and excellence in adolescence, aligning with their conceptualizations as characteristic adaptations or surface characteristics (Gaudreau, 2019). This implies that although many adolescents maintain their relative standing compared to others over time, there remains room for change, and individuals differ in how much and in what direction they change. Such variation can potentially be shaped by close social interactions—such as feedback from parents, peers, or teachers—as well as more distal influences, like attending a highly competitive school or coming from a cultural background that places a strong emphasis on performance (Bronfenbrenner, 1979). However, contrary to the propositions from the MEP and as discussed in Subsection 5.1.3. there we no predictive effects from striving toward perfection vs. excellence on indicators of psychosocial (mal)adjustment from different developmental task domains in the adolescent sample of Study III.

Beyond underpinning some of the targeted assumptions from the MEP (Gaudreau, 2019, 2021), findings from Study I and III further extend the MEP in two central ways. First, differences between the results from Study I and III, on the one hand, and empirical findings from adult samples (Gaudreau et al., 2022), on the other hand, suggest age-differential manifestations of striving toward perfection and striving toward excellence. Specifically, the closer empirical association between striving toward perfection and striving toward excellence that has also been found in another adolescent sample (Tape et al., 2024), combined with the absence of pronounced differences in rank-order stabilities, points to developmental differences

between adolescents and adults in how strivings are organized and developed. Also, the inverse association pattern between striving toward perfection and striving toward excellence with self-esteem in adolescents but not in adults suggests that self-esteem may play a central role in the developmental function of perfectionistic strivings during this life phase. Together, these findings suggest the incorporation of a developmental lens within the MEP to understand how striving toward perfection and striving toward excellence develop and function across different life phases. Specifically and in line with original and current considerations, they point to self-esteem as a potentially central variable for a deeper understanding of adolescents' perfectionism (Adler, 1956; Sorotzkin, 1985; Stricker & Preckel, 2022).

Second, Study III proposes that both types of striving decline slightly over the course of a school year. In addition to the mean level difference in striving toward perfection across different school types (i.e., higher levels among students from comprehensive schools) in Study I and the predictive effects from procrastination on both types of striving, these findings further extend the MEP by highlighting school as a decisive context factor for the expression and development of different achievement strivings.

In summary, the present findings support some of the MEP's key propositions and extend the model by highlighting the importance of developmental and contextual influences. At the same time, the absence of predictive effects on psychosocial (mal)adjustment underlines the need to address the presented conceptual and methodological challenges (see Subsection 5.1.3.) to increase clarity about longitudinal dynamics between striving toward perfection vs. excellence and adolescents' psychosocial (mal)adjustment.

5.2.2. Refining the Differentiation Between Core Traits and Surface Characteristics

As a third theoretical contribution, findings from Study II on the longitudinal interplay between the Big Five and self-esteem support and refine current considerations about core traits and surface characteristics of humans' personalities. Accordingly, this dissertation adds to research that proposes an integrative view on "rather core like" and "rather surface like" characteristics, highlighting potential transactions between them (e.g., Asendorpf & Motti–Stefanidi, 2018; Henry & Mõttus, 2020; Kandler et al., 2014; McAdams & Pals, 2006).

First, by including personality ratings from other-reports, Study II further substantiates current theoretical considerations on core traits and surface characteristics (e.g., Asendorpf & Motti–Stefanidi, 2018; Henry & Mõttus, 2020; Kandler et al., 2014; McAdams & Pals, 2006) and add to first multi-rater studies in adulthood (Instinske & Kandler, 2024). Specifically, they suggest that the longitudinal interplay between personality characteristics is not confined to, nor merely a methodological byproduct of, self-reports but also manifests in observer-based

assessments. As an outlook, future research might investigate whether such cross-informant perspectives reflect complementary processes in the joint shaping of personality development through self- and social perceptions.

