The Interplay of Personality and Social Interactions in Adolescence:

Investigating The Role of Metaperceptions

Dissertation

zur Erlangung des Doktorgrades

an der Universität Hamburg,

Fakultät für Psychologie und Bewegungswissenschaft,

Institut für Psychologie

vorgelegt von

Eva Bleckmann

Hamburg, 2023

Date of thesis defense: 10.01.2024

Members of the doctoral examination board
Chair of the disputation: Prof. Dr. Anja Riesel
First dissertation reviewer: Prof. Dr. Jenny Wagner
Second dissertation reviewer: Prof. Dr. Maarten van Zalk
First disputation reviewer: Prof. Dr. Juliane Degner
Second disputation reviewer: Prof. Dr. Nale Lehmann-Willenbrock

Danksagung

An dieser Stelle möchte ich all den Menschen meinen Dank aussprechen, die mich in den vergangenen Jahren begleitet und unterstützt haben. Dabei möchte ich einige ganz besonders hervorheben:

Zuerst möchte ich meiner Erstbetreuerin Prof. Dr. Jenny Wagner für ihre herausragende Betreuung danken. Ihre Unterstützung und Expertise haben maßgeblich dazu beigetragen, dass ich in den letzten Jahren so viel gelernt habe, den Spaß an der Forschung nicht verloren habe, und mich zwischendurch sportlich um die Alster bewegt habe. Ich bin sehr dankbar für die Freiräume, eigene Ideen zu entwickeln und für ihr wertvolles Mentoring während des gesamten Promotionsprozesses. Mein aufrichtiger Dank gilt auch Prof. Dr. Maarten van Zalk, der sich als Zweitgutachter die Zeit genommen hat, sich in meine Forschungsthemen einzudenken. Außerdem möchte ich Prof. Dr. Erika Carlson besonders hervorheben, die mich so herzlich in das Team des SKIP-Lab in Toronto aufgenommen hat und sich viel Zeit für Gespräche genommen hat, die mir neue Perspektiven eröffnet und mich sehr inspiriert haben.

Ein großes Dankeschön geht an meine lieben Kolleginnen Larissa, Naemi, Kristina und Mieke für eure unermüdliche Geduld, selbst die 65. Grafik zu sozialen Interaktionsprozessen anzuschauen. Eure stets offenen Türen, die gemeinsamen Mittagessen und Konferenzreisen quer durch die Welt haben die Promotionszeit zu einer besonderen Erfahrung gemacht. Ebenso möchte ich Hannes und Kai für die regelmäßigen Krisengipfel rund ums Promovieren an der UHH danken—Ihr wart eine großartige Unterstützung, gerade auf den letzten Metern der Promotion. Ein besonderes DANKE geht an Larissa, Hannes und Hanna für eure Zeit, eure Gedanken, und euer konstruktives Feedback zu diesem Dissertationsprojekt.

Abschließend möchte ich meiner Familie und meinen Freunden danken. Meiner Familie für ihr unerschütterliches Vertrauen und ihre Unterstützung in allen Lebenslagen. Meinen Freunden dafür, dass sie mich immer daran erinnern, dass das Leben auch außerhalb der Arbeit wunderbar ist.

Table of Contents

Summary

A longstanding assumption in psychological research is that how people are—their personality—is reciprocally linked to the people who surround them—their social environments. Empirical evidence has affirmed the close link between personality and social relationships, yet the underlying processes within social interactions that drive this interplay remain largely uncharted. Understanding the processes that characterize the interplay between personality and social interactions becomes particularly important during adolescence, a stage in which social interactions represent a central context for achieving the developmental tasks of forming a clear view of one's own personality and establishing meaningful peer relationships. Drawing from the research fields of personality psychology, social interaction processes, and developmental psychology, this dissertation aimed to explore three interrelated processes that characterize the interplay between personality and social interactions by focusing on adolescents' metaperceptions as a key element within this interplay. First, the dissertation examines how adolescents' stable personality traits act as default settings that are associated with metaperceptions within social interactions. Second, it investigates how metaperceptions feed back into momentary changes in personality. Third, the dissertation zooms in on the situational dynamics between metaperceptions, other interpersonal perceptions, and behaviors that constitute adolescents' social experiences. To illuminate these three processes, this dissertation comprises three preregistered studies drawing on data from two samples (individuals aged between 14 and 18) that provide insights into adolescents' virtual and face-to-face social interactions with peers.

Study 1 focused on the formation of meta-liking as a specific metaperception type that becomes increasingly important in adolescents' social interactions with peers. Using latent change score modeling, this study investigated how personality traits and social interaction experiences captured in adolescents' perceptions and behavioral signals of their interaction partners inform meta-liking and meta-liking changes in virtual zero-acquaintance interactions. Study 2 used multilevel modeling to examine sociometer processes, detailing how adolescents' meta-liking contributes to momentary self-esteem in face-to-face interactions at zero-acquaintance and with familiar interaction partners. Moreover, this study investigated how personality traits act as moderators of the link between meta-liking and momentary self-esteem. Finally, Study 3 explored sociometer processes and situational dynamics between personality metaperceptions (i.e., meta-accuracy and meta-positivity) and meta-liking judgments in adolescents' virtual interactions. To unravel the links between personality metaperceptions,

meta-liking, and momentary self-esteem, this study employed a combination of multilevel modeling and a path-analytical framework.

Collectively, the three studies offer comprehensive insights into the three interrelated processes that underlie the interplay of personality and social interactions in adolescence. The findings support the notion that personality traits operate as default settings within social contexts: Higher extraversion and trait self-esteem were associated with more positive meta-liking at the beginning of social interactions, while neuroticism was linked to more negative expectations of being liked and attenuated the positive link between meta-liking and momentary self-esteem. Furthermore, the results underscore the central role of meta-liking judgments in short-term sociometer processes that contribute to adolescents' momentary self-esteem in both face-to-face and virtual social interactions. Finally, the findings illustrate the dynamic connections between different perceptions and behaviors within social interactions: Subjective perceptions of adolescents (i.e., liking others) as well as behavioral cues of their interaction partners (i.e., expressive behaviors) were linked to increases in meta-liking. In addition, more positive personality metaperceptions (i.e., meta-positivity) were associated with higher meta-liking during interactions.

Given these findings, this dissertation provides three key contributions that increase our understanding of the dynamic interplay between personality and social interactions in adolescence. First, it supports and extends assumptions on the functionality of personality in social contexts, the generalizability of sociometer processes, and the formation of metaperceptions in adolescence. Second, this dissertation underscores the importance of adopting a process-oriented approach, as well as employing multiple methods including different perspectives (self-, other-, and metaperceptions) and externally coded behavioral data to gain a nuanced understanding of the interplay between personality and social interactions in adolescence. Lastly, the insights gained from the three studies hold practical implications for supporting adolescents in navigating their social interactions to foster positive self-esteem, prevent mental health problems, and facilitate the formation of peer relationships. As an outlook, the current findings offer a starting point for comprehensive investigations of social interaction processes, where future studies should explore the role of interaction partners' personalities and integrate a process-oriented approach with long-term assessments. This holistic approach will help unraveling how momentary changes in personality and social interactions are linked to long-term outcomes in both personality development and social relationship formation in adolescence and beyond.

1. Theoretical Background

Humans possess an intrinsic social nature that drives them to engage in social interactions, form lasting relationships, and seek social acceptance within groups (Baumeister & Leary, 1995). A fundamental assumption in psychological research is that people's personalities, defined as relatively stable patterns of feeling, thinking, and behaving (Roberts et al., 2006), are intertwined with their social environment (Cooley, 1902; James, 1913; Lewin, 1936; Mischel & Shoda, 1995). In the past, research primarily focused on either personality or social situations (e.g., Tracy et al., 2009). In recent decades, however, researchers across psychological research fields have increasingly adopted a *dynamic interactionist perspective* (Back, Baumert, et al., 2011; Conger & Donnellan, 2007; Lerner, 1978; Mischel & Shoda, 1995; Neyer & Asendorpf, 2001; Reynolds et al., 2010; Shibutani & Glassner, 1987). The key assumption of this perspective is that individuals are inextricably embedded in their social contexts, and both the structure and changes in personality or social relationships cannot be fully understood without the other (Greene & Reed, 1992).

Understanding the interplay between person and social context remains a challenge due to the complex nature of both (Moskowitz & Fournier, 2015). Addressing this challenge, previous research provides two key premises. First, researchers have underscored the need to adopt a process-oriented approach (Back et al., 2023; Baumert et al., 2017; Geukes et al., 2017; M. van Zalk et al., 2020; Wrzus, 2021): While studies on personality development have offered valuable insights into the longitudinal interplay between personality and social relationships (e.g., Denissen et al., 2011; Deventer et al., 2019; Neyer et al., 2014), the specific processes within social interactions driving this interplay remain largely unexplored. Second, scholars increasingly adopt interdisciplinary approaches, not only integrating concepts from personality and social psychological research but also from developmental literature to comprehend the interplay between personality and social interaction characteristics (Baumeister & Tice, 1996; Cooper & Sheldon, 2002; Mischel, 2004; Wagner et al., 2020). Such interdisciplinary approaches are of particular relevance given that both personality and social interaction characteristics change across the lifespan, making their interplay sensitive to developmental changes across different life stages as well (Baltes et al., 2007; Lerner & Steinberg, 2009; Wagner et al., 2013). Among these stages, adolescence stands out as a phase marked by both personality development and profound changes in the social context (Wrzus et al., 2013). However, most studies examining the personality-social interaction interplay to date have focused on adults, leaving a substantial research gap in understanding social interaction processes characterizing this interplay during adolescence.

One approach to close this gap is to identify personality and social interaction characteristics that play a significant role in adolescent's social lives and investigate how they are connected to each other. In this regard, one central element within social interactions are a person's metaperceptions, capturing the beliefs about how others perceive them (Carlson & Kenny, 2012). Metaperceptions play an important role in shaping how people feel about themselves and help to navigate social interactions (Carlson, 2016; Grutterink & Meister, 2022; Tissera et al., 2021). As such, metaperceptions are instrumental in adolescents' developmental tasks of forming a clear view of their own personality and establishing peer relationships (e.g., Eschenbeck & Knauf, 2018). Given their central role in social interactions, metaperceptions may enable us to unravel the processes that characterize the interplay between personality and social interactions during adolescence. However, few studies have focused on metaperceptions in adolescence, leaving open questions about how adolescents form metaperceptions and how they are linked to characteristics of their personalities and social interactions.

By investigating the role of metaperceptions, this dissertation aims to contribute to the understanding of the dynamic interplay between personality and social interactions in adolescence. To do so, I adopt a process-oriented, interdisciplinary approach to investigate the links between adolescents' personality characteristics, their metaperceptions, and key features of their social interactions. The structure of the first chapter is as follows: First, I introduce a theoretical framework which outlines the central concepts and processes involved in the interplay between personality and social interactions. This framework serves as the basis for organizing and classifying the specific constructs used in this dissertation. Second, I apply a developmental lens to explore the role of metaperceptions in adolescence and identify age-specific characteristics of personality and social interactions in this phase. Third, I integrate these research streams to pinpoint three types of processes in which adolescents' metaperceptions take a central role and review empirical findings related to the specific processes. Combining these theoretical and empirical findings, I conclude the chapter by formulating the overarching research questions.

1.1. A Process-Oriented Perspective on Personality and Social Interactions: the PERSOC Framework

The dynamic interactionist perspective highlights the reciprocal transactions between individuals and their social environment (e.g., Deventer et al., 2019; Neyer et al., 2014; M. van Zalk et al., 2020). To understand this interplay, it is necessary to consider both characteristics of individuals and of the social interactions they engage in, drawing from different

psychological research fields. The *PERSOC* framework (*PER*sonality and *SOC*ial relationships; Back, Baumert, et al., 2011; Back, 2021) addresses the need for such an interdisciplinary approach by integrating theories on personality structure and development (e.g., McCrae & Costa, 1987; Neyer & Asendorpf, 2001; Roberts & Wood, 2014) with social psychological theories focusing on interaction processes (e.g., Brunswik, 1956; Funder, 2012; Kenny & La Voie, 1984). At its core, PERSOC posits that the interplay between personality and social relationships takes place during social interactions and constitutes of specific processes that are driven by individuals' personalities, their interaction partners, and specific social features, such as relationship quality.

One key assumption in PERSOC is the distinction between stable and dynamic components in both personality and social interactions. The framework comprises variables at these two levels: Stable personality and relationship characteristics that persist across situations and situation-specific characteristics that vary within and across social interactions. Situation-specific characteristics include interpersonal perceptions, which encompass any perceptions that the target person and interaction partners form of each other (e.g., liking and being liked; Back & Kenny, 2010), and situational behavior cues, defined as any observable behavioral signals during an interaction (e.g., smiling, nodding; Baumeister et al., 2007). The cross-situational and situation-specific characteristics in PERSOC are interconnected through three overarching processes (see Figure 1.1.): First, stable cross-situational personality and relationship characteristics affect how social interactions unfold by shaping situation-specific perceptions and behaviors. Second, situation-specific perceptions and behaviors feed back into an individual's personality and their relationships over multiple interactions. Third, bidirectional relationships between situation-specific perceptions and behaviors make up situational dynamics within social interactions, resulting in unique social experiences (Back, Baumert, et al., 2011).

Given the broad range of characteristics at the cross-situational and situation-specific levels within the PERSOC framework, it is important to specify variables within the three processes to maintain theoretical precision (cf. Neyer & Asendorpf, 2018). To achieve this, I adopt a person-centered approach in this dissertation: Within the three overarching processes that characterize the interplay between personality and social interactions, I mainly concentrate on the personality of the target person and how it is linked to situation-specific perceptions. Furthermore, I focus on metaperceptions as a distinct type of situation-specific perception that play a central role in social interactions. In the upcoming section, I provide an overview of

personality concepts that have demonstrated significant relevance in social contexts and introduce the concept of metaperceptions.

Figure 1.1.

Schematic Overview of the PERSOC Framework
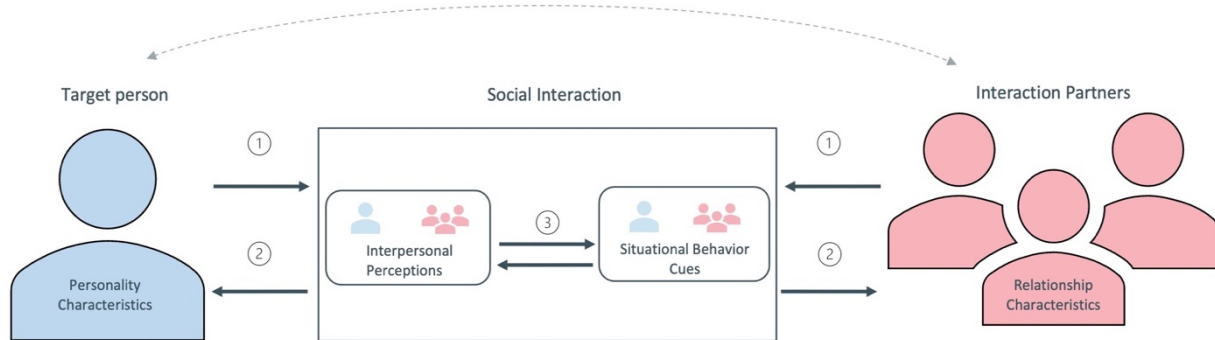
Note. Simplified overview of the PERSOC framework (Back, Baumert, et al., 2011), illustrating how cross-situational characteristics (i.e., stable personality traits and relationship characteristics) and situation-specific characteristics (i.e., interpersonal perceptions and situational behavior cues) are linked via three overarching processes: Process 1 reflects how personality and relationship characteristics affect situation-specific characteristics. Process 2 reflects how situation-specific characteristics feed back into personality and relationships. Process 3 reflects bidirectional links between perceptions and behaviors within social interactions.

1.1.1. Personality Characteristics of the Target Person

Aligned with the PERSOC framework (Back, Baumert, et al., 2011), conventional views conceptualize personality as a blend of stable traits (McCrae & Costa, 1987). Personality traits include enduring tendencies to perceive their social environment, interact with others, and experience emotions across situations (Roberts et al., 2006). However, insights from personality research suggest a more nuanced perspective: While traits remain foundational, personality also comprises malleable personality states (Baumert et al., 2017; Fleeson & Jayawickreme, 2015; Funder, 2001). Personality states are dynamic constructs that fluctuate from moment to moment and are shaped by stable traits as well as proximal situation features (Horstmann & Ziegler, 2020; R. A. Sherman et al., 2015). This dual structure of personality traits and states is important for understanding the underlying process of how situation-specific characteristics may impact an individual's personality. Contemporary theories of personality development (e.g., Geukes et al., 2018; Wagner et al., 2020; Wrzus, 2021) propose that recurrent changes in personality states contribute to gradual changes in traits over time, thereby changing stable personality in a bottom-up process. In the context of PERSOC (Back, Baumert, et al., 2011), personality traits can thus be understood as *default settings* that generally guide

people's understanding of their surroundings and social interactions. Conversely, personality states represent dynamic characteristics that illuminate how momentary expressions of personality are shaped both by the target person and their immediate social surroundings. Given this foundation, I consider both personality traits and states in this dissertation.

The Big Five Personality Traits

When talking about personality traits, researchers have adopted the *Big Five* taxonomy as a shared language to describe stable interindividual differences in personality (John & Srivastava, 1999). The Big Five—neuroticism, extraversion, openness, agreeableness, and conscientiousness—originate from the works of Gordon Allport and colleagues, who proposed that personality is composed of a hierarchical structure of traits ranging from broad dispositions to more specific descriptions of interindividual differences (Allport & Stagner, 1937). Factor analyses eventually led to the consensus of these five dimensions as the foundation for higher-order personality descriptions (Costa & McCrae, 2008; Soto & John, 2017).[1] While neuroticism pertains to an individual's tendency towards feeling anxious and stressed, extraversion describes the tendency to seek social interaction and enjoy being around others. Openness to experience denotes a tendency to seek out intellectual engagement, whereas agreeableness reflects the tendency to be compassionate and act in a modest and altruistic manner. Finally, conscientiousness encompasses the tendency to possess self-discipline and organize tasks efficiently. The Big Five dimensions have been applied across different age groups (Allik et al., 2004; Soto et al., 2008) and diverse cultural settings (e.g., John & Srivastava, 1999; Yamagata et al., 2006), providing a useful framework for studying the role of personality traits in social interactions.

Among the Big Five, extraversion and agreeableness have received considerable attention in social contexts due to their links to positive situation-specific behaviors and perceptions (e.g., Cuperman & Ickes, 2009; Funder & Sneed, 1993; Wilson et al., 2015). Moreover, neuroticism has been identified as a relevant predictor of interpersonal perceptions: Individuals high in neuroticism process social information more negatively (Denissen & Penke, 2008b; McNulty, 2008; Shiner, 2019). While these three traits have mostly been considered as predictors within social contexts (e.g., Ozer & Benet-Martínez, 2006), modern perspectives advocate for a more interactionist view and suggest that personality traits also represent differences in people's reactions to situation-specific perceptions and behaviors (Denissen &

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[1] Of note, there are other frameworks proposing varying numbers of higher-order traits (Bakan, 1966; DeYoung, 2015; Lee & Ashton, 2004). However, the Big Five taxonomy remains the most widely accepted and studied framework in personality research (Funder, 2001) and is therefore the focus of this dissertation.

Penke, 2008a; Mischel & Shoda, 1995; Tett & Guterman, 2000). This can be illustrated with the hypothetical case of Harry, who exhibits comparatively high extraversion levels. Harry's trait extraversion predicts his general approach to social interactions; he enthusiastically engages in conversations and displays genuine interest in others. In addition, his high extraversion level might also make him react more strongly to social cues of his interaction partners (e.g., smiling, nodding). Thus, personality traits—in particular extraversion, agreeableness, and neuroticism—likely play a dual role in the context of social interactions. On one hand, these traits contribute to the formation of situation-specific perceptions and behaviors, on the other hand they likely shape how people react to perceptions and behaviors in social interactions.

Taken together, I focus on the personality traits extraversion, agreeableness, and neuroticism given their importance in social contexts. By integrating the interactionist perspective on personality traits into the PERSOC framework (Back, Baumert, et al., 2011), I consider how the three traits manifest in the first overarching process outlined in PERSOC, illustrating how cross-situational personality traits act as default settings within social interactions (see Figure 1.1.).

Self-Esteem: Stable Trait and Dynamic State

Self-esteem—defined as a global self-evaluation reflecting positive or negative attitudes towards oneself (Leary & Baumeister, 2000; MacDonald & Leary, 2012)—ranks among the most widely investigated constructs in personality and social psychology research next to the Big Five. In contrast to the Big Five, researchers are often at odds about whether self-esteem should be conceptualized as a trait or a state (Donnellan et al., 2011). Some view self-esteem as a trait, with empirical evidence illustrating significant stability across the lifespan comparable to the Big Five traits (Orth & Robins, 2014; Trzesniewski et al., 2003; Wagner et al., 2016). Others argue for considering self-esteem as a state that fluctuates across situations and is strongly shaped by the environment (Greenier et al., 1999; Leary et al., 1998). Recent perspectives advocate for considering self-esteem both as a trait and state for understanding self-esteem changes (e.g., Braun et al., 2021; Hutteman et al., 2015; Reitz, 2022). In the following, I provide an overview of trait and state conceptualizations of self-esteem and discuss the utility of both within the context of the PERSOC framework (Back, Baumert, et al., 2011).

At trait-level, self-esteem represents a stable self-evaluation based on internal appraisal processes and external factors like social approval from others or physical appearance (Campbell et al., 2010; Thomsen et al., 2018). While self-esteem can also be viewed as a domain specific-construct (e.g., academic or social self-esteem), its focus markedly shifts

towards the social domain in adolescence and is commonly treated as a global construct from this age onwards (Harter, 2012). Similar to the Big Five personality traits, trait self-esteem represents a stable interindividual difference that shapes general tendencies to perceive their social context (Baumeister et al., 2003; Greenwald & Banaji, 1995): Individuals with higher trait self-esteem tend to interpret social cues more positively and generally anticipate positive social outcomes (Back et al., 2009; Murray et al., 2002).

Regarding self-esteem at state level, the seminal sociometer theory (Leary et al., 1995; Leary & Baumeister, 2000) proposes that momentary self-esteem represents a monitor that measures a person's perceived social inclusion. Sociometer theory builds on the assumption that due to the evolutionary significance of social inclusion for survival and well-being, momentary self-esteem operates as a universal surveillance mechanism. Despite being a universal mechanism, empirical evidence highlights differences in the extent to which people's momentary self-esteem reacts to perceptions of social inclusion. That is, people exhibit individual differences in their *self-esteem reactivity* (Greenier et al., 1999). Thus, while momentary self-esteem is sensitive to contextual influences and linked to perceptions of social inclusion during social interactions, the strength of this link may differ across individuals.

Collectively, both trait and state self-esteem can be integrated into the PERSOC framework (Back, Baumert, et al., 2011). On one hand, trait self-esteem reflects a default setting that informs the target person's perceptions and behaviors as outlined in the first overarching process (see Figure 1.1.). On the other hand, momentary self-esteem introduces a dynamic personality construct at the situation-specific level to the framework that is molded by situation-specific perceptions within social interactions, as outlined in the second process. The dual inclusion of trait and momentary self-esteem thus allows for a comprehensive understanding of how personality characteristics shape social interactions and how social interactions, in turn, link to changes in contextualized, situation-specific personality characteristics.

1.1.2. Metaperceptions: Navigating the Interplay Between Personality and Social Interactions

The PERSOC framework (Back, Baumert, et al., 2011) emphasizes that to understand the interplay of personality and social interactions, it is necessary to consider situation-specific characteristics alongside cross-situational characteristics like personality traits and trait self-esteem. In the scope of this dissertation, I focus on metaperceptions—peoples' beliefs about

how others perceive them (Kenny & DePaulo, 1993)[2]—as a key element within the three outlined processes (see Figure 1.1.) that link an individual's personality to their immediate social environment.

Choosing metaperceptions as a focal variable within social interaction processes is based on two rationales: First, metaperceptions are a cornerstone in sociometer processes that link social experiences to momentary self-esteem (Leary et al., 1995). This way, metaperceptions shape how satisfied or dissatisfied a person feels about themselves while also having a social function in regulating impressions in social interactions (Carlson, 2016; Eisenkraft et al., 2017; Grutterink & Meister, 2022; Schlenker & Weigold, 1992). Second, the formation of metaperceptions offers a lens through which to explore the dynamic interplay between stable traits and dynamic situational factors. Conceptual models highlight two primary sources that people draw upon when forming metaperceptions (e.g., Ames, 2004; Elsaadawy et al., 2022; Kenny & DePaulo, 1993): their self-viewed personality (i.e., how people see themselves) and social experiences made within the interaction (i.e., the social feedback they get from others). However, to date, few of these conceptual models have made assumptions about how specific social experiences within social interactions inform metaperception formation dynamically alongside personality traits. On one hand, people may use behavioral reactions of social interaction partners as social feedback to inform and update their metaperceptions during social interactions (Elsaadawy et al., 2022; Kaplan et al., 2009). On the other hand, individuals may use their subjective experiences captured in their own perceptions during interactions to form metaperceptions, such as how much they like their interaction partners (Kenny, 2020; Malloy, 2018; Montoya & Insko, 2008).

Summarizing, metaperceptions are conceptualized as situation-specific characteristics within the PERSOC framework (Back, Baumert, et al., 2011). They are involved in all three outlined processes that characterize the interplay between personality and social interactions: The initial formation of metaperceptions is likely tied to stable personality default settings (Process 1), and metaperceptions also feature in sociometer processes, being linked to momentary self-esteem (Process 2). Finally, metaperceptions require an active and continuous engagement with the social context to pick up on social feedback of interaction partners, while the target person's own situation-specific perceptions are related to their metaperceptions

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[2] Psychologists across research fields have used different terms to study metaperceptions (e.g., reflected self, reflected appraisal, or perceived regard; Cooley, 1902; Grutterink & Meister, 2022; Wallace & Tice, 2012). The terms share a common core, reflecting beliefs that people form of what others think of them. In this dissertation, I follow the terminology used in interpersonal perception research (Kenny, 2020) and refer to metaperceptions.

during interactions (Process 3). Taken together, metaperceptions serve as a bridge connecting personality and the dynamics of social interactions.

1.2. A Developmental Perspective on Personality and Social Interactions in Adolescence

In previous sections, I reviewed the theoretical relevance of specific cross-situational and situation-specific characteristics within the PERSOC framework to comprehend the interplay of personality and social interactions. However, it is important to note that personality and social interactions change depending on the developmental stage of the individual (Baltes et al., 2007; Lerner & Walls, 1999), potentially leading to age-specific patterns in their interplay. One phase marked by profound changes in personality and the social context is adolescence (Hill, 1983; Steinberg, 2020). Adolescence spans the period between the onset of puberty and the transition into adult roles, such as work and parenthood (Arnett, 2007; Lerner & Steinberg, 2009). Due to the many changes across biological, cognitive, and social domains occurring during this time, adolescence is commonly divided into three phases: early adolescence (10-13 years), mid-adolescence (14-16 years), and late adolescence (17-19 years; (Lerner & Steinberg, 2009; Smetana et al., 2006). However, these age-based classifications are only approximate due to significant interindividual differences in the timing of puberty and the transition to adulthood (Steinberg, 2020).[3] In this dissertation, I concentrate on the age range encompassing mid- and late adolescence, which I collectively refer to "adolescence".

In the upcoming section, I draw on developmental literature to introduce two prominent developmental tasks that describe age-specific characteristics of adolescents' personalities and their social interactions. Subsequently, I discuss age-related developments of social cognition that are relevant for understanding the formation and functions of adolescents' metaperceptions in social contexts.

1.2.1. Major Developmental Tasks in Adolescence

Educational psychologist Robert Havighurst (1948) introduced the concept of developmental tasks, which describe normative challenges encountered in different life stages. He proposed that these tasks emerge from the interplay between age-specific biological processes, individual attributes, and societal expectations (Havighurst, 1948, 1953).

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[3] Some researchers have proposed a fourth stage of *emerging adulthood*, encompassing the early to mid-20s before individuals transition into adulthood to reflect the evolving societal demands and roles in the modern world (Arnett, 2007). However, this phase may not be universally applicable to all cultures or societies (Côté & Bynner, 2008; Kloep & Hendry, 2014).

Accomplishing developmental tasks equip individuals with the skills to navigate obstacles and foster personal growth. The idea of developmental tasks has been adapted by numerous researchers (e.g., Erikson, 1968; Grob & Jaschinski, 2003; Hurrelmann & Quenzel, 2018; Hutteman et al., 2014; Seiffge-Krenke & Gelhaar, 2008) and offers a valuable framework for studying the structural and normative aspects of adolescence. However, while some of the tasks proposed by Harvighurst (1953) are considered universally important across different cultures and time periods (McCormick et al., 2011), others may not be as relevant for all adolescents nowadays. For example, becoming financially independent from parents or forming close relationships with peers are still important tasks for adolescents today across cultures. In contrast, preparing for marriage may not be as relevant now due to changes in how and when individuals transition into adulthood, and there may be significant variations between Western and non-Western cultures (Seiffge-Krenke & Gelhaar, 2008).[4] Thus, it is important to recognize that developmental tasks can vary based on cultural, societal, and individual factors (Eschenbeck & Knauf, 2018).

In this dissertation, I focus on two developmental tasks that are commonly applicable to adolescents across various societies and cultural contexts and have been recognized in different developmental frameworks of adolescence (Eschenbeck & Knauf, 2018; Hill, 1983; Hurrelmann & Quenzel, 2018; Steinberg, 2020). The first task focuses on building a clear and stable sense of self, which I refer to as *personality formation*. The second task centers around forming meaningful social relationships beyond the family sphere, which I refer to as *social relationship formation*.

Personality Formation

There is a consensus that adolescence is marked by a substantial reorganization and restructuring of the individual's sense of self (e.g., Steinberg, 2020), and researchers have approached these developmental changes at the person level through various lenses. One approach centers on the formation of a self-concept, which refers to the personality traits and attributes individuals see in themselves (Asendorpf et al., 2002; Harter, 2012). This stream of research largely focuses on the expression and development of the Big Five traits and self-esteem during adolescence (e.g., Soto & John, 2014; Soto & Tackett, 2015; Wagner et al., 2013, 2018). Another approach is influenced by Erikson's works on the identity of adolescents (1959, 1968), focusing on the person they are and want to be, the roles they aspire in adulthood, and

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[4] Researchers today propose that responsible media consumption and selecting leisure activities are additional developmental tasks that adolescents need to handle (Hurrelmann & Quenzel, 2018). However, these tasks appear to be predominantly relevant in industrialized countries and may vary across cultures (Eschenbeck & Knauf, 2018).

their place in society (e.g., Branje et al., 2021; Crocetti, 2017; Klimstra, 2013; Marcia, 1980). Although interconnected, adolescents' self-concepts and their identities are often studied separately due to the multifaceted and complex nature of both constructs (Klimstra, 2013). The current work follows the first approach and focuses on the developmental task of personality formation through the lens of the self-concept, operationalized as adolescents' self-views of their personality traits.

From a developmental viewpoint, adolescent personality exhibits distinctive features when compared with other life stages. First, research on personality development illustrates that personality traits—both Big Five traits and trait self-esteem—increase in stability from childhood to early adolescence and beyond (Borghuis et al., 2017; Chung et al., 2017; Roberts & DelVecchio, 2000; Trzesniewski et al., 2003; Wagner et al., 2018), and self-report assessments become suitable for assessing personality traits (e.g., Brandt et al., 2020; Soto & Tackett, 2015). However, despite an apparent trend towards increased stability in personality traits across adolescence, there are also substantial interindividual differences in the degree and direction of personality trait change in adolescence that distinguish it from adulthood (e.g., Borghuis et al., 2017; Chung et al., 2017; Wagner et al., 2018). Second, theoretical notions complement these observations by emphasizing the dynamic nature of personality during adolescence. For instance, social cognition theories suggest that adolescents are particularly receptive to social feedback, which they use as a source of personality formation (Blakemore & Choudhury, 2006; Harter, 2012). In addition, the theory of symbolic interactionism (Cooley, 1902; Mead, 1934) postulates that social interactions represent opportunities for adolescents to infer others' opinions of them (i.e., "reflected appraisals") which they integrate into their self-views—an idea that strongly resonates with the concept of metaperceptions and sociometer processes (see Section 1.1.1).

In summary, the combination of the relative stability of personality traits and adolescents' sensitivity to social feedback has potential implications for the processes characterizing the interplay of adolescent personality and their social interactions. On one hand, the functionality of personality traits may be the same as in adulthood, with traits serving as default settings that shape situation-specific metaperceptions. On the other hand, the heightened social sensitivity may make the links between metaperceptions and personality in sociometer processes particularly salient during adolescence.

Social Relationship Formation

In parallel to the developmental changes occurring at the person level, adolescents also face profound changes in their social environments. Many of these social changes revolve

around interactions with peers, defined as social equals who share similar levels of behavioral complexity (Brown, 2004; Hartup, 1996; Lewis & Rosenblum, 1975; Rubin et al., 2007). As adolescents strive for greater autonomy from their parents, their interactions with peers become more frequent and intense (Smetana, 2002). Remarkably, adolescents spend over 40% of their daily social exchanges with peers (Vierhaus & Wendt, 2018). These extensive peer interactions serve two functions: At a practical level, peer interactions facilitate learning social skills and behaviors that are important for psychosocial adaption and psychological well-being (Rubin et al., 2007). On a broader scale, peer interactions are necessary to expand social networks beyond the familial setting (Wrzus et al., 2013). Consequently, achieving social acceptance within peer groups emerges as a central developmental undertaking during adolescence (Cillessen & Borch, 2006; de Vries et al., 2020; Newman et al., 2007).

In the pursuit of peer acceptance, adolescents become acutely aware of the impressions they leave on their peers, leading them to think about whether others hold positive opinions of them (e.g., Andrews et al., 2021; Somerville, 2013). This reflective process gives rise to a specific metaperception type termed *meta-liking* (Elsaadawy et al., 2023). Meta-liking provides cues that help discern whether social contacts should be continued or avoided. Thus, meta-liking becomes instrumental in steering adolescents toward socially accepting contexts while avoiding situations predisposed to rejection and can be understood as an early indicator of social inclusion in social interactions. The next sections introduce two contexts of adolescent social interactions with peers where meta-liking judgments stand out as particularly intriguing to investigate: zero-acquaintance interactions and virtual interactions.

Social Interactions at Zero-Acquaintance. Zero-acquaintance interactions mark the start of social relationships where individuals form first impressions of each other with minimal information about interaction partners (Ambady & Skowronski, 2008). As the common belief "first impressions count" suggests, this context carries a great deal of information: On one hand, initial perceptions are already relatively stable and can have a lasting impact on subsequent interactions and relationships (Breil et al., 2021; Human et al., 2020), making zero-acquaintance interactions an important foundation for subsequent relationships. On the other hand, zero-acquaintance contexts offer a unique opportunity for researchers to examine cues and processes that shape the formation of perceptions devoid of specific relationship influences (Ambady & Skowronski, 2008). Given the relevance of building peer relationships in adolescence, there is thus much to be gained in studying zero-acquaintance interactions as a specific social setting.

Social Interactions in Virtual Settings. The increasing possibilities of interacting via social network platforms and video chats are changing the social interactions of adolescents

today. The common differentiation used in research between "real world" versus virtual interactions seems outdated: Approximately 70% of individuals aged between 15–24 have internet access and use it for meeting people and maintaining their friendships, thereby rendering the online realm very much a reality for them (N. van Zalk & Monks, 2020). For instance, emerging evidence suggests metaperceptions have similar social functions in online and in-person settings (Tissera et al., 2023) and that virtual social interactions in general can positively impact the well-being of college students (Kroencke et al., 2023). Research concentrating on adolescents has so far mostly focused on media usage and its potential negative effects (see Odgers & Jensen, 2020), leaving interpersonal perceptions and interaction processes in virtual contexts largely unexplored. However, given the omnipresence of digital technologies in adolescents' lives, investigating social interactions in virtual settings is important—not only for understanding differences between virtual and in-person environments, but also for informing guidelines for responsible technology usage for adolescents and caretakers.

1.2.2. Socio-Cognitive Characteristics of Adolescence

Given that adolescents' metaperceptions likely play a role in both developmental tasks of personality formation and social relationship formation, it is necessary to consider changes in social cognition that may impact the formation and functions of metaperceptions during this time. Overall, adolescence is a time of cognitive growth with individuals showing significant improvements in abstract thinking, information processing, and reflective processes (Andrews et al., 2021; Blakemore & Choudhury, 2006; Keating, 2012). These improvements typically manifest in early adolescence with basic cognitive capacities comparable to those of adults by mid-adolescence (Steinberg, 2020). Classic developmental theories (Inhelder & Piaget, 1958; Selman, 1986) propose that these cognitive changes are accompanied by changes in social cognition, progressing through stages from basic to more complex levels: First, interpersonal perceptions become more abstract and complex. Second, individuals increasingly note differences between their own and others' perceptions, which leads to an improved social awareness (Shaffer & Kipp, 2014). While these theoretical notions have informed extensive research, contemporary views challenge the idea that cognitive development occurs in distinct stages and suggest that development is a gradual process that continues beyond adolescence (Kuhn, 2009). Thus, while adolescence is a period of increased ability to form metaperceptions, there may be significant interindividual differences in the extent to which these skills are used and in which situations they are applied.

Another classic developmental perspective suggests that socio-cognitive changes are accompanied by an increased self-awareness and the recognition of one's own individuality (Elkind, 1967): An egocentric bias known as a *spotlight effect* (Gilovich et al., 2000) is assumed to skew adolescents' metaperceptions, with individuals overestimating the extent to which their actions and appearance are judged by others. Thus, adolescents might be capable of forming metaperceptions but are preoccupied by an increased focus on themselves. The idea of an egocentric bias in adolescence has been criticized, with empirical findings demonstrating that spotlight effects are also present in adult perceptions (Vartanian, 2000). However, it remains likely that the acquisition of new cognitive skills, such as forming complex metaperceptions, comes with the challenge of forming them accurately in social interactions.