Second, beyond substantiating current perspectives on core traits and surface characteristics, the present findings refine available considerations by adding a developmental perspective to the discussion. While most personality models incorporate developmental considerations (e.g., suggesting that core traits emerge earlier in life than surface characteristics; McAdams & Pals, 2006), they do not address how developmental dynamics might shape the interplay between different personality characteristics. Results from Study II suggest that self-esteem, despite appearing less stable than the Big Five, is as predictive for the development of certain Big Five traits as they are for the development of self-esteem in adolescence. This is, adolescents' self-esteem not only reflects but also shapes personality development, particularly in relation to extraversion and potentially openness to experience. The reciprocal pattern between extraversion and self-esteem aligns with theories emphasizing the social foundations (Denissen et al., 2008; Leary & Baumeister, 2000) and expressions (Srivastava & Beer, 2005) of self-esteem, which are especially salient during adolescence. The links between openness to experience were inverse: self-esteem increases predicted increases in openness to experience, while increases in openness to experience predicted small short-term decreases in self-esteem. This may reflect the challenges adolescents face when confronted with novel experiences, that may temporarily strain their self-confidence.

5.2.3. Enriching Developmental Principles From Lifespan Psychology with Insights on Adolescent Personality and Psychosocial (Mal)adjustment

As a final theoretical contribution, the presented findings support (see also Section 5.1.) and enrich the usefulness of the three developmental principles from lifespan psychology to varying degrees (Baltes, 1987; Baltes et al., 2006). That is, because lifespan psychology has been formulated as an integration of various insights, the three principles (multidimensionality, multidirectionality, and multifunctionality) offer a valuable overarching framework to understand human development. However, they are too general on their own to derive specific hypotheses about the development of particular personality characteristics or their roles in adolescents' psychosocial (mal)adjustment across different developmental tasks domains. Along these lines, Study I picks up on the multidimensionality principle and enriches it with more specific insights on the links of adolescents' striving toward perfection vs. excellence with their Big Five and self-esteem (see Subsection 5.1.1.).

In contrast, most findings from Study II and 3 provide mixed evidence on the multidirectionality of adolescents' personality development across different personality characteristics. Whereas striving toward perfection and excellence do not differ in their rank-order stabilities or average developmental trajectories as shown in Study III, Study II illustrates a nuanced developmental interplay between each Big Five trait with self-esteem, further taking the role of time into account. As such and in line with different conceptualizations of personality as a complex system (e.g., Cramer et al., 2012; DeYoung, 2015; Fajkowska, 2018; Mayer, 2015; Mischel & Shoda, 1995), Study II highlights the complementarity of the multidimensionality and the multidirectionality principle. That is, personality characteristics are not only distinguishable and evolving in potentially different directions but are interrelated and as such developmentally intertwined. As another enrichment to the developmental principles from lifespan psychology and in line with current considerations (Driver & Voelkle, 2018; Hopwood et al., 2022), the findings from Study II indicate the value of taking not only lifetime (i.e., a person's age or the current developmental phase they are in) but also clock time (i.e., literal time that has passed between assessments) into account to get a broader understanding of personality development.

Finally, the findings from Study I and II collectively illustrate and support the multifunctionality of personality characteristics—specifically, striving toward perfection vs. excellence and the Big Five—for (the development of) adolescents' self-esteem. Although both forms of striving involve the pursuit of high standards, striving toward perfection and excellence show opposing associations with self-esteem, while various Big Five traits consistently predict increases in self-esteem, reflecting patterns of multifinality and equifinality. In contrast, Study III provided no evidence for multifunctional effects from striving toward perfection vs. excellence different indicators of psychosocial maladjustment, such as procrastination, loneliness, or depressive symptoms. Together, these findings underscore the relevance of different personality characteristics for adolescents' self-esteem. However, longitudinal effects from striving toward perfection vs. excellence on psychosocial (mal)adjustment across different developmental task domains in adolescence need further exploration (see Subsection 5.2.2.). To advance lifespan psychology, future work should aim to specify how the general principles of multidimensionality, multidirectionality, and multifunctionality operate at the level of specific personality processes and their interactions with developmental task demands. This requires integrating temporally dynamic models of personality development with domain-specific outcomes to better capture the complexity and contextuality of adolescent psychosocial adjustment.

To sum up, the empirical findings from this dissertation partly support the applicability of the targeted lifespan principles to the study of adolescents' personality development. Moreover, they enrich the empirical scope of these principles by specifying how particular personality characteristics develop and function in adolescence.