Accurate metaperceptions are usually determined as the extent to which metaperceptions of personality reflect the actual other-perceptions of interaction partners (Carlson, 2016; Kenny & DePaulo, 1993). In other words, do adolescents' beliefs of how others see their personality reflect how they are seen in reality? Prior research differentiates between two components to answer this question: *distinctive meta-accuracy* and *meta-positivity*. In essence, distinctive meta-accuracy refers to the extent to which individuals accurately understand how specific interaction partners perceive their personality, while meta-positivity centers on beliefs about being positively perceived by others in general (Carlson, 2016; Tissera et al., 2021). Meta-accuracy and meta-positivity of personality metaperceptions are considered independent components that can impact situational dynamics in meaningful ways by predicting subsequent perceptions in interactions (e.g., being liked and liking others; Tissera et al., 2023; West & Kenny, 2011). Thus, to understand how adolescents form metaperceptions and how different types of perceptions are connected to form situational dynamics, one important aspect is to consider whether adolescents achieve meta-accuracy and meta-positivity.

1.3. Conceptual Integration and Empirical Evidence

In the previous sections, I reviewed personality, social, and developmental perspectives and concepts that are relevant to understand the interplay between personality and social interactions in adolescence. In the following, I integrate these theoretical underpinnings by incorporating specific concepts to examine tangible processes that characterize this interplay as outlined in the PERSOC framework (Back, Baumert, et al., 2011, Figure 1.1.). Following the introduction of each process, I provide an overview of empirical findings and discuss remaining gaps in the literature regarding these processes underlying the interplay of personality and social interactions in adolescence.

1.3.1. Process 1: Personality Traits as Default Settings

From the overarching PERSOC framework (Back, Baumert, et al., 2011), it emerges that one central process characterizing the interplay between personality and social interactions is how cross-situational personality variables predict situation-specific features within social interactions (Section 1.1). Furthermore, contemporary approaches to personality (Denissen & Penke, 2008a) highlight two functions of stable personality traits—in particular extraversion, agreeableness, neuroticism, and trait-self-esteem—acting both as predictors and as moderators of reactions within social interactions (Section 1.1.1). Finally, developmental perspectives show that personality traits are increasingly stable in adolescence (Roberts & DelVecchio, 2000), suggesting that their functionality within social contexts may be similar to that observed in adulthood (Section 1.2.1).

The integration of these personality concepts and developmental perspectives offers insights into how adolescent personality traits (i.e., extraversion, agreeableness, neuroticism, and trait self-esteem) may serve as default settings for adolescents' situation-specific metaperceptions. In the context of adolescence, both the predictive and moderating functions of the outlined traits are particularly intriguing with respect to meta-liking judgments that gain importance in interactions with peers (Somerville, 2013). On one side, the predictive function of extraversion, agreeableness, neuroticism, and trait-self-esteem can contribute to the formation of meta-liking. Meta-liking judgments, especially those in zero-acquaintance settings, are likely informed by heuristics (Kenny, 2020), meaning that people draw on their default settings and their general idea of how others perceive them (Ames, 2004; Elsaadawy et al., 2022). Going back to the example of Harry: An extraverted person like Harry might form positive meta-liking judgments, generally believing that he is well-liked. As a result, Harry may approach others with higher motivation, prompting him to engage actively in an interaction. Thus, his positive initial meta-liking judgments (i.e., at zero-acquaintance) can set the stage for an engaging first interaction. This example highlights how personality traits may guide adolescents in anticipating positive or negative social outcomes (i.e., being liked).

On the other side, investigating how the Big Five traits (i.e., extraversion, agreeableness, and neuroticism) shape the reactions to meta-liking is equally important, especially regarding the close theoretical connection between meta-liking and adolescents' momentary self-esteem (Harter, 2012; Leary et al., 1998). Turning to Harry again: His high level of extraversion might make him more receptive to positive meta-liking judgments (e.g., perceiving to be liked by others) or buffer potentially harming effects of negative meta-liking judgments (e.g., perceiving to be disliked). That is, in a situation where he forms negative meta-liking judgments, his

momentary self-esteem might bounce back more swiftly compared to someone with lower extraversion. Thus, this moderating function of personality traits may strengthen or dampen the link between meta-liking and momentary self-esteem, explaining interindividual differences in self-esteem reactivity.

In conclusion, exploring the processes of how adolescent personality traits are linked to meta-liking sheds light on the functionality of adolescent personality in social contexts. Such insights have the potential to unravel the nuanced dynamics of the personality-social interaction interplay and interindividual differences therein, fostering a deeper understanding of how adolescents navigate and thrive within social contexts (Back et al., 2023).

Empirical Evidence

Extensive research spanning adult and adolescent samples illustrates that individuals with higher levels of extraversion or agreeableness have more positive social interactions and tend to form more positive interpersonal perceptions (Duffy et al., 2018; Funder & Sneed, 1993; Mehl et al., 2006; Wilson et al., 2015). Specifically, adolescents high in extraversion seem to perceive others more positively (Selfhout et al., 2010; Wieczorek et al., 2021) and are perceived as more likable by peers (de Vries et al., 2020; Hubers et al., 2016; van der Linden et al., 2010). Adolescents with higher agreeableness levels tend to experience fewer conflicts in their interactions with others (Jensen-Campbell & Graziano, 2001) and they are more often perceived as likable and chosen as friends by their peers (de Vries et al., 2020; Jensen-Campbell et al., 2002; Selfhout et al., 2010; van der Linden et al., 2010). In alignment, studies focusing on adult samples reveal that people high in extraversion or agreeableness generally form positive meta-liking judgments, expecting that they are well-liked by others (Cuperman & Ickes, 2009). While extraversion and agreeableness are associated with positive social interactions, neuroticism has been linked to a more problematic interpersonal style (Hampson, 2012; Shiner, 2019). In general, adults high in neuroticism report more negative interpersonal perceptions (Finn et al., 2015; McNulty, 2008; Mueller et al., 2019). This result pattern is similar in adolescence, where individuals with increased neuroticism tend to perceive greater levels of conflict in their daily social interactions (Borghuis et al., 2020) and form less positive perceptions of both their own and others' behaviors (Wieczorek et al., 2021). Evidence concerning the specific link between neuroticism and meta-liking is mixed, as some studies propose that adults with higher neuroticism anticipate being liked less in initial encounters (Back, Schmukle, et al., 2011), while others do not find significant associations with metaperceptions (Cuperman & Ickes, 2009).

Beyond the Big Five traits, empirical findings show that a person's trait self-esteem is related to perceptions and behaviors within social interactions (Baumeister et al., 2003). Notably, self-esteem does not exhibit a clear link with being perceived as more likable or perceiving others in a more positive way (Back, Schmukle, et al., 2011; Moritz & Roberts, 2020). However, insights from adult studies indicate a robust association between self-esteem and meta-liking judgments. Individuals with higher trait self-esteem tend to expect more positive feedback during social interactions (Back, Schmukle, et al., 2011; Hepper et al., 2011), while those with lower self-esteem often underestimate how positively they are seen by others (Moritz & Roberts, 2020; Murray et al., 2002).

Concerning the role of the three Big Five traits (i.e., extraversion, agreeableness, and neuroticism) in self-esteem reactivity, little is known as to how extraversion and agreeableness shape the link between meta-liking and momentary self-esteem. High extraversion levels are generally thought to be associated with greater reactivity to pleasant cues; yet research has questioned this general reactive effect, showing that highly extraverted individuals do not necessarily react stronger to social cues (Lucas et al., 2000; Lucas & Diener, 2001). However, findings illustrate that people high in extraversion report more positive social events, and the increased quantity of social interactions may have buffering effects on negative social experiences (Longua et al., 2009). Regarding agreeableness, evidence suggests that lower levels of agreeableness might induce stronger emotional reactions to cues of social rejection in adults (Wang et al., 2017; Wilkowski et al., 2006). With respect to self-esteem reactivity specifically, recent findings link higher levels of agreeableness to stronger self-esteem reactions to perceived social inclusion in adults (Mahadevan et al., 2019). Finally, neuroticism has received substantial research attention due to its presumed reactive component to threatening stimuli (Evans et al., 2016; Robinson, 2007; Suls & Martin, 2005). In social contexts, neuroticism seems to be an important predictor of self-esteem reactivity: Higher levels of neuroticism have been linked to stronger self-esteem decreases when perceiving rejection cues both in adult (Denissen & Penke, 2008b) and adolescent samples (Poorthuis et al., 2014).

Taken together, the current body of research underscores the associations between higher levels of extraversion, agreeableness, and trait self-esteem with positive meta-liking judgments, while neuroticism tends to be linked to a negative bias in meta-liking. However, there is a notable lack of studies investigating the links between personality and meta-liking specifically in the context of adolescent social interactions at zero-acquaintance. Additionally, there is a substantial knowledge gap regarding how the three Big Five traits are related to self-esteem reactivity within adolescents' social interactions. Initial findings suggest differences in

how extraversion, agreeableness, and neuroticism are linked to reactions to different social cues (e.g., Robinson, 2007), potentially moderating how individuals' momentary self-esteem reacts to meta-liking judgments. Given that developmental research suggests a heightened sensitivity to social feedback during adolescence (Blakemore & Choudhury, 2006; Harter, 2012), investigating whether personality traits contribute to this reactivity by strengthening or dampening the link between meta-liking and momentary self-esteem is an important part of understanding the interplay of personality and social interactions.

1.3.2. Process 2: Metaperceptions in the Sociometer Process

A second key process in PERSOC involves the link between situation-specific variables and personality (Section 1.1). The idea of this social feedback process is detailed in sociometer theory (Leary et al., 1995), proposing a link between metaperceptions of social inclusion and momentary self-esteem (Section 1.1.1). Developmental perspectives (Cooley, 1902) emphasize the role of metaperceptions in social contexts as important contributors to adolescents' self-views (Section 1.1.2). Furthermore, socio-cognitive perspectives (Andrews et al., 2021; Somerville, 2013) highlight a growing sensitivity to meta-liking as a specific marker of social inclusion in peer interactions (Section 1.2.1).

Integrating these complementary ideas and perspectives, meta-liking once more emerges as a key concept in the scope of this dissertation, serving as an indicator of social inclusion in sociometer processes. Given adolescents' heightened need for peer approval (e.g., Rubin et al., 2007), it is likely that individuals constantly monitor their social inclusion, suggesting that they continuously form and reassess their meta-liking within social interactions with peers, which feeds back into their momentary self-esteem. This idea fits with the assumption that the sociometer is a universal process (Leary & Baumeister, 2000) and suggests that the link between meta-liking and momentary self-esteem manifests across different types and settings of social interactions. Specifically, sociometer processes should be evident not only in interactions with familiar peers but also in interactions at zero-acquaintance, which play a foundational role in building peer relationships (Ambady & Skowronski, 2008). Additionally, sociometer processes likely extend beyond traditional in-person encounters to encompass virtual social interactions, which are relevant social settings for adolescents today (Van Zalk & Monks, 2020; see Section 1.2.1). In the case of Harry, this means that his sociometer is constantly switched on when interacting with unfamiliar peers, whether it be in face-to-face or in virtual spaces. Consequently, his belief of being liked or disliked by peers may lead to fluctuations in his momentary self-esteem during these social interactions. To sum up,

investigating the outlined sociometer processes in the context of adolescent social interactions with peers across different social settings is important to understand fluctuations in momentary self-esteem and serves as a starting point for unraveling the underlying mechanisms of how social experiences could contribute to personality changes over time (e.g., Back et al., 2023; Baumert et al., 2017).

Empirical Evidence

Research has revealed a robust link between perceptions of social inclusion and long-term changes in trait self-esteem across childhood (Magro et al., 2019), adolescence (Bishop & Inderbitzen, 1995; Gruenenfelder-Steiger et al., 2016; Poorthuis et al., 2014; Reitz et al., 2016; Wagner et al., 2018), and adulthood (de Moor et al., 2021; Denissen et al., 2008; Leary et al., 1998).[5] In addition, empirical evidence supports short-term sociometer processes, linking perceptions of social inclusion to momentary self-esteem in adult samples (Blackhart et al., 2009; Koch & Shepperd, 2008; Murray et al., 2003; Srivastava & Beer, 2005; Willms et al., 2023). While there is somewhat less empirical research on adolescents, there are several studies demonstrating short-term sociometer processes in school contexts (Schmidt et al., 2021; Thomaes et al., 2010) and daily social interactions (Wagner et al., 2023).

Reviewing prior research on sociometer processes reveals varying assessments of social inclusion perceptions. Studies have often used a blend of self- and metaperception items such as perceived social acceptance or relationship quality as indicators of social inclusion (Denissen et al., 2008; Gruenenfelder-Steiger et al., 2016; Hutteman et al., 2015; Wagner et al., 2018). Yet again, some studies have operationalized social inclusion as other-perceptions of liking from peers to study sociometer processes (e.g., Reitz et al., 2016; Srivastava & Beer, 2005).

To conclude, there is a consensus in the literature that sociometer processes operate universally in social contexts, spanning various life stages including adolescence. However, several questions remain unanswered regarding short-term sociometer processes in adolescence. First, little attention has been directed towards sociometer processes within social interactions outside of the school context. As such, the extent to which short-term sociometer processes generalize to different social settings, particularly those involving zero-acquaintance or virtual settings, remains largely unexplored. Second, although metaperceptions such as meta-liking judgments are considered the central mechanism in sociometer processes (Leary et al., 1995), their comprehensive exploration in the context of adolescence and its comparison to

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[5] A recent meta-analysis (Harris & Orth, 2020) suggests a reciprocal relationship between social relationships and trait self-esteem across age groups, suggesting a positive feedback loop between positive social experiences and self-esteem over time.

other operationalizations of social inclusion (e.g., self- or other-perceived social inclusion) in sociometer processes warrant further investigation.

1.3.3. Process 3: Situational Dynamics

A third process category highlighted in PERSOC refers to the links between different interpersonal perceptions and situational behavior cues within social interactions that constitute the fabric of social experiences (Section 1.1). In this dissertation, the primary focus lies on understanding the situational dynamics revolving around the formation of adolescents' meta-liking, given the importance of these specific metaperceptions in sociometer processes discussed above and their presumed role in guiding social interactions with peers (Section 1.2.1). Conceptual models of metaperception formation (Elsaadawy et al., 2022; Kenny & DePaulo, 1993) propose that people draw upon their self-viewed personality, but also on their social experiences to form and meta-liking judgments during social interactions (Section 1.1.2). At the same time, theoretical perspectives on socio-cognitive development (e.g., Blakemore & Choudhury, 2006; Keating, 2012) suggest that adolescents' capacities to perceive and interpret social information undergo substantial changes, which may impact the situational dynamics of their social interactions and the formation of metaperceptions (Section 1.2.2).

Integrating these different perspectives, adolescents likely draw on different sources to form meta-liking judgments: their self-viewed personality (see Process 1 outlined in Section 1.3.1), behavioral signals from interaction partners, and their own perceptions within the interaction. Zero-acquaintance interactions provide an intriguing context for disentangling the connections between these information sources and meta-liking: While meta-liking judgments at the very beginning may primarily depend on people's general default settings (i.e., their personality traits), new social information that becomes available during in the interaction may gain more weight in predicting meta-liking and changes therein. To illustrate this, picture Harry again: His meta-liking might be anchored in his personality traits at the beginning of an interaction, meaning that his default expectation is to be liked by others when he does not have any other information on his peers. As the interaction progresses, he may perceive behavioral cues (e.g., being smiled or frowned at) from his interaction partners, leading him to increase or decrease his meta-liking. Additionally, Harry might come to like his peers more during the interaction and use his sense of this dynamic (i.e., how much he likes others) to inform his meta-liking, a process called *assumed reciprocity* (Montoya & Insko, 2008). Consequently, it is likely that the different information sources—personality traits and social experiences—play distinct roles in the formation of meta-liking judgments, with situational experiences (i.e.,

behavioral cues and assumed reciprocity) driving a dynamic updating of meta-liking during interactions.

In addition to this dynamic updating of meta-liking, it is an intriguing question how more complex situational dynamics such as meta-accuracy and meta-positivity of personality metaperceptions manifest in adolescents' social interactions and are linked to meta-liking judgments. Considering personality metaperceptions alongside the actual other-perceptions of peers can yield insights into how well adolescents understand how specific peers view them (distinctive meta-accuracy) and how positively they think that others see them in general (meta-positivity; see Section 1.2.2). Both of these components may predict subsequent meta-liking judgments; however, socio-cognitive theories offer different perspectives on how these complex dynamics may manifest during adolescent social interactions. On one hand, adolescents' heightened awareness to social cues (e.g., Smetana & Villalobos, 2009) might result in fairly high levels of meta-accuracy which could predict meta-liking judgments. For example, if Harry accurately understands how his peers see his personality (i.e., he exhibits high meta-accuracy in his personality metaperceptions), this might lead to feelings of being understood and could contribute positively to his meta-liking. On the other hand, a potential spotlight effect (Elkind, 1967) introduces the possibility that adolescents might focus primarily on their subjective perceptions within the interaction. This could mean that adolescents do not achieve high levels of meta-accuracy and rather draw on their sense of how positively they think that others view them (indicated by meta-positivity) to inform their meta-liking judgments. Thus, if Harry maintains a positive view of how others perceive his personality (i.e., high meta-positivity in personality metaperceptions), regardless of whether this perception aligns with reality, he may increase his meta-liking as well.

To sum up, investigating situational dynamics revolving around metaperceptions can yield novel insights into if and how adolescents can effectively use their cognitive capabilities to integrate social feedback from behavioral cues, accuracy, and positivity information into their meta-liking judgments as they navigate social situations. These insights hold particular significance in light of developmental perspectives that underscore the pivotal role of metaperceptions in achieving developmental task related to personality formation and the establishment of meaningful social relationships.

Empirical Evidence

Research shows that adults tend to rely somewhat more on their self-viewed personality traits than the social feedback they receive during interactions when forming metaperceptions (Kenny & DePaulo, 1993). However, empirical findings suggest behavioral cues of interaction

partners within social interactions do predict individual's metaperceptions as well (Kaplan et al., 2009), and ample research provides evidence for assumed reciprocity dynamics, illustrating links between perceptions of liking others and expecting to be liked (Elsaadawy et al., 2023; Montoya & Horton, 2014; Rau et al., 2022). Additionally, recent research investigated changes in interpersonal perceptions within zero-acquaintance contexts and beyond (Rau et al., 2022), demonstrating that people change and update their interpersonal perceptions based on their subjective interaction experiences. This situational updating could also apply to metaperceptions, which have been found to fluctuate across social interactions (Salazar Kämpf et al., 2018).

Regarding the associations between personality metaperceptions (i.e., meta-accuracy and meta-positivity) and meta-liking judgments, prior research provides few insights to date. Several studies demonstrated that adults display both meta-accuracy and meta-positivity samples (e.g., Carlson & Furr, 2009; Elsaadawy et al., 2023; Moritz & Roberts, 2018), yet it is not known whether these findings generalize to adolescent samples. Moreover, initial findings focusing on adult samples link higher levels of meta-accuracy to more positive other-perceptions (i.e., being liked more), while higher levels of meta-positivity have been linked to more positive perceptions of the target person (i.e., liking others more; Carlson, 2016; Tissera et al., 2021). Recent findings suggest that these links generalize to virtual contexts in adult samples (Tissera et al., 2023). Across these studies, meta-accuracy, meta-positivity and liking perceptions were assessed concurrently after social interactions.

In summary, existing research suggests that people draw upon different sources to form their meta-liking judgments during social interactions. However, prior studies have largely adopted cross-sectional and static designs, assessing metaperceptions only at the end of an interaction (e.g., Tissera et al., 2021). Thus, little is known about the role of situational dynamics in meta-liking formation, both in adult and in adolescent populations. Notably, all reviewed studies have exclusively focused on adult samples, leaving a critical gap in our understanding of how adolescents integrate different situation-specific information from interaction partners' behaviors to situational perceptions into their meta-liking judgments.