5.3. Methodological Implications

The present dissertation offers several methodological implications that are relevant for the future study of the development and functioning of personality in adolescence. In the following paragraphs, I discuss three aspects that touch on the measurement and statistical modeling of adolescents' personality and their psychosocial (mal)adjustment.

First, Study I underscores the need to measure effects from perfectionistic strivings on an outcome variable in a multivariate framework that distinguishes between striving toward perfection and striving toward excellence (Gaudreau et al., 2023). Capturing both kinds of striving is essential to deduct how striving toward perfection *beyond* excellence relates to other variables. Furthermore, results from Study I reinforce the idea that the conflation of striving toward perfection and striving toward excellence across different perfectionism questionnaires might have contributed to mixed findings between perfectionistic strivings and different (mal)adjustment indicators in earlier studies (Blasberg et al., 2016; Gaudreau, 2019; Osenk et al., 2020). Along these lines, the newly developed Scale of Excellencism and Perfectionism (SCOPE) offers the first validated instrument to empirically distinguish between striving toward perfection and striving toward excellence (Gaudreau et al., 2022). Study I demonstrates the generalizability to German high school students and presents a validated German version of the SCOPE that should be used in future studies to study the effects of perfectionistic strivings on psychosocial (mal)adjustment. The development of a short version could further promote a more economic measurement of striving toward perfection and excellence, considering that the original version with 22 items is relatively long.

Second, Study II highlights the value of considering the developmental interplay between personality characteristics at different time scales. Study II is the first empirical study that used continuous time modeling (CTM; Driver & Voelkle, 2018) to do so in adolescence. In CTM, time is treated continuously instead of being broken down into discrete time intervals and as such allows for the integration of data with varying intervals between assessments. Accordingly, continuous time parameters are not limited to specific time intervals but describe how processes change at any particular moment (Voelkle et al., 2012). Importantly, continuous time parameters can be transformed into discrete time parameters of any time interval and thus allow the comparison to parameters that were derived from other studies with different time

intervals between personality assessments. The latter aspect is particularly important as it holds potential to promote the systematic integration of scientific insights across studies and illuminate our theoretical understanding of time with regard to adolescents' (personality) development. Drawing from these considerations, future research could use CTM and combine data with shorter time intervals between assessments (e.g., daily or weekly measurements) and medium (e.g., monthly) or longer time intervals (e.g., yearly) to connect the insights from Study II with more fine-grained information on the temporal dynamics of adolescents' personality development.

Third, Study III illustrates some of the methodological challenges that come with the intention to decompose between- vs. within-person variance in longitudinal data. Given that between- and within-person effects can vary with regard to presence, direction, and strength (P. J. Curran & Bauer, 2011; Hamaker et al., 2015), it is important to match the analyzed effect-level to the corresponding research question (Asendorpf, 2021; Orth et al., 2021). Along these lines, two statistical models in particular have been at the center of ongoing, controversial methodological discussions in psychology (e.g., Hamaker, 2023; Hamaker et al., 2015; Lucas, 2023; Lüdtke & Robitzsch, 2022): the cross-lagged panel model (CLPM; Finkel, 1995) and the random-intercept cross-lagged panel model (RI-CLPM; Hamaker et al., 2015). The two models are often discussed as two opposing alternatives to model cross-lagged effects in longitudinal data. The more traditional CLPM estimates cross-lagged associations over time by blending stable between-person differences and within-person variation, thereby, limiting interpretability at the level of individual change. The RI-CLPM separates stable between-person variance by including random intercepts, allowing the cross-lagged effects to be estimated based on residual variation, often-interpreted as within-person effects.

In Study III, we aimed to investigate and compare results from the CLPM and the RI-CLPM. However, likely due to the limited overlap between participants across different time points, it was not feasible to further decompose the variance into a stable latent trait-like part and a state-specific part at the residual level as indicated by the absence of significant variance in random intercepts across all RI-CLPMs. While this underscores the need for greater longitudinal coverage and, preferably, more than three measurement occasions to allow for a stable estimation of random-intercepts (Park et al., 2023; Usami et al., 2019), some works have also questioned the usefulness of RI-CLPMs to investigate cross-lagged effects between rather stable trait-like constructs, such as personality characteristics (e.g., Lüdtke & Robitzsch, 2022). Specifically, RI-CLPMs might fail to capture theoretically meaningful variance when most variability in the constructs of interest is absorbed by the latent trait. In such cases, the occasion-

specific residual variance may not adequately represent the core attributes of the constructs anymore, potentially leading to attenuated or non-significant cross-lagged effects. Recent discussions have emphasized that the choice between CLPM and RI-CLPM should not be seen as a simple preference for either within- or between-person effects, but must be carefully aligned with the research question, the time scale of the processes under study, and the empirical patterns in the data (Hamaker, 2023; Orth et al., 2021). In particular, it is crucial to recognize that processes operating at different timescales may call for different modeling approaches and that both stable trait-like differences and short-term fluctuations can offer meaningful insights, depending on the study's aims. Moving beyond a binary opposition between models, future research should adopt an integrative perspective that matches theoretical considerations, study design, and statistical modeling. Importantly, as Hamaker (2023) highlights, the distinction between within-person and between-person variance is not absolute but also depends on the timescale of observation. What appears rather stable (between-person) over a short time frame may still vary over longer periods, making the decomposition sensitive to the study's design, including the time intervals and overall duration. Therefore, theoretical considerations about the timescale of the processes under investigation should guide both model choice and interpretation (Hopwood et al., 2022; Luhmann et al., 2014).

In summary, this dissertation emphasizes several methodological advancements for studying the development of personality characteristics in adolescence. The findings underscore the value of validated measurement instruments, sufficient sample sizes, and careful attention to timescales. These methodological insights extend beyond adolescence and are applicable to research across different age groups.

5.4. Practical Implications

Beyond the theoretical and methodological contributions presented, the findings of this dissertation offer valuable insights for applied settings. First, the present results emphasize the salience of high performance standards during adolescence (T. Curran & Hill, 2019; Flett & Hewitt, 2022) and enrich the empirical picture by differentiating between striving toward perfection and striving toward excellence. As such, the present findings suggest that rising levels of high standards among adolescents and young adults (T. Curran & Hill, 2019) might indeed be attributable to increases in their striving toward perfection and not only to rising levels of excellencism. Recognizing the high prevalence of perfectionistic tendencies among current generations of young people is particularly important for parents and other caregivers, especially in light of prevailing negative stereotypes about younger generations being unmotivated or lacking independence (e.g., Szabó & Maczó, 2022). Along these lines, one

should aim to foster an environment that supports realistic performance striving while being attentive to the potential psychosocial costs associated with perfectionistic standards (e.g., lower self-esteem, concerns about mistakes, or doubting own actions, as illustrated in Study I). Practical strategies may include promoting realistic goal setting, encouraging adaptive responses to failure, and explicitly valuing personal growth and learning processes over flawless outcomes.

Considering that schools represent a central context where adolescents' performances are expected and evaluated, reflecting on internalized standards within this setting holds particular potential to address perfectionistic tendencies directly in those environments where they are most likely to manifest (Endleman et al., 2022; Stricker, Schneider, & Preckel, 2019). This is backed up by the findings from Study I and III that illustrate links between the school type and average levels of striving toward perfection as well as study-related behaviors (i.e., procrastination) and the development of both striving toward perfection and excellence. As such, school-based strategies should address internalized standards directly. Such strategies might include psychoeducation that addresses the existence of differences between striving toward perfection and excellence, classroom practices that reward process-oriented learning, and systemic efforts to reduce performance pressures, especially during periods of heightened stress, such as final examinations. More specifically, psychoeducational interventions could help adolescents differentiate between striving toward perfection and striving toward excellence. These distinctions may be introduced through structured workshops or the integration into the school curriculum. Along these lines, classroom discussions and reflective writing exercises that focus on personal goal-setting, motivational orientations, and responses to mistakes can further support students to reflect on their achievement standards. In terms of instructional practice, teachers can promote a process-oriented learning climate by providing formative feedback that highlights students' strategies, effort, and progress rather than focusing solely on correctness or final grades. Moreover, methods such as portfolio assessments, which encourage students to collect and reflect on their work over time, can help shift attention from isolated outcomes to broader developmental trajectories (López-Crespo et al., 2022; Nicolaidou, 2012). Lastly, even within the constraints of mandated grading systems and centralized exams, schools can actively mitigate performance pressure through how these assessments are framed. Teachers can present high-stakes evaluations as opportunities for learning and growth, explicitly communicating that no single test defines a student's ability or value.