1.4. Research Objectives

The overarching research objective of this dissertation is to deepen the understanding of the interplay between personality and social interactions during adolescence. To achieve this goal, I integrated insights from personality, social, and developmental psychology into a comprehensive framework that guides this dissertation. Within this framework, I examine three

interrelated processes revolving around adolescents' metaperceptions (see Figure 1.2). Drawing on empirical evidence, I highlighted research gaps pertaining to each of the three processes, which result in the following research questions: First, to what extent do adolescents' personality traits represent default settings linked to meta-liking and self-esteem reactions to meta-liking in social interactions? This broad question addresses the potential dual function of personality, where personality traits may predict meta-liking but also shape self-esteem reactivity by moderating the link between meta-liking and momentary self-esteem (*Process 1: Personality Traits as Default Settings*). Second, how do meta-liking judgments relate to adolescents' momentary self-esteem? This question addresses sociometer processes (*Process 2: Metaperceptions in the Sociometer Process*) and aims to gain conceptual clarity by exploring the links between meta-liking and momentary self-esteem within the context of other interpersonal perceptions. Third, how are specific social interaction experiences (i.e., behavioral cues and situation-specific perceptions) linked to meta-liking and meta-liking changes within the social interaction (*Process 3: Situational Dynamics*)? With this final research question, I aim to gain a deeper understanding of situational dynamics that form an integral part of the personality-social interaction interplay.

This dissertation addresses the need for a process-oriented and age-sensitive perspective on the interplay of personality and social interactions. To address the outlined questions, I conducted three preregistered empirical studies focusing on adolescent social interactions with unfamiliar peers. Within these three studies, I analyze correlative repeated measures data from two original samples focusing on adolescents: the SELFIE study (Wagner et al., 2021) and the SNAP study (Wagner & Bleckmann, 2021). Importantly, the three dissertation studies each tackle specific aspects of the overarching questions (see Figure 1.2.), which I describe in the next section.

Figure 1.2.

Integrative Framework Outlining the Processes Underlying the Interplay of Personality and Social Interactions in Adolescence
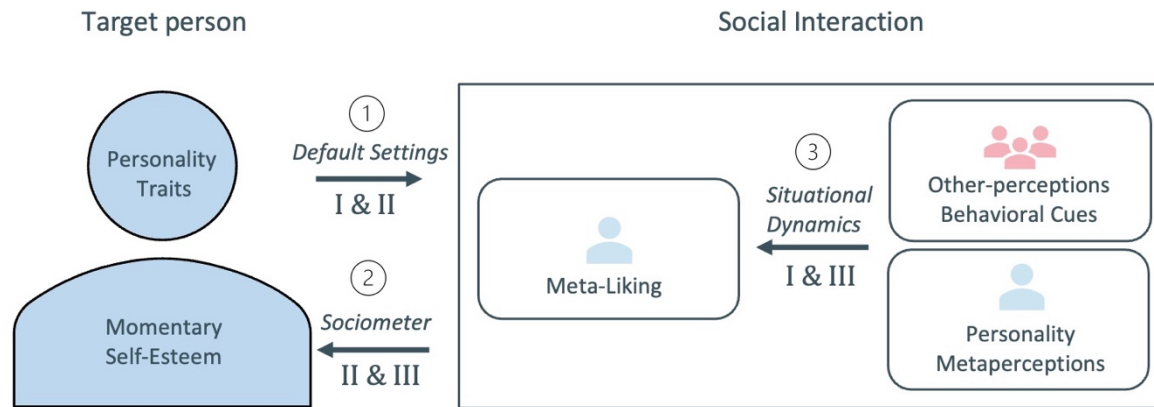
Note. Personality Metaperceptions reflect the two components of meta-accuracy and meta-positivity. The Arabic numbers denote the three outlined processes that characterize the interplay. The Roman numbers denote the number of the respective dissertation study: The first study (I) provides an empirical test of Process 1 and 3, the second study (II) examines Process 1 and 2, and the third study (III) investigates Process 2 and 3.

1.4.1. Study 1

Study 1 pursued two research questions: First, the study explored the links between adolescents' personality traits and their initial meta-liking judgments at zero-acquaintance (*Process 1: Personality Traits as Default Settings*). Second, it examined whether initial meta-liking judgments changed throughout the interaction, and whether these changes could be linked to situational interaction experiences that adolescents dynamically integrate into their meta-liking (*Process 3: Situational Dynamics*). Specifically, I focused on behavioral cues displayed by interaction partners and the target person's liking of interaction partners (i.e., assumed reciprocity) as drivers for updating meta-liking judgments.

To address these questions, I formulated three hypotheses. First, I assumed that due to their positive interpersonal orientation, agreeableness and extraversion are positively linked to adolescents' initial meta-liking judgments (Cuperman & Ickes, 2009). Conversely, I expected that neuroticism would negatively relate to initial meta-liking (Back, Schmukle, et al., 2011). I also considered the role of trait self-esteem, assuming that it predicted positive initial meta-liking judgments (Moritz & Roberts, 2020). Second, based on prior insights on interpersonal perceptions (Kenny, 2020; Rau et al., 2022), I expected that meta-liking judgments are not static but change over the course of the social interaction. Third, to explore what may predict meta-liking changes, I assumed that expressive behaviors of interaction partners and assumed

reciprocity would predict increases in meta-liking. I used data from the SNAP study (Wagner & Bleckmann, 2021), focusing on zero-acquaintance group interactions among 293 adolescents (M_{age} = 15.48) to test the outlined hypotheses. To investigate changes in meta-liking throughout the interaction, univariate latent neighbor-change models were fitted (Geiser, 2010; McArdle, 2009).[6] As such, Study 1 represents a first empirical test of personality default settings and situational dynamics involved in meta-liking formation and meta-liking changes.

1.4.2. Study 2

Study 2 addressed two research questions: First, the study examined how adolescents' personality traits—extraversion, agreeableness, and neuroticism—moderate links between meta-liking and momentary self-esteem within social interactions (*Process 1: Personality Traits as Default Settings*). Second, the study investigated the concurrent links between different interpersonal perceptions (i.e., meta-liking, self-, and other-perceptions of social inclusion) with adolescents' momentary self-esteem during social interactions to disentangle the role of metaperceptions in sociometer processes (*Process 2: Metaperceptions in the Sociometer Process*).

Along the lines of prior research (Denissen & Penke, 2008b; Mahadevan et al., 2019; Poorthuis et al., 2014), I assumed that adolescents high in neuroticism or high in agreeableness show higher momentary self-esteem reactivity in response to different perceptions of social inclusion. Conversely, I expected that due to their overall higher experience of being socially included (Longua et al., 2009; Wrzus et al., 2013), adolescents with high extraversion show less pronounced self-esteem reactivity within social interactions. Diving deeper into sociometer processes, I expected that meta-liking is significantly and positively associated with momentary self-esteem over and above self- and other-perceptions of social inclusion (Leary et al., 1998; Wagner et al., 2018). I tested these hypotheses in two separate study parts: Part A centered on group interactions at zero-acquaintance in a controlled laboratory environment (n = 103; M_{age}), while Part B revolved around everyday social interactions involving familiar interaction partners (n = 218; M_{age} = 17.70). Both study parts used data from the SELFIE study (Wagner et al., 2021). To accommodate the nested data structure (i.e., measurement points nested within individuals), linear multilevel regression models were fitted, specifying two levels: within-person (level 1) and between-person (level 2). Accordingly, Study 2 offers novel insights into

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[6] In latent change score models, changes over time are captured in latent difference variables that are free of measurement error (Geiser, 2010).

the moderating role of personality traits across different social settings (i.e., zero-acquaintance vs. interactions with familiar interaction partners).

1.4.3. Study 3

As the final study of this dissertation, Study 3 addressed two research questions: First, the study explored sociometer processes in a virtual context (*Process 2: Metaperceptions in the Sociometer Process*). Extending Study 2, I considered the temporal dimension of these sociometer processes within social interactions by examining the relationships between meta-liking, other-perceptions of liking, and momentary self-esteem at sequential measurement points (i.e., during and at the end of the interaction). Second, Study 3 investigated how meta-accuracy and meta-positivity of personality metaperceptions assessed early in the interaction were associated with subsequent meta-liking judgements of adolescents and via this link, with momentary self-esteem (*Process 3: Situational Dynamics*).

Addressing these questions, I proposed three sets of hypotheses: First, consistent with prior self-esteem research (Leary et al., 1998; Wagner et al., 2018), I anticipated that adolescents' meta-liking is more strongly linked to their momentary self-esteem than other-perceptions of liking. Second, given adolescents' cognitive capabilities (Steinberg, 2020), I assumed that they generally achieve statistically significant levels of meta-accuracy and meta-positivity when forming personality metaperceptions. Third, I expected that higher levels of meta-positivity would be linked to meta-liking based on prior findings (Carlson, 2016; Tissera et al., 2021). To examine these hypotheses, I used data from the SNAP study (Wagner & Bleckmann, 2021), with 296 adolescents (M_{Age} = 15.76) in zero-acquaintance virtual group interactions. The data analysis proceeded in two steps. First, I applied social accuracy multilevel modeling procedures (SAM; Biesanz, 2010) to estimate and extract indicators of meta-accuracy and meta-positivity of personality metaperceptions.[7] In a second step, I used a path analytic framework to test the associations between meta-accuracy and meta-positivity, meta-liking judgments, other-perceptions of liking, and momentary self-esteem. Study 3 adds to our understanding of situation-specific processes that contribute to meta-liking and momentary self-esteem. Moreover, I present novel insights into the degree to which adolescents achieve meta-accuracy, indicating their understanding of the impressions they leave on peers.

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[7] SAM is a statistical approach to assess perceptual accuracy of personality profiles. SAM accommodates data dependencies (i.e., perceptions simultaneously nested within metaperceivers and other-perceivers) by employing a multi-leveling framework featuring crossed random effects (Biesanz, 2010).

2. I Think You Might Like Me: Emergence and Change of Meta-Liking in Social Interactions at Zero-Acquaintance

Bleckmann, E., Rau, R., Carlson, E., & Wagner, J. (2023). I think you might like me: Emergence and change of meta-liking in social interactions at zero-acquaintance. [Manuscript submitted for publication].

The accepted manuscript version at the Journal of Personality and Social Psychology, Section Personality Processes and Individual Differences, can be found as an unedited preprint. The manuscript will undergo copyediting, typesetting, and review of resulting proof before it is published in its final form.

The official citation that should be used in referencing this material is:
Bleckmann, E., Rau, R., Carlson, E., & Wagner, J.(in press). I think you might like me: Emergence and change of meta-liking in initial social interactions. *Journal of Personality and Social Psychology*. https://doi.org./10.31234/osf.io/r26jz

Abstract

Feeling accepted by others is a fundamental human motive and an important marker of successful initial social interactions. This interpersonal perception, known as meta-liking, is especially relevant during adolescence when peer relationships deepen and expand. However, knowledge is limited regarding meta-liking formation in initial social interactions. This study investigated whether adolescents ($N = 293$, $M_{age} = 15.48$, 61.10% female) have default expectations for meta-liking at zero-acquaintance and how these judgments are updated during group interactions. Specifically, we used latent change models to examine how personality traits predicted initial meta-liking at zero-acquaintance and whether personality and social interaction experiences were linked to changes in meta-liking judgments throughout the interaction. Our findings revealed three key insights: First, meta-liking increased gradually over the course of the initial interaction, with substantial individual differences in both default meta-liking and change scores. Second, extraversion, neuroticism, and self-esteem predicted initial meta-liking. Third, liking others was also linked to initial meta-liking and early changes, while meta-liking changes toward the end of the interaction occurred independent of all these features and were not predicted by expressive behaviors of interaction partners. This study represents a first empirical test of default expectations and updates in meta-liking based on personality characteristics and social interaction experiences at zero-acquaintance. We discuss our results in terms of a broader framework for understanding how metaperceptions are formed and updated in zero-acquaintance interactions.

Keywords: meta-liking, interpersonal perceptions, personality, zero-acquaintance, adolescence

I Think You Might Like Me: Emergence and Change of Meta-Liking in Social

Interactions at Zero-Acquaintance

To feel liked and accepted by others is a universal human motive and a key feature of successful social interactions (Baumeister & Leary, 1995). Correspondingly, research suggests that a person's *meta-liking*, that is, their belief about being liked by others, plays an important role in the course of social interactions, motivating people to form social bonds (Fehr, 2008; Kenny, 2020). This function of meta-liking is particularly relevant in getting-acquainted contexts (Boothby et al., 2018; Tissera et al., 2021), as a successful first social interaction sets the stage for further social encounters. Building meaningful social relationships becomes particularly relevant in adolescence, a developmental period in which individuals extend their social networks beyond familial relationships (Hurrelmann & Quenzel, 2018; Wagner et al., 2014). Accordingly, meta-liking plays an important role in the acquaintance process in adolescents' social interactions with peers. To date, research has mainly focused on the accuracy of meta-liking (Kenny & DePaulo, 1993; Mastroianni et al., 2021), asking questions such as "Does Harry understand how much his interaction partners like him?". In contrast, little is known about the emergence of initial meta-liking and how it changes during first social interactions. The resulting questions are: "How much does Harry think others like him at the beginning of a first social encounter? And in what ways does his initial meta-liking change throughout that first interaction?".

Previous research has identified two major sources of information that people use to estimate how much others like them. First, empirical findings on metaperceptions show that people's beliefs about how others see them are guided by their stable personality characteristics (Back, Schmukle, et al., 2011; Cuperman & Ickes, 2009; Elsaadawy et al., 2022). When meeting for the first time, these general patterns of thinking, behaving, and feeling likely reflect people's *default expectations* that inform initial meta-liking judgments in the absence of other contextual information. Second, metaperceptions also integrate information from *social interaction experiences* collected during a social encounter. Two specific social interaction experiences could be particularly relevant to update meta-liking. One process is called *assumed reciprocity*. If Harry likes his interaction partners, this increases the likelihood that he also thinks that others like him back and vice versa (Kenny, 2020; Malloy, 2018; Montoya & Insko, 2008). The other is the *behavioral feedback* of interaction partners during the interaction (Elsaadawy et al., 2022; Kaplan et al., 2009). For example, if Harry notices that his interaction partners nod in affirmation when he speaks, he might infer they like him.

While both personality characteristics and social interaction experiences can contribute to meta-liking judgments, critical issues regarding the emergence and development of meta-liking remain unanswered. First, no research to our knowledge has investigated what informs meta-liking at the start of a zero-acquaintance interaction or how meta-liking develops throughout the interaction. Second, there are no integrative approaches that consider how different sources (i.e., personality and social interaction experiences) jointly inform meta-liking during social interactions. Third, little research so far has focused on such social interaction processes in adolescence, even though these processes are likely central to the development of peer relationships as well as adolescents' self-concept (Erikson, 1968; Harter, 2012). The present study introduces a novel conceptual framework on changes in meta-liking grounded in theoretical assumptions of social interaction processes (Back, Baumert, et al., 2011). In doing so, we aim to examine changes in meta-liking within social interactions and shed light on the formation of metaperception in a broader context. We formulate three research questions: First, how does initial meta-liking—the estimation of whether one is liked by unfamiliar others at first sight—change over the course of a social interaction? Second, to what extent do personality characteristics represent default expectations to predict initial meta-liking? Finally, does new relational information, such as assumed reciprocity and behavioral feedback from interaction partners, predict changes in meta-liking?

Changes in Meta-Liking at Zero-Acquaintance

Our first research question is whether meta-liking changes during the early stages of becoming acquainted with someone. When people meet for the first time, they have little to no information about their interaction partners or how those partners might view them. As a result, interpersonal perceptions in general and meta-liking judgments in particular are likely informed by heuristics (Kenny, 2020). Thus, people rely on their subjective expectation of how they generally experience social interactions as well as their general idea of how others perceive them to be (Mead, 1934). Thus, when Harry meets a group of peers for the first time, his sense of how much others like him is probably based on some kind of default expectation (see Path A in Figure 1). However, as the interaction progresses and more information becomes available, people may update their meta-liking judgments based on their interaction experiences (Rau et al., 2022). For example, Harry may come to like his peers more and use his subjective sense of the dynamic (i.e., his own liking of others) to inform his beliefs about being liked, a process called assumed reciprocity (Path B). He might also use his interaction partners' reactions (e.g., smiling, nodding) to update his meta-liking judgments (Path C). Thus, while people likely enter

social interactions with some default expectation of how much they are liked, there is reason to believe that meta-liking changes throughout an interaction.

Theoretical accounts and empirical research on interpersonal processes support the idea that meta-liking within social interactions follows a dynamic change pattern. Conceptually, meta-liking judgments can be understood as interaction states that vary with context-specific information (Back, Baumert, et al., 2011). Empirically, findings in adult samples suggest that meta-liking does fluctuate, with stabilities ranging from .66 to .71 following brief dyadic interactions (Salazar Kämpf et al., 2018) and over the course of a week (Kenny, 2020). However, little is known about the processes behind these changes and which personality factors and interaction experiences might drive these dynamics. In the following, we illustrate how the two pathways—personality and interaction experiences—could be linked to meta-liking default settings and changes in zero-acquaintance interactions.

Figure 1

Conceptual Framework for Studying the Formation of and Changes in Meta-Liking
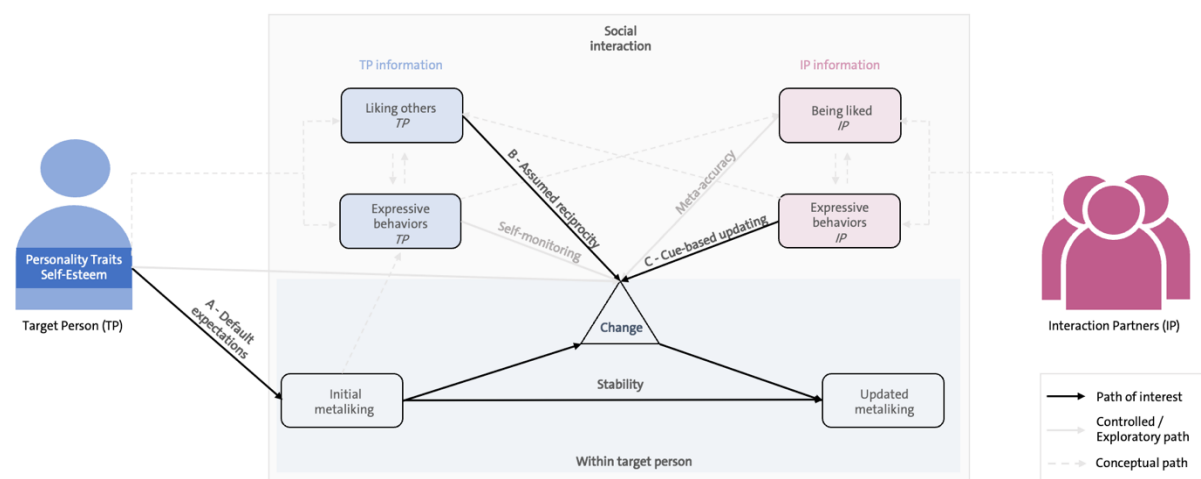
Note. Paths A, B, and C are of key interest in the current study and reflect research hypotheses 1, 2 and 3. Controlled/ exploratory paths are considered in the analyses. Conceptual paths are discussed but not explicitly modeled.