Further practical implications can be derived from the observed developmental interplay between adolescents' Big Five and their self-esteem in Study II. The results highlight the dynamic interplay between the Big Five and self-esteem at the intraindividual level and suggest that increases in extraversion, agreeableness, and conscientiousness, as well as decreases in neuroticism and openness to experience, are predictive of subsequent increases in self-esteem—though changes in self-esteem do not reciprocally influence all Big Five. This asymmetry underscores that while self-esteem can shape aspects of personality—especially those related to social aspects (M. A. Harris & Orth, 2020), and the willingness to engage with novel experiences— changes in broader patterns of thinking, feeling, and behaving are often the more immediate precursors of self-esteem development than vice versa. Accordingly, strategies aimed at promoting self-esteem in adolescence may be particularly effective when they support behavioral, cognitive, and emotional changes together. These may include helping adolescents to engage more actively in social or academic roles, like volunteering as class president or trying out different after-school activities. Further, working through internalized (negative) self-views might be more sustainable in a context that also focuses on relational aspects—for instance, by helping adolescents explore how their self-evaluations have been shaped by past or current interactions with significant others, and by fostering corrective emotional experiences within trusted relationships. This may involve creating spaces where adolescents can express vulnerability, receive non-judgmental feedback, and revise internalized assumptions about their social worth through consistent, validating interpersonal encounters. Supporting adolescents in experiencing themselves as competent, valued, and emotionally understood in everyday settings may thus provide a more robust foundation for long-term self-esteem development than addressing self-evaluations on narrative level alone.

The inclusion of other-reports of personality provided further insights. In particular, the stronger, longer-lasting, and later-peaking effects of conscientiousness and openness to experience on self-esteem in other-reports suggest that these traits may be especially salient in school settings. This highlights the potential of including teachers or classmates in assessment and guidance processes, especially for traits with high social observability. In counseling or mentoring settings, involving external observers could help to identify emerging strengths in adolescents that they may not yet recognize themselves, providing valuable feedback loops for the development of self-esteem. However, direct access to other-reports may not always be feasible or could evoke feelings of shame and exposure in some adolescents. As an alternative, systemic (von Sydow et al., 2024) or mentalization-based (Sharp & Rossouw, 2024) techniques that focus on perspective-taking can be used to approximate the function of external feedback.

For example, interventions that help adolescents explore how significant others might perceive their behavior might support more differentiated self-perceptions and help internalize positive social feedback.

5.5. Limitations and Outlook for Future Research

It is important to acknowledge that the presented research cannot fully capture the breadth of adolescents' developing personalities and their complex intertwinements with psychosocial (mal)adjustment. Below, I critically discuss several conceptual and methodological limitations that need to be kept in mind when interpreting the results and outline possible avenues to address these limitations in future research.

First, despite the inclusion of longitudinal datasets, the present work is limited in the examination of processes that may underlie the associations between adolescents' personality characteristics and their psychosocial (mal)adjustment. The examination of perfectionistic concerns as a mediator between striving toward perfection and different indicators of psychosocial maladjustment in Study III, for example, was challenging due to the large amount of longitudinal dropout. Nevertheless, this dissertation discussed and identified potentially relevant variables that should be investigated in future studies (e.g., mastering developmental tasks). Furthermore, the inclusion of multiple more fine-grained assessments might help to capture short-term or even micro-level processes, using daily diary or experience sampling methods (Horstmann, 2021). From a methodological perspective, the inclusion of more measurement points per person would provide additional flexibility that can enable the modeling of non-linear processes and an easier decomposition of between-person differences and within-person processes. From a conceptual perspective, the complementary inclusion of such *personality state measures* (i.e., descriptions of how people think, feel, and behave at a particular moment rather than in general) would also closely align with the dynamic understanding that is put forward in complex systems approaches to personality (e.g., Cramer et al., 2012; DeYoung, 2015; Fajkowska, 2018; Mayer, 2015; Mischel & Shoda, 1995). The combination of more widely spaced trait assessments with more densely sampled state data could enable the investigation of whether and how short-term dynamics accumulate into more enduring changes in personality or psychosocial (mal)adjustment over time (e.g., Geukes et al., 2018; Jayawickreme et al., 2019; Wrzus & Roberts, 2017). However, such multiscale approaches are highly resource intensive, making it particularly important to base the selection of variables and the timing of assessments on well-founded theoretical frameworks.