The Role of Personality in Initial Meta-Liking and Changes in Meta-Liking

A person's unique personality plays a central role in how they perceive themselves and others around them in social contexts (Back, Baumert, et al., 2011; Breil et al., 2019; Cuperman & Ickes, 2009; Rau et al., 2022). Tendencies to perceive their social environment, behave towards others, and feel about others give rise to certain expectations that people bring with them to social interactions. Research focusing on the formation of personality metaperceptions has demonstrated that individuals anchor their beliefs of how others see them in their

personality self-concept (Elsaadawy et al., 2022; Kenny & DePaulo, 1993). Regarding meta-liking judgments, two personality components may be particularly relevant: (1) personality traits that show high relevance in social contexts and (2) a person's self-esteem, reflecting their global positive or negative attitude toward themselves (Leary et al., 1998).

Specifically, the traits extraversion, agreeableness, and neuroticism seem to play a significant role in social interactions (Cuperman & Ickes, 2009; Festa et al., 2012; Harris & Vazire, 2016). Higher levels of extraversion, characterized by the enjoyment of social interactions (Duffy et al., 2018; Srivastava et al., 2008), and agreeableness, characterized by a motivation to get along with others (Tackett et al., 2019), are associated with a more positive interpersonal orientation in social interactions. People with high scores on these traits exhibit more salient social behaviors in interactions (van Zalk & Denissen, 2015; DeYoung et al., 2013), are liked more by others (de Vries et al., 2020; Hubers et al., 2016; Wortman & Wood, 2011), and form more positive interpersonal perceptions (Harris & Vazire, 2016). Consistent with this, empirical findings show that high agreeableness and extraversion are positively linked to meta-liking, i.e., individuals with these traits tend to believe that interaction partners generally like them when they first meet (Cuperman & Ickes, 2009). In contrast, neuroticism is characterized by a tendency towards feeling anxious, and has been associated with a more problematic interpersonal style (Hampson, 2012). Higher neuroticism is linked to a tendency to perceive social situations as stressful or negative (Borghuis et al., 2020; Denissen & Penke, 2008a). However, existing findings on the link between neuroticism and meta-liking are mixed, with some studies suggesting that individuals with higher neuroticism expect to be liked less in zero-acquaintance contexts (Back, Schmukle, et al., 2011), while others found no significant associations (Cuperman & Ickes, 2009).

Next to these personality traits, research has shown that a person's global self-esteem can also have a substantial impact on the positivity of metaperceptions (Elsaadawy et al., 2022; Moritz & Roberts, 2018). Sociometer theory posits that self-esteem is an indicator of a person's social inclusion, with trait self-esteem largely determined by past experiences of being socially valued. In turn, trait self-esteem operates as a default expectation in social settings where no information about interaction partners is available (Back et al., 2009; Leary & Baumeister, 2000). In line with this, people with low self-esteem tend to believe that their interaction partners like them less (Back, Schmukle, et al., 2011; Moritz & Roberts, 2020).[8] Taken together,

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[8] Research has shown that the relationship between self-esteem and the social environment (i.e., social interactions and relationships) is bidirectional (Harris & Orth, 2020): a person's self-esteem affects their social experiences (de Moor et al., 2021; Harris & Orth, 2020), and positive social experiences can increase a person's self-esteem (Bleckmann et al., 2022; Denissen et al., 2008a; Hutteman et al., 2015). In the present research, we focus on the former by examining the link between trait self-esteem and meta-liking within social interactions.

a person's levels of agreeableness, extraversion, neuroticism, and their global self-esteem may inform initial meta-liking (see path *A – Default expectations* in Figure 1).

However, it is an open question whether personality traits also predict changes in meta-liking during the interaction. While personality default settings may be part of initial meta-liking judgments, these first guesses are at the same time characterized by uncertainty. As the interaction progresses, people might interpret incoming information through the lens of their personality and towards their usual default expectations: For instance, if Harry is high in neuroticism, it may be difficult for him to interpret the other person's behavior as a positive indicator of their liking, and he would be less likely to increase his meta-liking during the interaction. In contrast, if Mary is highly extraverted, she might interpret feedback within the interaction positively due to her strong motivation to connect with others, increasing her meta-liking judgments. The current study aims to provide new insights into the role of specific personality characteristics in perceptual processes by investigating personality as a predictor of initial meta-liking and, in an exploratory manner, of changes in meta-liking.

The Role of Social Interaction Experiences in Changes in Meta-Liking

Given the expectation that social interaction experiences provide new relational information, we suggest that this will result in meta-liking changes over the course of a social interaction. Here, we focus on two specific social interaction experiences: the role of assumed reciprocity and behavioral feedback sent by interaction partners.

Liking Others: The Principle of Assumed Reciprocity

Theoretical frameworks on social interaction processes such as the Social Relations Model (Back & Kenny, 2010) or the PERSOC framework (Back, Baumert, et al., 2011) suggest that interpersonal perceptions are connected dynamically and mutually inform each other during interactions. Focusing on interpersonal perceptions of liking, this dynamic mutuality can be captured in two ways: by meta-accuracy, which reflects how accurately people perceive how much they are liked by their interaction partner (Kenny, 2020), and by assumed reciprocity, which reflects how much people base their meta-liking judgments on their subjective liking of interaction partners (Montoya & Insko, 2008). Along these lines, meta-liking changes could either be based on "accurate" updates, meaning that people pick up how others like them and change their meta-liking judgments accordingly (see path *Meta-accuracy* in Figure 1). In contrast, changes could also be based on people's own sense of liking others, reflecting their subjective experience in the interaction. While it is unclear to what extent adolescents have insights into how they are liked by others, research on adults suggests that meta-accuracy tends to be quite low in zero-acquaintance contexts (Kenny, 2020). Instead, people are more likely to

use their sense of liking others to inform their meta-liking (e.g., Malloy, 2018; Montoya & Insko, 2008; Rau et al., 2022). Accordingly, liking others at the beginning of the interaction may reflect an important source for adolescents' initial meta-liking and changes in meta-liking that are independent of how much people are actually liked (Path B – *Assumed reciprocity* in Figure 1).

Looking at Others: Behavioral Feedback from Interaction Partners

While prior research has suggested that self-perceptions represent a route to forming metaperceptions (Carlson et al., 2011; Kenny & DePaulo, 1993), behavioral signals from interaction partners may also provide information during social interactions (Kaplan et al., 2009). To be a valid source of information for meta-liking, the behaviors of interaction partners need to meet two primary criteria. First, behaviors must be observable for the target. In this regard, research has shown that people generally perceive recurring behavioral patterns (e.g., frequent smiling, nodding, general head movements) more clearly during an interaction compared to single, isolated behavioral cues (e.g., a smile; Burgoon & Dunbar, 2018). As a second criterion, the behavior needs to include relevant information (cf. Funder, 2012). That is, it should relate to an interaction partner's actual liking (e.g., approachable behavior).

Expressive behaviors, which include friendly, sociable, and self-disclosing behaviors during social interactions (Geukes et al., 2017; Leckelt et al., 2015; Wieczorek et al., 2021), are one behavioral pattern that meets the criteria for informing both liking and meta-liking perceptions. Expressiveness is conveyed through a combination of observable nonverbal behavioral (e.g., smiling, nodding, attentive movements) and verbal (e.g., revealing personal information) cues. People who exhibit expressive behaviors are generally liked more, whereas those who reveal less personal information tend to be liked less (e.g., Back, Schmukle, et al., 2011; Collins & Miller, 1994; Riggio & Friedman, 1986; Voncken & Dijk, 2013; Weisbuch et al., 2009). Expressive behaviors may fuel not only liking perceptions but also meta-liking, as they can be interpreted as a signal of liking for others, leading to higher meta-liking (see path *C - Cue-based updating* in Figure 1). Despite this theoretical connection, to our knowledge, there is no empirical research investigating whether people use the expressive behaviors of interaction partners to inform their meta-liking during social interactions.

Conceptually, it is important to note that expressive behaviors, liking, and meta-liking judgements are embedded in social interactions and connected to other interpersonal behaviors and perceptions (Back, Baumert, et al., 2011). For example, a person might also monitor their own behavior to inform their meta-liking (see path *Self-monitoring* in Figure 1): Harry observes his expressive behavior toward others, which leads him to assume that others will like him. In

the current study, we control for the role of self-monitoring when answering our research questions.[9]

The Present Study

The present research investigated initial meta-liking and changes in meta-liking during initial social interactions in small groups. First, we examined if and how an individual's initial meta-liking, assessed at first sight under complete zero-acquaintance, changes throughout a social interaction of 60–90 minutes. Second, we investigated how an individual's default expectations, reflected in their unique personality characteristics, inform initial meta-liking (path A in Figure 1). Third, we investigated whether new experiences gained during the interaction—assumed reciprocity (path B) and expressive behavioral cues of interaction partners (path C)—are used to update perceptions and thus predict changes in meta-liking.

Concerning our first research question, we expected that meta-liking is not static but changes from an initial value at first sight over the course of the social interaction (Hypothesis 1). Regarding our second research question addressing the role of personality, we focused on four specific characteristics that are particularly relevant within interpersonal contexts. First, we considered the Big Five traits agreeableness, extraversion, and neuroticism. Given that agreeableness and extraversion are characterized by a positive interpersonal orientation, we assumed that both traits are positively associated with individuals' initial meta-liking (Hypothesis 2a). In contrast, we expected that neuroticism is linked negatively to initial meta-liking (Hypothesis 2b). Second, we considered a person's trait self-esteem, assuming that a positive attitude towards oneself relates to more positive initial meta-liking (Hypothesis 2c). In an exploratory analysis, we also investigated whether these personality characteristics predict changes in meta-liking.

With our third research question, we investigated how new interaction experiences contribute to meta-liking changes, focusing on assumed reciprocity and behavioral feedback from interaction partners. We hypothesized that assumed reciprocity would drive changes in meta-liking and that this would be independent of actual liking by interaction partners (Hypothesis 3a): Individuals who initially like their interaction partners more will also report higher meta-liking over the course of the interaction, regardless of how much they are liked in reality (Hypothesis 3a). Next, we hypothesized that interaction partners' expressive behaviors would be positively associated with changes in meta-liking (Hypothesis 3b).

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[9] We note that associations between meta-liking and expressive behaviors may be bidirectional. Thus, initial meta-liking could predict subsequent displays of expressive behaviors. However, since the current work specifically focuses on predicting meta-liking and changes therein, this is not a key interest in our analyses.

We addressed these questions by using latent change score modeling to analyze repeated-measure data of adolescents in a zero-acquaintance social group interaction in an online setting. We focused on the specific age group of adolescents, as we believe that understanding processes within social interactions is particularly important for developing lasting friendships and self-concept formation in this phase (Harter, 2012; Hurrelmann & Quenzel, 2018; Wagner et al., 2014). Specifically, meta-liking is considered a hallmark of social anxiety (i.e., concerns about negative evaluations from others; (Christensen et al., 2003), which often emerges during adolescence (Erath et al., 2007). Therefore, gaining insights into the formation and development of meta-liking in adolescence holds considerable relevance. Moreover, online social interactions are common among adolescents and provide a setting that is close to adolescents' everyday social lives.

Method

The present research used data from [project name blinded for review], a multi-method study focusing on social interaction dynamics and personality development in adolescence (https://osf.io/w4nmj/?view_only=0ef127d0296548c28156aac2580504cf). In [project name masked for blind review], adolescents (aged 14 to 18) across Germany were recruited via social media and student job portals from May to December 2021. Ethical approval was granted by the local ethics committee at [institution name blinded for review]. The study was implemented online and included multiple questionnaires over a three-month period. Additionally, participants attended an online interactive group session (three to five participants each). For the current research, we used data collected in the first online questionnaire and during these interactions. We preregistered our hypotheses and data analyses at the Open Science Framework (https://osf.io/z6gqr/?view_only=abf92aa6e94d43e3b3b94c43af865911). Table OS 1 in the Online Supplement (OS) provides a detailed overview of deviations from our preregistration.

Procedure

In [project name blinded for review], participants completed four study phases.[10] As shown in Figure 2, all participants completed an online-based questionnaire assessing sociodemographic variables, personality constructs (i.e., Big Five personality traits, self-esteem) in the first phase. Once completed, participants selected a date for the online interactive session. Participants did not receive any information regarding other participants or the content of the interaction beforehand. Four student assistants were trained and moderated the sessions

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[10] See the study's OSF page for a detailed overview.

following a standardized manual (i.e., one session was moderated by one student assistant). The sessions lasted about 60-90 minutes on average and consisted of three main parts. First, the experimenter introduced the study and instructed participants to turn on their cameras simultaneously. Based on this zero-acquaintance impression, participants filled out the first of four round-robins, which all included the same items. Specifically, they rated their mood and behaviors, made ratings about how they thought the other group members viewed them (i.e., metaperceptions), and provided ratings about how they viewed each of the other participants (i.e., other-perceptions). All participants then introduced themselves individually in one minute (with their name, where they live, and what superpower they would like to have and why), which was followed by a second round-robin. Next, participants took part in an interactive roleplay. Each group member was assigned a role in a school project and the group was asked to discuss who would take on predefined tasks within the project (e.g., task manager, communication with the teacher). Groups were randomly assigned to either a cooperative or a competitive condition (task instructions varied slightly between conditions). The roleplay was followed by the third round-robin. Finally, participants discussed climate change actions in schools, this time without predefined roles. This discussion was followed by the final, fourth round-robin, after which the moderators bid participants goodbye. Of note, participants did not receive feedback on other group members' ratings and did not meet again during the study.

Figure 2

Overview of Study Design
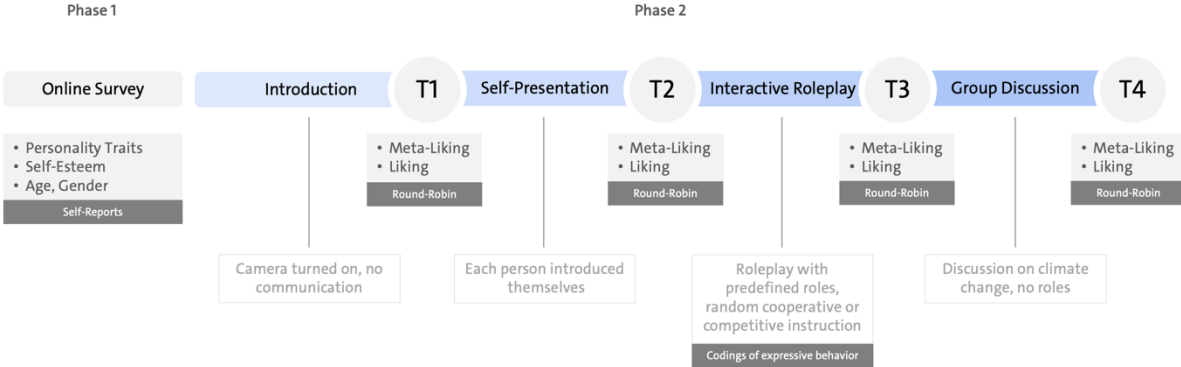
Note. T1–T4 represent the round-robins during the virtual interaction. Each interaction lasted around 60–90 minutes.

Participants

In total, $N = 526$ participants completed the personality measure in the first online questionnaire and $N = 303$ of these adolescents took part in the interactive session. Although the investigators were careful to ensure that participants in the assigned groups did not know each other prior to the interactive session, ten participants indicated that they knew each other personally. Consequently, data from these participants were excluded from the analyses. The final sample consisted of $N = 293$ adolescents ($M_{Age} = 15.73$, $SD = 1.28$, 60.08% female).[11] Most adolescents indicated that they attended the highest academic school track in Germany ("Gymnasium", 81.23%) and indicated German as their first language (84.98%). For the interactive sessions, participants were randomly assigned to one of 80 groups with 3 to 5 participants ($M = 3.83$, $SD = 0.78$).

Since, to the best of our knowledge, no established approach for a priori power analyses exists for latent change score modeling, we reviewed previous literature using latent change score models (applied to other constructs) or focusing on similar constructs (using other statistical modeling approaches). First, recent studies on longitudinal changes in personality traits using latent change score models have suggested that sample sizes of $N > 250 - 300$ participants are sufficient to detect small changes of $d = 0.2$ (Quintus et al., 2021). We expect the effects of changes in meta-liking to be of comparable size based on research on behavioral and perceptual processes in social interaction settings (Leckelt et al., 2015; Rau et al., 2022; Salazar Kämpf et al., 2017). Second, research focusing on perceptual processes in social interactions with similar research designs (i.e., round-robin designs; Rau et al., 2022) suggest that sample sizes comparable to ours (i.e., $N = 254$; $N = 311$) provided sufficient data to estimate similarly complex models such as latent growth curve models. Together, these references imply that our sample provides sufficient power to address our research questions via latent change score models.

Data Processing

According to the Social Relations Model (SRM; Kenny, 1994), interpersonal perceptions such as meta-liking in round-robin designs exhibit a complex structure that consists of three components: (1) a *perceiver effect*, reflecting a general tendency of the metaperceiver to expect to be liked by others (Harry believes that others generally like him), (2) a *target effect*, denoting a general tendency for others to perceive a specific target (others generally perceive Harry as

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[11] Sensitivity analyses showed that participants who took part in the interactive session ($n = 293$) were on average more agreeable ($t(436.18) = -2.17$, $p = .031$) than participants who dropped out of the study or were excluded ($n = 233$). There were no significant differences between participants and drop-outs in mean levels of age, extraversion, neuroticism, self-esteem, or gender distribution.

someone how likes others), and (3) a *relationship effect*, capturing the unique perception of the metaperceiver and their interaction partner independent of perceiver and target effects (Harry believes that Lea likes him more than others). SRM analyses can disaggregate these perceptions into their components and determine the variance accounted for by each. Thus, extracting the perceiver effect of meta-liking with SRM analyses allows for examining how individuals change their expectations of being liked by others over the course of the interaction in the current study.

Importantly, changes in overall meta-liking can occur because individuals update their perceiver effects in a general way (e.g., Harry's belief that the group likes him more) or because of changes at the group level that are not accounted for by either of the three SRM components (e.g., *all* group members increase their meta-liking over time). In the current study, we view both sources of change to be valid and meaningful. Accordingly, we operationalized meta-liking as a person-level variable that reflects the sum of a person's meta-liking perceiver effect and the meta-liking mean of their respective group. Adding group means to person-level scores is often a standard option in SRM software (cf. Schönbrodt et al., 2022) and is recommended for cases such as ours. However, our preregistration referred to traditional (i.e., group-mean centered) perceiver effect scores (see Table OS 1). For transparency, we report results both for scores including (main text) and excluding group-means (Tables OS 5–6). The results were largely similar and deviations between them are mentioned in the text.

Measures

Personality Characteristics

The personality traits agreeableness, extraversion, and neuroticism were assessed with the BFI-2 (Danner et al., 2016) with 12 items each. Trait self-esteem was assessed with four items selected from the Rosenberg-Self-Esteem-Scale (Rosenberg, 1965). All items were assessed on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Internal consistency was good with values ranging from $\omega = .84$ for agreeableness to $\omega = .91$ for self-esteem.

Meta-Liking

In each of the round-robins, meta-liking was assessed with the item "How much do you think does this person like you?", which participants answered for each group member on a scale ranging from 0 (*not at all*) to 10 (*very*). For our main analyses, we extracted meta-liking perceiver effects using SRM analysis with maximum likelihood estimation (Nestler, 2016; 2018) at each measurement point and combined these perceiver effects with the meta-liking

group mean. The variance decomposition of the meta-liking perceiver effect is displayed in Table OS 2. Consistent with prior research (see Kenny, 2020), our findings reveal that perceiver and relationship effects accounted for the majority of the variance in meta-liking at each measurement point.

Perceptions of Liking

Participants stated how much they liked all other group members on a scale ranging from 0 (*not at all*) to 10 (*very*). As with meta-liking, we used SRM analyses to index how much people generally liked their interaction partners (perceiver effect of liking) and how much people were generally liked by their interaction partners (target effect of liking). In our analyses, we combined these SRM components with the respective group means of liking others or being liked to explore assumed reciprocity effects independent of actual liking judgments.[12]

Expressive Behaviors

Expressive behaviors were assessed by four trained coders who followed a standardized coding procedure to code the videotaped interactive roleplay (between T2–T3, see Figure 2).[13] The coders used an adapted version of the Münster Behavior Coding Scheme (M-BeCoSy; Grünberg et al., 2018), a mixed coding and rating scheme developed for behavioral analyses of interpersonal behaviors in group interactions. In the present research, we exclusively selected items at a meso-level, since observations on this level are assumed to be closely approximate to the level of observation used by untrained raters and which is visible during the interaction (Burgoon & Dunbar, 2018). To consider the multi-faceted nature of interpersonal behaviors, we selected items from different input channels (gesture, mimic, verbal, paraverbal).[14]

After an extensive training session, all coders watched the muted interaction to rate nonverbal behaviors (expressive mimic and gestures). Subsequently, they watched the recording again to assess verbal expressiveness. All behaviors were assessed on a 6-point scale (*displays behavior not at all – displays behavior very strongly*) at every 30-second interval of the interaction. If participants did not make a verbal contribution, that sequence was marked with zero. Note that in calculating the verbal expressiveness score, we excluded all intervals without verbal contributions. Therefore, verbal expressiveness reflects the expressiveness of the content when a target person engaged with the group, not the participants' amount of speech. Finally, after watching the videos twice for each participant, coders rated paraverbal

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[12] Table OS 2 shows the SRM variance decomposition for liking.
[13] Coders were student assistants and blind to the study's hypotheses.
[14] For a detailed listing of all items, see our preregistration on OSF.

expressiveness (i.e., volume, pitch) on the same 6-point scale at the end of the videotaped interaction (i.e., once per participant).

A crossed-design was used to determine interrater reliability (Gerpott et al., 2019): All videos were double coded by an expert (an extensively trained research assistant), and one other coder. A subset of 25% of the videos were coded by all four coders, which was used to estimate intraclass correlations (i.e., two-way random effects, absolute agreement between four raters; Shrout & Fleiss, 1994; Koo & Li, 2016). The four coders achieved satisfying agreement with values ranging from $ICC(2, 4) = 0.68$ for verbal expressiveness to $ICC(2, 4) = 0.85$ for paraverbal expressiveness. An exploratory factor analysis revealed that a general expressiveness factor explained 67.5% of the variance in the individual behavioral channels that all showed high loadings on this general factor ($> .70$; see OS 3). Therefore, we used this expressiveness factor in our main analyses and report exploratory models with separate behavioral channels in the OS.

Since we were primarily interested in the expressive behavior of interaction partners, we estimated the average expressive behavior displayed by all interaction partners within a group, excluding the target person's own behavior. To exploratorily investigate the role of the self-monitoring path (see Figure 1), we considered the target person's own expressive behavior as a separate variable.

Control Variables

Sociodemographic information was assessed in the online questionnaire preceding the online interaction session. Participants indicated their age and their gender (i.e., the gender they identified most closely with), which was coded (0) for female and (1) for male participants. Additionally, we considered the interaction condition (cooperative [0] vs. competitive [1]) in which participants interacted with each other during the interaction session.

Analyses

To investigate changes in meta-liking during the interaction and what might predict these changes, we used univariate latent neighbor-change models (Geiser, 2010; McArdle, 2009). Below, we first describe the basic model used to investigate initial levels and changes in meta-liking (Research Question 1), before turning to the full model containing predictors of levels and change (Research Questions 2 and 3).

In latent change score models, change over time is modeled with latent difference variables that are free of measurement error (Geiser, 2010). In our case of a neighbor-change model, two factors were of interest: the initial level of meta-liking and changes in meta-liking over time. Initial meta-liking is modeled as a manifest variable at T1 (i.e., at zero-acquaintance).

The variance of the initial meta-liking illustrates a combination of interindividual and intergroup variability at T1. Three latent difference score variables reflect the amount of change in meta-liking during the interaction: first, Δ*change2* reflects change from the first round-robin (T1) to the second (T2), with participants briefly introducing themselves to each other in between. Second, Δ*change3* reflects change from the second to the third round (T3), between which interactive role-playing took place. Finally, Δ*change4* reflects change from the third to the last round (T4), where participants discussed with each other on a given topic. The variance components of the change scores represent variability in change over time.

In a first basic model (see Figure OS 1 for an illustration), we constrained the paths between initial meta-liking (T1) and meta-liking at all subsequent measurement points to 1, so that differences between the measurement points were fully contained in the latent change scores. Additionally, paths between the latent change scores and meta-liking at T2, T3, and T4 were constrained to 1. The regression parameters β_{ML1-3} reflect the degree to which the change scores depend on initial meta-liking at T1 (cf. Kievit et al., 2018; McArdle, 2009). According to McArdle (2009), estimating these regression parameters (instead of covariances between baseline measures at T1 and change scores) is reasonable when no changes have yet occurred at the time of the first measurement, and ensures a model with baseline-free change values. Finally, residuals of the meta-liking scores were correlated with each other and the latent change scores were correlated with each other in the model.

To address research questions 2 and 3, we expanded the basic model in a stepwise procedure to predict initial meta-liking and meta-liking changes by personality characteristics of the target person, the target person's liking of others, and the expressive behaviors of interaction partners (see Figure OS 2). First, we fitted four separate models with the initial meta-liking score regressed on a specific personality characteristic (i.e., extraversion, agreeableness, neuroticism, and self-esteem; Hypotheses 2a–2c). Next, the initial liking of others (i.e., the target person's perceiver effect of liking) and the expressive behaviors of interaction partners were entered into the respective models as predictors of initial meta-liking and meta-liking changes (Hypothesis 3a–b). Since expressive behavior was coded during the interactive roleplay taking place between T2 and T3, it was used as a predictor for changes in meta-liking between T2 – T3 (Δchange2) and T3 – T4 (Δchange4). In a third step, we fitted a full model to investigate the robustness of our hypothesized effects. In this full model, the latent change scores were regressed on the personality characteristics to investigate whether personality also predicts changes in meta-liking. Additionally, we considered effects of initial liking by interaction partners at T1 on initial meta-liking and all change scores and effects of the target

person's own expressive behavior (coded during the interactive roleplay between T2 and T3) on Δchange3 and Δchange4. Finally, the full model included participants' age and gender as well as the condition of the interaction (competitive vs. cooperative) as covariates predicting initial meta-liking. All continuous predictors were grand-mean centered.

All analyses were conducted with *R* (R Core Team, 2020) and the *lavaan* package (Rosseel, 2012). Accounting for the nesting in the data (individuals were nested within interaction groups), we fitted all models with robust standard errors and used full maximum likelihood estimation to address missing data. To evaluate model fit, we report the robust comparative fit index (CFI) and the robust root-mean-square error of approximation (RMSEA) of the models. We report exact *p*-values and discuss all effects significant at $p < .05$.

Results

First, we present descriptive information on meta-liking, including means and correlational patterns, followed by the results of the basic neighbor-change model testing initial levels and change in meta-liking during the interaction. Second, we report the full conditional latent change score models and investigate how personality and social interaction experiences predict initial meta-liking and meta-liking change.

Stability and Changes in Meta-Liking

Table 1 presents the group mean levels and correlations of meta-liking during the interaction. Additionally, we provide the group mean levels of liking alongside the meta-liking values for comparison. Descriptive statistics and correlations of meta-liking with all other study variables are shown in Table OS 4. People entered the interaction with meta-liking being roughly at the scale mid-point at T1 ($M = 5.14$), after which mean-levels gradually increased. As such, meta-liking correlated significantly across the four measurement points ($r_{T1-T2} = .63$; $r_{T2-T3} = .61$; $r_{T3-T4} = .73$), suggesting that meta-liking was relatively stable (i.e., people who started off with higher meta-liking early on tended to have higher meta-liking later on) but also subject to changes throughout the interaction (i.e., people did not maintain their rank order in meta-liking). Testing the consecutive retest stabilities for meta-liking showed statistically significant differences, such that stability increased towards the end of the interaction ($r_{T2-T3} < r_{T3-T4}$, $p = .010$).

Table 1

Intercorrelations of Meta-Liking and Being Liked Throughout the Interaction

Variable	M	SD	1	2	3	4	5	6	7
Meta-Liking									
T1	5.14	1.63							
T2	5.95	1.78	.63						
T3	6.52	1.75	.50	.61					
T4	6.95	1.85	.55	.66	.75				
Being Liked									
T1	6.58	1.05	.38	.44	.41	.42			
T2	7.16	1.07	.39	.48	.38	.46	.84		
T3	7.46	1.09	.30	.40	.56	.50	.58	.71	
T4	7.58	1.13	.27	.41	.51	.57	.60	.67	.85

Note. M and *SD* are used to represent mean and standard deviation, respectively. T1-T4 indicate the measurement point within the social interaction. Meta-liking and being liked are operationalized as the perceiver effect extracted with SRM analyses combined with the group mean of the respective perception variable. All correlations in bold font were significant at *p* < .05.

Basic Neighbor-Change Model

Table 2 presents the basic latent neighbor-change models testing changes in meta-liking during the social interaction. Meta-liking seemed to increase systematically from T1 to T2 ($\mu\Delta$change2 = 2.38, *p* < .001) and from T2 to T3 ($\mu\Delta$change3 = 1.39, *p* = .010), meaning that people's expectations of being liked by interaction partners gradually became more positive throughout the interaction. Meta-liking changes towards the end of the interaction (T3–T4) were still positive but not significant ($\mu\Delta$change4 = 0.13, *p* = .722).[15]

Illustrating interindividual differences in average levels and changes, variance components suggest that there were reliable differences in initial meta-liking and all three change scores ($\sigma_{\text{meta-liking T1}}^2 = 2.64$, $\sigma\Delta_{\text{change2}}^2 = 1.91$, $\sigma\Delta_{\text{change3}}^2 = 2.33$, $\sigma\Delta_{\text{change4}}^2 = 1.62$, *p*'s < .001). This result pattern was replicated when we fitted the same neighbor-change model with meta-liking perceiver effects (see Table OS 4). Thus, individuals differed substantially in how much they expected to be liked at the beginning of the interaction and in their changes of meta-liking throughout the interaction.

To further illustrate these interindividual differences, Figure 3 shows the individual trajectories of meta-liking averages throughout the social interaction. Moreover, we computed a 95% plausible value range for each of the three change scores to illustrate the magnitude of variability (see Raudenbusch & Bryk, 2002). Results revealed that parameters for meta-liking changes at T1–T2 (T2–T3; T3–T4) ranged between -1.36 (-3.18; -3.05) and 6.12 (5.96; 3.31). Thus, despite the average increase, some participants also reported a decrease in meta-liking during the social interaction. To specify the ratio of participants that increased or decreased, we

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[15] Note that the change scores reflect a baseline-free measure that is independent of initial meta-liking.

extracted the predicted values of the change scores to examine the direction of change for each participant. Results of this illustrative analysis indicate that at each measurement point, most participants exhibited increases in their meta-liking (79.86% from T1–T2, 67.58% from T2–T3, and 72.01% from T3–T4).

Table 2 illustrates that interindividual differences in early meta-liking changes were significantly linked to initial meta-liking: Adolescents with higher initial levels changed less from T1–T2 (b = -0.30, p < .001). Few participants reported very high meta-liking at T1 (about 1.36% indicated values above 9), making it unlikely that the link between initial meta-liking and change from T1 to T2 is attributable to a ceiling effect (i.e., only a small fraction of participants could not increase in meta-liking because of the scale limit). Later changes in meta-liking (T2–T3; T3–T4) were not predicted by initial meta-liking. Thus, meta-liking changes towards the end of the interaction seemed to be unrelated to individuals' starting points.[16]

Table 2

Basic Latent Neighbor-Change Model Testing Changes in Meta-Liking

Variable	Est.	SE	p
Meta-liking T1 ~			
Intercept	**5.13**	0.16	< .001
Variance	**2.64**	0.29	< .001
Δchange2 ~			
Intercept	**2.38**	0.47	< .001
Variance	**1.91**	0.24	< .001
Meta-liking T1	**-0.30**	0.09	.001
R^2	**.112**		
Δchange3 ~			
Intercept	**1.39**	0.54	.010
Variance	**2.33**	0.33	< .001
Meta-liking T1	-0.16	0.10	.109
R^2	.028		
Δchange4 ~			
Intercept	0.13	0.37	.722
Variance	**1.62**	0.31	< .001
Meta-liking T1	0.05	0.06	.365
R^2	.005		
Δchange2 ~			
Δchange3	**-0.97**	0.27	< .001
Δchange4	0.14	0.15	.374
Δchange3 ~			
Δchange4	**-0.86**	0.22	< .001

Note. The displayed model is full-blown with no degrees of freedom.

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[16] As a deviation, the model with group-mean centered perceiver effects (Table OS 5) showed that initial meta-liking was negatively linked to changes from T2–T3 (b = -0.23, p = .008) and weak changes from T3–T4 (b = 0.12, p = .042). Thus, when we isolated individual meta-liking tendencies, default meta-liking seemed to matter somewhat more for later meta-liking changes.

Figure 3

Changes in Meta-Liking Throughout the Social Interaction
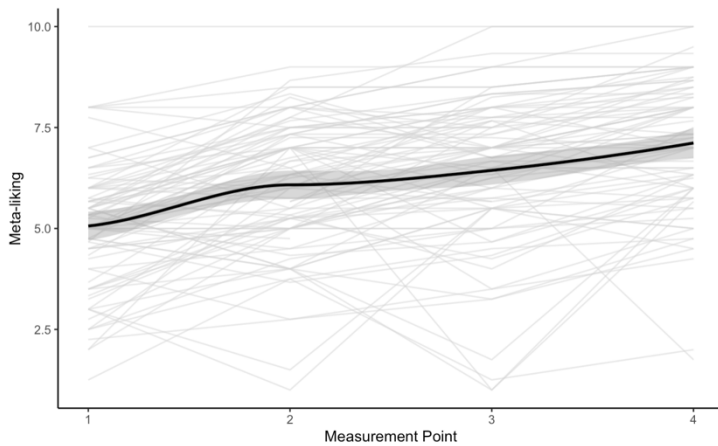
Note. Individual trajectories of meta-liking averages across the four measurement points in the interaction of 90 randomly selected participants.

The Role of Personality and Social Interaction Experiences for Initial Meta-Liking and Changes in Meta-Liking

To address our second and third research questions regarding the role of an individual's personality for initial meta-liking and social interaction experiences for meta-liking changes, we fitted four separate conditional neighbor-change models with each personality trait and interaction experiences as exogenous manifest variables. Table 3 displays the results of the full models including control variables (i.e., gender, age, and interaction condition). Models containing the meta-liking perceiver effects as a robustness check are presented in Table OS 6. Model fit was satisfactory with CFI values > .95 and RMSEA values < .07 for all models.

The Role of Personality

In line with our assumptions, personality characteristics appeared to reflect people's default expectations, predicting initial meta-liking at zero-acquaintance. That is, people higher in extraversion and self-esteem tended to report higher initial meta-liking (extraversion: $b = 0.33$; self-esteem: $b = 0.24$, p's < .001). In contrast, participants with higher neuroticism levels generally expected to be liked less by other group members at T1 ($b = -0.25$, $p = .003$). Contrary to our hypothesis, agreeableness did not predict initial meta-liking. This result pattern remained robust when fitting models with meta-liking perceiver effects (Table OS 6).[17]

In addition, we examined whether personality was linked to changes in meta-liking. As shown in Table 3, extraversion, neuroticism, and self-esteem predicted changes from T1–T2

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[17] A combined model with all three Big Five traits also displayed a similar result pattern (Table OS 7).

(Δchange2), that is, changes following participants' self-introductions. People with higher extraversion and self-esteem showed more pronounced increases from T1–T2 (extraversion: $b = 0.32$, $p < .001$; self-esteem: $b = 0.18$, $p < .001$), while people with higher neuroticism showed attenuated increases in meta-liking in this early phase of the interaction ($b = -0.26$, $p < .001$). Beyond the second measurement point, none of the personality characteristics predicted any changes in meta-liking. Again, this pattern was similar when fitting the models with the meta-liking perceiver effects.[18] For a detailed look at early meta-liking changes, Figure 4 shows individual change trajectories of meta-liking for high, medium, and low scores for each trait (categories are based on one standard deviation above or below the mean).

The Role of Social Interaction Experiences

Our third research objective addressed whether specific interaction experiences predict meta-liking at the beginning of an interaction as well as changes therein throughout the interaction. First, we focused on the link between liking one's interaction partners at the beginning of the interaction and initial meta-liking and meta-liking changes (i.e., assumed reciprocity path). Second, we investigated whether expressive behaviors of interaction partners predict meta-liking changes (i.e., cue-based updating path).

Overall, liking others seemed to play a role for initial meta-liking and changes early during the interaction. Adolescents who liked their interaction partners at T1 (at first sight) expected to be liked more in return (b's = 0.47–0.49, p's < .001; see Table 3). Moreover, these participants increased more in their meta-liking between T1–T2 (b's = 0.32– 0.35, p's < .001). These associations were consistent across models and robust when controlling for being liked at T1. Being liked by others was not linked to initial meta-liking (i.e., meta-accuracy path) or changes in meta-liking from first to second measurement. Apparently, the initial expectation of being liked was driven by people's own sense of how much they liked others, rather than reflecting how much they were liked in reality. Finally, meta-liking changes from T2–T3 and T3–T4 were not predicted by either liking interaction partners or being liked. Models with meta-liking perceiver effects largely replicated these results but showed a significant link between being liked and meta-liking change from T2–T3 as a diverging finding from the main models (see Table OS 6).

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[18] As a preregistered exploratory analysis, we considered the potential effects of acquiescent responding in personality ratings, as younger age groups have been found to show higher levels of acquiescence in their self-reports of personality traits that might bias results (Soto et al., 2008). To do so, we standardized the personality scores within each person (i.e., ipsatization) and fitted the models with these standardized personality scores. Internal consistencies for the ipsatized personality scores were good with values ranging from $\omega = .83$ for agreeableness to $\omega = .88$ for neuroticism. Model results remained robust and similar to our main models (Table OS 8).

Turning to the role of expressive behaviors for meta-liking changes from T2–T3 and T3–T4, the models showed a mixed picture: Expressive behaviors of interaction partners were positively linked to meta-liking changes from T2–T3 (b's = 0.53–0.54, p's = .012) but not associated with changes from T3–T4. That is, if interaction partners showed more expressive behaviors during the interactive roleplay between T2–T3 (see Figure 2), adolescents tended to increase more in their meta-liking immediately after the roleplay. However, this result was not replicated in the models with meta-liking perceiver effects. We address this inconsistency in the Discussion section. Finally, there were significant but inconsistent links between participants' own expressive behaviors and meta-liking changes across models (b's = 0.22–0.26, p's = .035).[19] Also, neither gender, age nor interaction condition consistently predicted initial meta-liking across models.