Second, the variable-centered (or function-centered; Baltes et al., 2006) approach that was predominantly employed in this dissertation has both strengths and limitations. While this

approach is well-suited to identify general trends and describe associations between variables, thereby promoting a broad understanding of newly emerging constructs, such as striving toward perfection vs. excellence, it may overlook important individual differences or subgroups within the population, limiting insights into the heterogeneity of how these constructs manifest and relate to outcomes. In contrast, more person-centered approaches focus on the identification of subgroups or person-specific within-person patterns of personality-outcome associations (Asendorpf, 2015; Phan et al., 2025). However, targeting this heterogeneity generally introduces additional complexity and thus requires larger sample sizes to reach satisfactory statistical power. To illustrate, while the sample size of approximately 1,000 adolescents with one to three measurement points per person was sufficient for the estimation of average within-person effects in Study II, it was not feasible to calculate individually varying drift parameters for each person in the sample. To promote the acquisition of larger (and denser) longitudinal data sets, data fusion approaches (Marcoulides & Grimm, 2017) or collaborative data collections (Schönbrodt et al., 2016) may provide viable solutions. Along these lines, continuous time modeling could also be applied to overcome challenges related to varying time intervals (Driver & Voelkle, 2018; Voelkle et al., 2012) as exemplified in Study II.

Third, despite the emphasis on sample diversity in Study I and 3, the findings from this dissertation may have limited generalizability to other populations (e.g., other age groups, clinical populations, adolescents from other socio-economic or cultural backgrounds). Along these lines, I highlight two aspects: the importance of looking beyond broader categories to describe individuals and the inclusion of relevant context variables. While the studies in this dissertation considered the central variables of gender and school type by differentiating between boys and girls as well as students from academically-oriented and comprehensive schools, such binary categories might be too broad to capture potentially relevant differences between individuals. Future research should consider interaction effects between different variables which may reveal distinct patterns that are not observable in main effects alone. Building on this, *intersectional perspectives* emphasize that multiple social identities jointly shape experiences in non-additive ways (Bowleg, 2017; Westberg & Syed, 2024). However, because not all dimensions can be measured simultaneously, a priori theorizing is necessary to guide the development of sufficiently powered studies. Given the relative scarcity of theoretical models that incorporate intersectionality into our understanding of personality development, descriptive or qualitative studies might be an important first step to identify central variables (e.g., experiences of discrimination or having access to financial and social resources) and

inform future hypotheses (for examples from other psychological fields, see Kaurin et al., 2024; Kern et al., 2020; Nadal et al., 2015).

Furthermore, the investigation of school types addressed only one relevant contextual factor for adolescents' development and functioning. However multiple, intersecting contexts—such as school, family, and peer environments—can interact with adolescents' development across different levels of abstraction (Bronfenbrenner, 1979; Magnusson & Stattin, 2007). Within the peer context, for instance, influences may range from broad peer group norms to specific social networks within a school to specific interactions between close friends. Personality in particular is known to be closely linked to and shaped by people's social environments (e.g., Back et al., 2011; Neyer et al., 2014). As an outlook for future research, conditioned ESM designs (i.e., ESM protocols that trigger assessments based on the occurrence of predefined events or experiences) might offer a promising approach to integrate considerations form the MEP (Gaudreau, 2019, 2021) and more interpersonal conceptualizations of perfectionism (e.g., Hewitt & Flett, 1991; Hewitt et al., 2017). Such designs could be used to investigate how striving toward perfection and excellence arise and develop after situations that might involve processes like social comparisons or perceived social evaluation.