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[19] Table OS 9 summarizes additional models including separate behavioral channels of interaction partners' expressiveness. These models produced similar findings compared to the main models, except for a significant positive association between paraverbal expressiveness by the target person and meta-liking changes from the T2–T3. However, given the high intercorrelations with other behavioral channels, we are cautious to interpret this single finding as a robust effect pertaining specifically to the paraverbal domain.

Table 3

Full Neighbor-Change Models with Personality and Interaction Experiences Predicting Initial Meta-Liking and Changes in Meta-Liking

	Extraversion			Agreeableness			Neuroticism			Self-Esteem		
	Est.	SE	*p*	Est.	SE	*p*	Est.	SE	*p*	Est.	SE	*p*
Meta-liking T1 ~												
Intercept	**4.26**	0.44	< .001	**4.27**	0.44	< .001	**4.44**	0.45	< .001	**4.49**	0.46	< .001
Personality	**0.33**	0.08	< .001	0.09	0.11	.424	**-0.25**	0.09	.003	**0.24**	0.06	< .001
Age	0.06	0.06	.322	0.06	0.06	.331	0.06	0.06	.333	0.05	0.06	.347
Gender	0.14	0.14	.313	0.12	0.15	.403	0.01	0.14	.919	-0.03	0.14	.838
Condition	0.43	0.26	.092	0.44	0.26	.091	0.43	0.26	.097	0.45	0.26	.081
Social interaction experiences												
Liking Others T1	**0.49**	0.1	< .001	**0.48**	0.1	< .001	**0.48**	0.1	< .001	**0.47**	0.09	< .001
Being Liked T1	0.03	0.11	.812	0.04	0.11	.708	0.04	0.11	.733	0.03	0.11	.766
R^2			.275			.239			.262			.293
Δchange2 ~												
Intercept	**3.51**	0.5	< .001	**3.27**	0.49	< .001	**3.44**	0.48	< .001	**3.54**	0.5	< .001
Meta-liking T1	**-0.52**	0.1	< .001	**-0.47**	0.1	< .001	**-0.51**	0.1	< .001	**-0.53**	0.1	< .001
Personality	**0.32**	0.08	< .001	0.05	0.1	.633	**-0.26**	0.08	.002	**0.18**	0.05	< .001
Social interaction experiences												
Liking Others T1	**0.35**	0.08	< .001	**0.32**	0.09	< .001	**0.34**	0.08	< .001	**0.35**	0.08	< .001
Being Liked T1	0.12	0.12	.344	0.12	0.13	.327	0.13	0.13	.302	0.12	0.12	.313
R^2			.264			.225			.256			.260
Δchange3 ~												
Intercept	**1.52**	0.63	.016	**1.61**	0.61	.008	**1.53**	0.63	.014	**1.46**	0.64	.023
Meta-liking T1	-0.19	0.13	.122	-0.21	0.12	.083	-0.2	0.12	.117	-0.18	0.13	.156
Personality	-0.09	0.1	.392	0.03	0.11	.771	0.11	0.11	.300	-0.09	0.08	.245
Social interaction experiences												
Liking Others T1	0.05	0.11	.647	0.05	0.11	.673	0.05	0.11	.637	0.04	0.11	.674
Being Liked T1	-0.08	0.14	.547	-0.08	0.14	.539	-0.09	0.14	.504	-0.09	0.14	.508
Expressive behavior IP	**0.53**	0.21	.012	**0.53**	0.21	.011	**0.54**	0.21	.011	**0.53**	0.21	.012
Expressive behavior TP	0.22	0.12	.070	**0.25**	0.12	.035	**0.26**	0.11	.024	**0.26**	0.12	.027
R^2			.071			.080			.087			.085
Δchange4 ~												
Intercept	-0.06	0.45	.895	-0.05	0.45	.910	-0.08	0.47	.874	-0.16	0.51	.750
Meta-liking T1	0.09	0.08	.285	0.09	0.08	.291	0.09	0.09	.293	0.11	0.09	.246
Personality	-0.01	0.1	.912	0.09	0.11	.418	0.02	0.07	.763	-0.06	0.06	.311

Social interaction experiences

Liking Others T1	0.02	0.09	.866	0	0.1	.977	0.02	0.09	.869	0.01	0.09	.915
Being Liked T1	-0.01	0.11	.888	0	0.1	.965	-0.01	0.11	.897	-0.02	0.11	.876
Expressive behavior IP	-0.2	0.26	.437	-0.2	0.26	.454	-0.21	0.27	.428	-0.22	0.27	.407
Expressive behavior TP	-0.08	0.11	.491	-0.11	0.11	.325	-0.09	0.11	.384	-0.08	0.11	.447
R^2			.017			.023			.020			.025

Model Fit

χ^2	19.69	24.99	26.14	25.25
Robust CFI	0.98	0.98	0.98	0.98
Robust RMSEA	0.05	0.06	0.07	0.06
BIC	3801.31	3828.57	3809.84	3794.03

Note. Significant effects are in bold font. IP = Interaction partner, TP = Target person. Gender coded as 0 = female, 1 = male. Condition coded as 0 = cooperative, 1 = competitive. Liking Others T1 and Being Liked T1 represent the perceiver and target effect of liking at first measurement point. RMSEA = root-mean-square error of approximation, CFI = comparative fit index, BIC = Bayesian information criterion.

Figure 4

Individual Meta-Liking Change Trajectories Displayed for the Respective Personality Traits
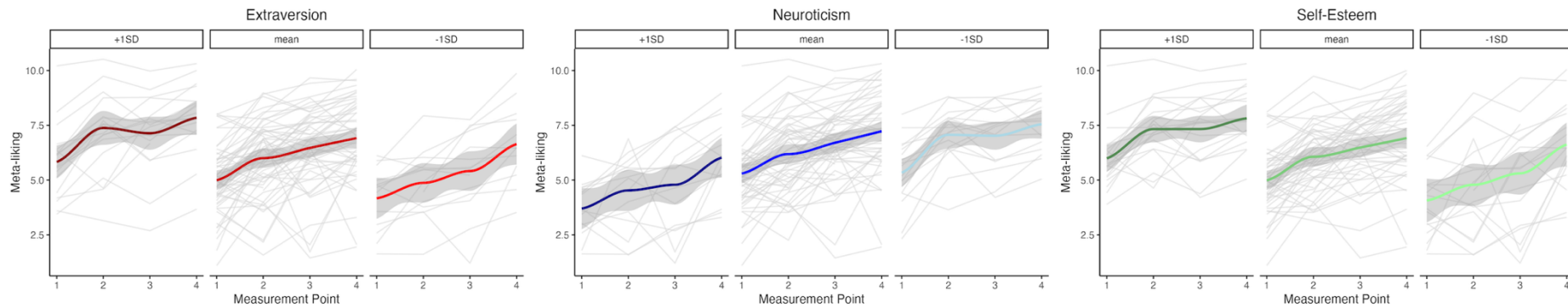
Note. Individual trajectories of meta-liking averages across the four measurement points in the interaction of 90 randomly selected participants.

Discussion

The present research used repeated-measures data from adolescent social group interactions to investigate the development of meta-liking from complete zero-acquaintance over the course of an initial social interaction of 60–90 minutes. Furthermore, we examined how personality and social interaction experiences explain initial meta-liking and meta-liking changes. Three key findings emerged: First, adolescents did systematically increase their average meta-liking and showed substantial interindividual differences in initial levels and in meta-liking change. That is, individuals entered the interaction with different expectations of how much they were liked and differentially adjusted their meta-liking throughout the interaction. Second, the personality traits extraversion, neuroticism, and self-esteem predicted initial meta-liking. Thus, informed by their personality, adolescents had different default expectations that characterized how much they believed to be liked by strangers when entering the interaction. Third, early meta-liking changed as a function of an individual's initial meta-liking, personality traits, and social interaction experiences captured in assumed reciprocity (i.e., liking others). In contrast, meta-liking changes during the interaction were positively but less robustly linked to expressive behaviors of interaction partners, and changes towards the end of the interaction occurred independently of all these features.

Taken together, our study provides a framework for a comprehensive investigation of social interaction patterns in an early stage of the acquaintance process by exploring how different information sources (i.e., personality and social interaction experiences) jointly inform meta-liking. Additionally, our research is the first to study the development of meta-liking in adolescence, an important developmental context characterized by a heightened social sensitivity (e.g. Somerville, 2013). Our discussion reviews the role of specific personality traits in establishing default settings of meta-liking, the social processes driving meta-liking changes, and implications of our findings.

Change and Stability of Meta-Liking in Zero-Acquaintance Interactions

Our findings suggest that meta-liking is composed of both stable and changing components in zero-acquaintance interactions: On the one hand, correlations between neighboring timepoint suggested that meta-liking contained a substantial degree of stability. These findings are in line with previous work that has examined meta-liking in adult samples, showing similar stabilities of meta-liking (Kenny, 2020; Salazar Kämpf et al., 2018). On the other hand, meta-liking mean-levels changed systematically over the first part of the interaction, with adolescents gradually increasing their meta-liking from the midpoint of the scale to more

positive expectations before leveling off towards the end of the interaction. As such, our study extends work on other-perceptions showing that people enter social interactions with a generalized stereotype that shifts towards a more group-specific stereotype (Rau et al., 2022; Srivastava et al., 2010), showing that meta-liking of adolescents display a similar pattern: It appears that meta-liking is relatively stable within first social interactions, but there is room for adapting one's perception as new information becomes available.

Next to systematic mean-level changes in meta-liking, we observed substantial interindividual differences in initial meta-liking and meta-liking changes. That is, people started with quite different expectations of whether interaction partners liked them and adapted their expectations differentially. Interindividual differences in early changes were partially explained by a person's starting value: If people expected to be disliked when entering the interaction, they were more likely to change their judgments in the first part of the interaction. However, initial meta-liking became less relevant as an anchor for meta-liking change over time. This could mean that during the acquaintance process, new social experiences become increasingly important for updating meta-liking. This resonates with recent research on other-perceptions: Focusing on different traits, individuals continue to change their perceptions in the early weeks of the acquaintance process, with changes largely based on accumulating social experiences (Rau et al., 2022). A similar process could be true for meta-liking: If Harry wants to engage in further social contact after the initial social interaction, his meta-liking might adapt continually due to new interaction experiences. To date, few studies have investigated changes in interpersonal perceptions, and more research is needed to understand when, how, and why people change their meta-liking (or hold on to their default expectations). To this end, future work could examine the development of meta-liking over multiple interactions, capturing the acquaintance process on a broader time scale. This could provide new insights into whether there are systematic and interindividual differences in meta-liking change *after* the initial interaction and how this impacts social relationships.

The Role of Personality for Initial Levels of and Changes in Meta-Liking

To get a deeper understanding of the origins of meta-liking, we investigated whether personality inform default expectations reflected in initial meta-liking at zero-acquaintance. Along the lines of our conceptual framework (Figure 1), people with high extraversion tended to believe that others liked them, while high neuroticism was linked to lower initial meta-liking. Together with previous research, these results provide a consistent picture of the social consequences of these two Big Five traits in the early stages of social relationships. On the one hand, research has demonstrated the benefits of high extraversion in social contexts, with

individuals being more comfortable interacting with strangers (Cuperman & Ickes, 2009) and initiating more social interactions (Festa et al., 2012). On the other hand, high neuroticism can be an obstacle to enjoying interactions with strangers (Mueller et al., 2019). Also, individuals high in neuroticism are more likely to perceive new social situations as threatening (Denissen & Penke, 2008a) and less likely to seek future contact (Festa et al., 2012). The current results suggest that these patterns are also reflected in default expectations about being liked by others: People high in extraversion generally expect positive outcomes (i.e., to be liked) from interactions with strangers, which arguably makes it desirable for them to initiate interactions. People high in neuroticism, by contrast, expect fewer positive outcomes when interacting with strangers, which may result in a more cautious approach.

Contrary to our expectations, agreeableness did not predict initial meta-liking. Past research has produced mixed findings regarding the role of agreeableness in zero-acquaintance settings for interpersonal perceptions (e.g., Back, Schmukle, et al., 2011; Cuperman & Ickes, 2009) and it has been theorized that the communal orientation captured by agreeableness (e.g., a focus on harmonious relationships) may play a more important role in established social relationships than in the acquaintance process (Harris & Vazire, 2016). Accordingly, exploring the potential function of agreeableness for meta-liking beyond first social interactions is an interesting topic for future research.

Next to the Big Five traits, we found that high trait self-esteem predicted higher initial levels of meta-liking. This finding is consistent with the tenets of sociometer theory depicting trait self-esteem as a default expectation (Leary & Baumeister, 2000) and corroborates research with adult samples in zero-acquaintance settings (Back, Schmukle, et al., 2011; Srivastava & Beer, 2005). Our results suggest that the interpersonal function of trait self-esteem also applies to adolescents' interactions: In zero-acquaintance interactions, adolescents with high trait self-esteem expect to be liked, while adolescents with low self-esteem start off with lower expectations. The link between self-esteem and meta-liking in social settings may be particularly pronounced in adolescence, as peers take on a prominent socializing function (Rubin et al., 2007). Specifically, being socially included or rejected by peers becomes important (e.g., Harter, 2012; Wagner et al., 2018). Accordingly, low self-esteem can pose a challenge to initiating social interactions with peers in adolescence, as accompanying low meta-liking may lead individuals to try to avoid potential peer rejection.

The same traits that were linked to initial meta-liking also predicted early changes in meta-liking in the current study. Specifically, individuals with high levels of extraversion or self-esteem reported stronger increases in their meta-liking after receiving information about

interaction partners in a short introduction round. In contrast, people with high neuroticism levels seemed to be less inclined to let go of their (negatively colored) default meta-liking, showing diminished increases. Taken together, these results suggest that a person's stable personality shapes meta-liking default settings as well as the intake and interpretation of new social information early in the interaction. Along these lines, relatively stable and fairly low levels of meta-liking may be one contributing factor to the link between high neuroticism and less satisfying social interactions demonstrated by earlier research (Deventer et al., 2019; Wieczorek et al., 2021; Wilson et al., 2015). Together with previous work (Hannuschke et al., 2020), our results suggest that neuroticism may bias self-referential perceptions such as meta-liking, but not perceptions of and by others (i.e., liking others and being liked in reality). Future research could investigate how neuroticism shapes perceptual processes later in the acquaintance process, which could contribute to understanding the negative link between neuroticism and satisfaction in long-term relationships (Finn et al., 2015).

Given that initial meta-liking at first sight was at the midpoint of the scale and the variability in meta-liking early on, initial judgments may have also been informed by uncertainty (Elsaadawy et al., 2022). That is, people might have differed in terms of how much their uncertainty informed their meta-liking judgments. For example, people with more extreme social histories such as individuals high in extraversion or neuroticism might have had stronger defaults to draw on, whereas people with less extreme trait levels might simply be unsure about how much they would be liked. Similarly, early changes in meta-liking may have been influenced by uncertainty. For instance, a person's initial meta-liking may have been shaped by a combination of their default setting and uncertainty (e.g., an extraverted person might have some uncertainty, but a positive default). Finally, we did not find that personality predicted interindividual differences in later meta-liking changes in the interaction, that is, after people introduced themselves. One reason for this null-finding could be that as more information about interaction partners is gained, peoples' default settings become a less important source for updating meta-liking.

To sum up, our findings suggest that people bring their personality-based default expectations to social interactions, which resonates with the idea of symbolic interactionism that people have working models in the form of a *generalized other*—a general idea of how others perceive them to be (Mead, 1934). We propose that initial meta-liking may present a form of the generalized other concept that people use to make sense of new social situations, but people may look beyond their default expectations to update their meta-liking as they become more familiar with their interaction partners.

 The Role of Social Interaction Experiences for Initial Levels of and Changes in Meta-Liking

Beyond the role of personality, the current study focused on two social interaction experiences as potential change agents of meta-liking during initial social interactions. First, the tendency to like interaction partners as a process of assumed reciprocity. Second, expressive behaviors of interaction partners as a source of feedback to update meta-liking.

Participants who liked others at the beginning of the interaction also reported higher initial meta-liking and displayed stronger meta-liking changes early in the interaction. This is in line with earlier research that has identified assumed reciprocity as a powerful driver in the acquaintance process (e.g., Malloy, 2018; Montoya & Insko, 2008). In contrast, we found that initial meta-liking was not linked to actual liking, suggesting that adolescents may have little idea how much they are liked by others (i.e., low meta-accuracy) at first sight. This extends similar findings of previous works with adults (Back, Schmukle, et al., 2011), and suggests that people are more likely to use their own liking to guide their meta-liking in zero-acquaintance interactions. Contrary to our expectations, we did not find that liking others predicted meta-liking changes later in the interaction. One reason for this could be that liking others becomes more relevant after the first interaction: At the beginning, Harry likes everyone more or less equally, which informs his general meta-liking. With more information available, he might begin to like some group members more than others and increase his meta-liking for those specific others. Although we did not observe SRM relationship variance throughout the interaction that hint at a dyadic process of assumed reciprocity, we recommend that future research investigates assumed reciprocity at a dyadic level and as a dynamic process. To this end, researchers should consider samples with larger numbers of metaperceiver-perceiver dyads to estimate stable SRM relationship components at multiple time points during the interaction.

Turning to the role of interaction behaviors, we found that expressive behaviors of interaction partners explained meta-liking change from T2–T3 in the interaction, with higher levels of expressiveness linked to more meta-liking change. However, this was not replicated in models with meta-liking perceiver effects, meaning that behavioral information was likely linked to changes in the group-mean meta-liking (i.e., all participants within the group increased their meta-liking), but not linked to changes in perceiver tendencies *relative* to other group members. This suggests that behavioral information of interaction partners might not be relevant for general perceiver tendencies at a group-level, but more important for meta-liking of specific interaction partners (i.e., at a dyadic level). In terms of the Social Relations Model

(Kenny, 2020), this could mean that behavioral information is more likely associated with relationship variance in meta-liking instead of perceiver variance. Future research is needed to investigate the role of behavioral feedback for updating interpersonal perceptions such as meta-liking, exploring how it may be connected to different SRM variance components. Additionally, our results tentatively suggest that meta-liking and changes therein could be differentially linked to separate behavior channels of expressive behaviors (nonverbal vs. verbal behaviors). Together with prior findings in adult samples (e.g., Back et al., 2011), this suggests that it may be useful for future studies to distinguish between behavioral channels when investigating perception-behavior links within social interactions.

Finally, our findings imply that in a loosely structured group context, the common experience for most adolescents is to feel increasingly liked by their peers as they get acquainted with them, even when their initial meta-liking may have been dampened by their default expectations. This may hold promise for treating adolescents with interpersonal challenges revolving around social anxiety. Adolescence is a critical period when negative social interaction experiences contribute to the onset of clinical social anxiety (Erath et al., 2007; Parker et al., 2015). By choosing group contexts which are geared more deliberately towards positive interpersonal experiences and by preparing and following up on these experiences in a supportive manner, professionals may capitalize on the meta-liking mechanisms revealed in the present research. Additionally, by raising awareness that initial meta-liking judgments at first sight are subjective and may not align with others' actual perceptions, individuals can develop a more accurate understanding of their social interactions and avoid misinterpretations.