Finally, although particular emphasis was placed on the theoretical derivation of hypotheses and the temporal ordering of variables where possible, the data underlying the three studies of this dissertation is correlational in nature and thus does not permit causal conclusions. This is a common challenge in personality research, particularly when examining complex, potentially multidirectional associations such as those between personality characteristics and psychosocial (mal)adjustment (Tackett, 2006; Tackett & Mullins-Sweatt, 2021). Experimental approaches would include controlled laboratory settings that involve the manipulation of specific situational perceptions, cognitions, or behaviors to explore short-term dynamics and underlying mechanisms (e.g., enforcing perfectionistic cognitions). However, such studies often suffer from limited external validity and the direct manipulation of personality characteristics is frequently neither ethically permissible nor practically feasible. Along these lines, naturally occurring events such as developmental transitions that involve entering new social or academic environments—offer a promising complementation for studying real-life processes under quasi-experimental conditions (e.g., Deventer et al., 2019; Hutteman et al., 2015). Furthermore, intervention studies have been discussed as an important approach to get closer to a causal understanding of personality development and functioning (e.g., Allemand et al., 2024; Bleidorn, 2024; Haehner et al., 2024; Stieger et al., 2021). However, it is vital to

acknowledge that the discussion around personality interventions is not free from ethical concerns as they can imply that certain manifestations of personality are inherently more desirable than others, thereby reinforcing value judgments and potentially stigmatizing individual differences. All in all, the discussed research designs are resource-intensive, underscoring the importance of focused studies like those in this dissertation to provide foundational insights that can inform the development of more complex, causally informative research in the future.

5.6. Conclusion

In conclusion, this dissertation applied a multidisciplinary and multimethodological approach to study the development and functioning of adolescents' personalities. The results underscore both the relative stability as well as the intertwined developments of personality characteristics during adolescence, pointing to dynamic interrelations between them. More specifically, the findings support the conceptual distinction between striving toward perfection and striving toward excellence and reveal their differential associations with the Big Five and self-esteem. Although longitudinal links to psychosocial maladjustment were limited, the results highlight adolescence as a sensitive phase for self-related standards. These insights broaden our understanding of personality and its' role in adolescents' psychosocial (mal)adjustment and provide a starting point for future studies. To gain a deeper understanding of the processes that explain the associations between adolescents' personality characteristics and their psychosocial (mal)adjustment, future research needs to further explore context-sensitive aspects and target the temporal dimension of personality processes more closely.

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Declarations

Attached declarations:

- Erklärung gemäß § 5 (4d) der Promotionsordnung des Instituts für Psychologie der Universität Hamburg vom 20.08.2003
- Eidesstattliche Erklärung nach § 9 (1c und 1d) der Promotionsordnung des Instituts für Psychologie der Universität Hamburg vom 20.08.2003

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Institut für Psychologie

Erklärung gemäß *(bitte Zutreffendes ankreuzen)*

☐ **§ 4 (1c) der Promotionsordnung des Instituts für Bewegungswissenschaft der Universität Hamburg vom 18.08.2010**

☒ **§ 5 (4d) der Promotionsordnung des Instituts für Psychologie der Universität Hamburg vom 20.08.2003**

Hiermit erkläre ich,

Kristina Bien (Vorname, Nachname),

dass ich mich an einer anderen Universität oder Fakultät noch keiner Doktorprüfung unterzogen oder mich um Zulassung zu einer Doktorprüfung bemüht habe.

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Eidesstattliche Erklärung nach *(bitte Zutreffendes ankreuzen)*

☐ **§ 7 (4) der Promotionsordnung des Instituts für Bewegungswissenschaft der Universität Hamburg vom 18.08.2010**

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Hiermit erkläre ich an Eides statt,

1. dass die von mir vorgelegte Dissertation nicht Gegenstand eines anderen Prüfungsverfahrens gewesen oder in einem solchen Verfahren als ungenügend beurteilt worden ist.
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