Limitations and Outlook

While we were able to closely track meta-liking development across small time intervals, there are several limitations of our study. First, our results do not allow for causal interpretations. In social interactions, interpersonal perceptions and behaviors are bidirectionally linked, resulting in complex dynamics (e.g., Back, Baumert, et al., 2011). For example, we studied liking others as a predictor of meta-liking and meta-liking change, but there is most likely a reciprocal dynamic: If Harry expects to be disliked, he might decide that he does not like others either. Accordingly, future studies should consider modeling simultaneous change in meta-liking and liking others to better understand the dynamics underlying assumed reciprocity.

Second, we focused on perceptions and behaviors at a group-level in the current study. Therefore, we cannot draw conclusions from our findings to meta-liking (changes) regarding interaction partners at a dyadic level. This is important because dyadic-level effects might affect

group experiences: If Harry thinks a particular group member who is especially popular or dominant does not like him, his meta-liking judgments might be lower for all group members. Thus, future work might explore these dyadic dynamics within groups as well as which factors lead to stronger dyadic effects (e.g., relative status). Relatedly, regarding the role of expressive behaviors, it is possible that people consider behavior of interaction partners at a more nuanced level instead of a general person-level. Mary's smiles, verbal address, and eye contact with Harry affects his meta-liking of Mary, not of the group. Of course, it might also be that strong negative cues from one person (Mark's frowns, verbal criticism) also strongly affect meta-liking for the group (Harry assumes everyone else shares Mark's dislike). In sum, future work is needed to disentangle dyadic and group-level processes in meta-liking change.

Third, although we accounted for method effects in the personality ratings by controlling for acquiescent responding, we cannot rule out the possibility that there may be additional method effects resulting from the use of self-reported data. As such, the robust and stronger association between liking others and initial meta-liking compared to the inconsistent link between meta-liking and being liked by others may have been artificially reinforced. Relatedly, we were unable to model the role of uncertainty (e.g., "fence-sitting") as a factor in initial meta-liking ratings. While past work has explored the role of confidence in meta-accuracy (e.g., people who are more confident in their accuracy are more accurate; Carlson et al., 2010), it is unclear if and how confidence predicts meta-liking and change.

Finally, the generalizability of the study's findings may be limited in several ways. First, we studied meta-liking in a sample of German adolescents, meaning that the current results may not be generalizable to other populations (e.g., other countries or older participants). Second, while the online setting of the study represents a prevalent social interaction context for adolescents (and adults), our findings may not generalize to face-to-face interactions. Face-to-face interactions may involve different, more subtle cues for updating meta-liking that are not captured in online settings (e.g., Sherman et al., 2013). However, recent research shows that processes involved in metaperception accuracy are similar in face-to-face and virtual interactions (Tissera et al., 2023), suggesting similar underlying processes. Third, meta-liking may change differentially depending on the stakes that come with a social situation. For instance, a zero-acquaintance interaction with a potential romantic partner would make meta-liking more consequential (e.g., Does this person want to go out with me?) and people might reflect more carefully on the information they receive about the other person or use different cues to inform their meta-liking. Fourth, initial meta-liking might be driven by different factors when people meet in different contexts (e.g., party versus a course in school). For example,

people higher in conscientiousness might expect to be liked more in an academic context or feel more liked over time due to what they believe they have to offer in that context. Taken together, future work is needed to investigate whether there are universal features that predict meta-liking in zero-acquaintance interactions and beyond on the one hand and identify features that play a role for meta-liking change in specific social contexts on the other.

Conclusion

In the current study, we illustrated that meta-liking within zero-acquaintance interactions is characterized by a relative stability with systematic increases in meta-liking mean-levels and substantial interindividual differences in initial meta-liking and change patterns throughout the interaction. Our findings suggest that adolescents' different starting expectations of being liked by unknown peers are partly driven by interindividual differences in a person's level of extraversion, neuroticism, and self-esteem. Further, we found that early meta-liking changed as a function of an individual's initial meta-liking, their personality, and social interaction experiences captured in assumed reciprocity (i.e., liking others). Changes in meta-liking toward the end of this first interaction were not explained by these features or by the expressive behavior of the interaction partners. Taken together, personality characteristics appear to play an important role for initial meta-liking when entering social interactions, whereas meta-liking updates become increasingly disconnected from these default expectations as the interaction progresses. Our study provides a framework for examining the personal and social information sources involved in the formation and changes of meta-liking that can be applied to study metaperceptions in a broader context.

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Supplemental Material Study 1

Table OS 1

Deviations from Preregistration

Topic	Preregistration	Changes in Manuscript
Operationalization of meta-liking and liking perceptions	- Operationalization of meta-liking as the perceiver effect extracted with SRM analyses (Kenny, 1994)	- We operationalized meta-liking as a combination of the perceiver effect and the group mean of meta-liking.
	- Operationalization of liking perceptions: Liking others was defined as the perceiver effect of liking, being liked as the target effect of liking.	- We operationalized liking others as a combination of the liking perceiver effect and the group mean of liking others. Being liked was operationalized as a combination of the liking target effect and the group mean of being liked.
Model specification	- Estimation of covariances between initial metaliking at T1 and change scores (Δchange2, Δchange3, Δchange4)	- Estimation of regressions between initial metaliking at T1 and change scores (Δchange2, Δchange3, Δchange4) based on McArdle, 2009.
	- We reported to estimate regressions between metaliking at T2 and Δchange3 and between metaliking at T3 and Δchange4.	- Based on model specifications outlined by Geiser, 2010: Estimations of regressions between meta-liking at T1 and all change scores (Δchange2, Δchange3, Δchange4)

Note. The preregistration can be found at the OSF:

https://osf.io/z6gqr/?view_only=abf92aa6e94d43e3b3b94c43af865911

Table OS 2

Variance Decomposition in Social Relations Analyses for Meta-Liking and Liking at T1–T4

	Perceiver effect	Target effect	Relationship effect
Meta-liking			
T1	0.41	0.06	0.53
T2	0.50	0.03	0.47
T3	0.41	0.04	0.55
T4	0.51	0.02	0.47
Liking			
T1	0.21	0.06	0.72
T2	0.25	0.10	0.65
T3	0.28	0.04	0.68
T4	0.31	0.05	0.64

Note. Variances can be interpreted as proportions of the total variance in ratings. Relationship effect includes measurement error. All estimates are standardized.

Table OS 3

Factor Loadings of Expressive Behavior Channels on A General Expressiveness Factor

	Loadings on general factor	Uniqueness
Gestures	0.87	0.25
Mimic	0.92	0.16
Verbal	0.71	0.49
Paraverbal	0.77	0.41

Note. Uniqueness is the variance in each item that is not explained by the factors. Proportion of variance = .664 explained by the general expressiveness factor.

Figure OS 1

Basic Univariate Latent Neighbor-Change Model to Assess Meta-Liking Changes
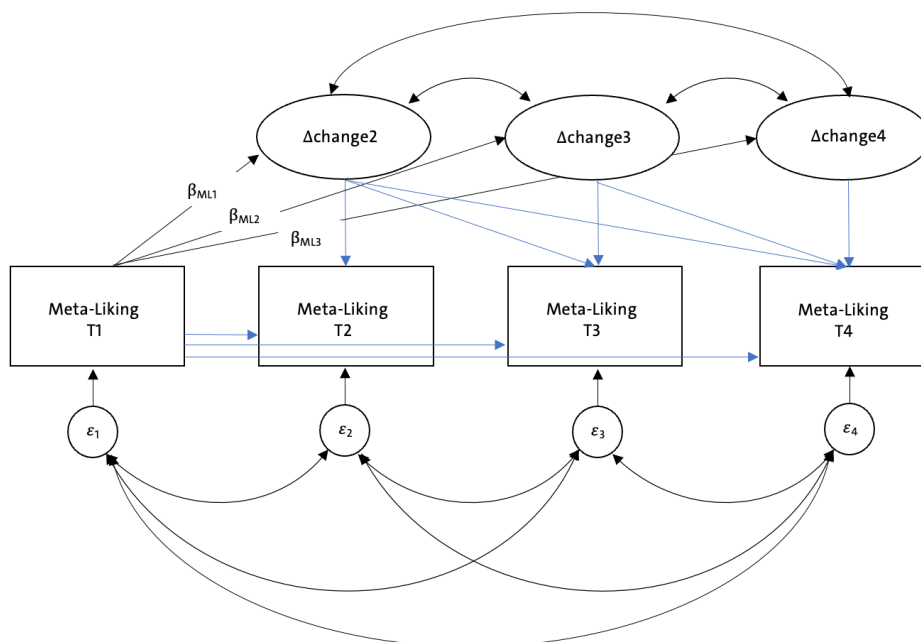
Note. Blue marks that paths are fixed to 1. Δchange2-4 = latent change scores, βML1-3 = auto-proportion coefficients, ε1-4 = observed score residuals. Double-headed paths indicate covariances.

Table OS 4

Correlations Among Key Study Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Meta-liking																								
1. Meta-liking T1	5.14	1.63																						
2. Meta-liking T2	5.95	1.78	.63																					
3. Meta-liking T3	6.52	1.75	.50	.61																				
4. Meta-liking T4	6.95	1.85	.55	.66	.75																			
Personality Traits																								
5. Extraversion	4.51	0.93	.24	.31	.24	.22																		
6. Agreeableness	4.96	0.82	.14	.15	.15	.17	.18																	
7. Neuroticism	3.99	1.03	-.17	-.23	-.14	-.13	-.35	-.24																
8. Self-esteem	4.52	1.60	.27	.28	.18	.13	.45	.22	-.68															
Social interaction experiences																								
9. Liking others T1	6.59	1.36	.47	.53	.50	.52	.06	.20	-.03	.06														
10. Being liked T1	6.58	1.04	.37	.46	.43	.44	.07	.12	-.01	.03	.79													
11. Expressive behavior IP	3.01	0.47	.24	.24	.34	.27	.08	-.01	.06	-.00	.22	.21												
12. Gesture	2.81	0.49	.26	.27	.30	.26	.11	.02	.02	.02	.22	.21	.88											
13. Mimic	2.73	0.60	.27	.26	.35	.33	.11	-.03	.05	-.01	.20	.21	.92	.84										
14. Verbal	2.94	0.38	.14	.15	.14	.13	.06	.00	.03	-.00	.13	.11	.78	.66	.62									
15. Paraverbal	3.56	0.68	.16	.15	.31	.19	.01	-.02	.08	-.01	.19	.18	.86	.58	.70	.56								
16. Expressive behavior TP	3.01	0.68	.21	.23	.28	.23	.32	.14	-.05	.13	.15	.21	.24	.24	.32	.12	.14							
17. Gesture	2.81	0.70	.22	.23	.24	.24	.32	.10	-.08	.13	.15	.19	.24	.27	.32	.15	.09	.87						
18. Mimic	2.73	0.78	.24	.24	.30	.26	.28	.12	-.02	.08	.18	.21	.36	.37	.47	.20	.21	.91	.81					
19. Verbal	2.93	0.59	.08	.15	.13	.11	.26	.11	-.07	.14	.06	.11	.10	.12	.15	.09	-.00	.80	.64	.62				
20. Paraverbal	3.57	1.04	.17	.18	.27	.17	.25	.14	-.02	.11	.13	.20	.14	.09	.18	.01	.15	.89	.62	.72	.61			
Covariates																								
21. Age	15.73	1.28	.01	.04	-.10	-.11	.03	.07	.02	-.04	-.05	-.01	-.09	-.03	-.07	-.07	-.14	.21	.20	.17	.22	.17		
22. Gender	0.39	0.49	-.00	-.04	-.04	.06	-.04	-.08	-.17	.18	-.09	-.11	-.05	-.08	-.08	-.03	-.00	-.18	-.13	-.22	-.11	-.16		
23. Condition	0.51	0.50	.24	.18	.10	.19	.02	-.02	-.02	.01	.21	.22	.18	.16	.20	.17	.11	.13	.12	.16	.11	.07		

Note. M and *SD* are used to represent mean and standard deviation, respectively. T1-T4 indicate the measurement point within the social interaction. Expressive behaviors were assessed between T2 and T3. IP = Interaction partners, TP = Target person. Meta-liking PE = perceiver effect of meta-liking, liking others reflects the perceiver effect of liking, being liked reflects the target effect of liking. Small deviations from zero in mean values of perceiver and target effects are due to missing values.

Table OS 5

Basic Latent Neighbor-Change Models Testing Changes in Meta-Liking Perceiver Effects

Variable	Est.	SE	p
Meta-liking T1 ~			
Intercept	0.00	0.05	.976
Variance	1.02	0.09	< .001
Δchange2 ~			
Intercept	0.00	0.05	0.939
Variance	0.92	0.1	< .001
Meta-liking T1	-0.31	0.08	< .001
R^2			
Δchange3 ~			
Intercept	0.00	0.05	.973
Variance	0.95	0.14	< .001
Meta-liking T1	-0.23	0.09	.008
R^2			
Δchange4 ~			
Intercept	-0.01	0.03	.834
Variance	0.7	0.1	< .001
Meta-liking T1	0.12	0.06	.042
R^2			
Δchange2 ~			
Δchange3	-0.51	0.1	< .001
Δchange4	0.08	0.06	.124
Δchange3 ~			
Δchange4	-0.35	0.08	< .001

Note. The displayed model is full-blown with no degrees of freedom, meaning that model fit could not be calculated for these models.

Table OS 6

Full Neighbor-Change Models with Personality and Interaction Experiences Predicting Initial Meta-Liking and Changes in Meta-Liking Using Meta-Liking Perceiver Effects

	Extraversion			Agreeableness			Neuroticism			Self-Esteem		
	Est.	SE	*p*	Est.	SE	*p*	Est.	SE	*p*	Est.	SE	*p*
Meta-liking T1 ~												
Intercept	**-0.59**	0.19	.002	**-0.59**	0.19	.001	**-0.46**	0.19	.016	-0.42	0.2	.036
Personality	**0.19**	0.05	< .001	0.09	0.07	.210	**-0.18**	0.06	.002	**0.18**	0.04	< .001
Age	0.07	0.04	.101	0.07	0.04	.119	0.07	0.04	.111	0.06	0.040	.099
Gender	**0.24**	0.10	.017	**0.23**	0.10	.020	0.15	0.10	.130	0.11	0.1	.271
Condition	0.17	0.09	.051	0.18	0.09	.048	0.17	0.09	.063	0.18	0.09	.041
Social interaction experiences												
Liking Others T1	**0.68**	0.11	< .001	**0.68**	0.12	< .001	**0.69**	0.11	< .001	**0.65**	0.11	< .001
Being Liked T1	0.35	0.23	.127	0.4	0.25	.110	0.41	0.23	.065	0.31	0.22	.158
R^2			.234			.207			.236			.280
Δchange2 ~												
Intercept	0.01	0.04	.828	0.01	0.04	.870	0.01	0.04	.845	0.01	0.04	.840
Meta-liking T1	**-0.46**	0.09	< .001	**-0.42**	0.09	< .001	**-0.46**	0.09	< .001	**-0.49**	0.09	< .001
Personality	**0.20**	0.05	< .001	0.05	0.07	.540	**-0.17**	0.06	.004	**0.12**	0.04	.001
Social interaction experiences												
Liking Others T1	**0.50**	0.12	< .001	**0.49**	0.12	< .001	**0.52**	0.12	< .001	**0.52**	0.12	< .001
Being Liked T1	**0.81**	0.27	.002	**0.87**	0.28	.002	**0.91**	0.28	.001	**0.86**	0.29	.002
R^2			.195			.164			.191			.197
Δchange3 ~												
Intercept	-0.01	0.05	.788	-0.01	0.05	.790	-0.01	0.05	.795	-0.01	0.05	.795
Meta-liking T1	**-0.23**	0.10	.017	**-0.24**	0.09	.010	-0.23	0.09	.014	-0.22	0.09	.018
Personality	-0.02	0.06	.801	0.04	0.08	.655	0.03	0.06	.633	-0.03	0.05	.509
Social interaction experiences												
Liking Others T1	-0.02	0.14	.878	-0.04	0.15	.789	-0.03	0.14	.826	-0.03	0.14	.826
Being Liked T1	-0.23	0.34	.508	-0.28	0.35	.427	-0.26	0.34	.452	-0.24	0.34	.483
Expressive behavior IP	0.07	0.08	.391	0.07	0.08	.345	0.08	0.08	.314	0.07	0.08	.337
Expressive behavior TP	0.05	0.08	.517	0.08	0.07	.258	0.09	0.07	.234	0.08	0.07	.258
R^2			.054			.060			.060			.059
Δchange4 ~												
Intercept	-0.02	0.04	.566	-0.02	0.04	.563	-0.02	0.04	.564	-0.02	0.04	.552
Meta-liking T1	0.13	0.07	.059	0.12	0.07	.075	0.13	0.07	.049	**0.17**	0.07	.017

Personality	-0.04	0.06	.510	0.06	0.08	.473	0.02	0.05	.653	-0.07	0.04	.079
Social interaction experiences												
Liking Others T1	0.04	0.11	.709	0.03	0.12	.820	0.04	0.11	.706	0.03	0.11	.782
Being Liked T1	0.29	0.26	.277	0.26	0.27	.344	0.28	0.26	.282	0.29	0.26	.279
Expressive behavior IP	0.02	0.11	.844	0.02	0.11	.836	0.02	0.12	.896	0.01	0.11	.937
Expressive behavior TP	-0.03	0.08	.715	-0.06	0.08	.455	-0.05	0.08	.517	-0.04	0.08	.613
R^2			.028			.031			.028			.041
Model Fit												
χ^2			26.71			32.88			32.61			34.36
Robust CFI			0.98			0.97			0.97			0.97
Robust RMSEA			0.06			0.07			0.07			0.07
BIC			2900.10			2921.14			2901.99			2879.70

Note. Significant effects are in bold font. IP = Interaction partner, TP = Target person. Gender coded as 0 = female, 1 = male. Condition coded as 0 = cooperative, 1 = competitive.

Liking Others at T1 is operationalized as the perceiver effect of liking, Being Liked at T1 as the target of effect of liking. RMSEA = root-mean-square error of approximation, CFI = comparative fit index, BIC = Bayesian information criterion.

Table OS 7

Neighbor-Change Models with Extraversion, Self-Esteem, and Neuroticism Predicting Initial
Meta-Liking and Meta-Liking Change in One Combined Model

Variable	Est.	SE	p
Meta-liking T1 ~			
Intercept	**4.42**	0.45	< .001
Extraversion	**0.19**	0.09	.030
Self-Esteem	**0.20**	0.07	.004
Neuroticism	0.02	0.10	.834
Age	0.05	0.06	.351
Gender	0.02	0.14	.879
Condition	0.44	0.25	.080
Social interaction experiences			
Liking Others T1	**0.48**	0.09	< .001
Being Liked T1	0.03	0.11	.797
R²			.302
Δchange2 ~			
Intercept	**3.63**	0.49	< .001
Meta-liking T1	**-0.54**	0.10	< .001
Extraversion	**0.23**	0.08	.006
Self-Esteem	0.07	0.06	.264
Neuroticism	-0.12	0.11	.266
Social interaction experiences			
Liking Others T1	**0.35**	0.08	< .001
Being Liked T1	0.12	0.12	.309
R²			.281
Δchange3 ~			
Intercept	**1.44**	0.65	.026
Meta-liking T1	-0.18	0.13	.168
Extraversion	-0.03	0.11	.809
Self-Esteem	-0.07	0.10	.476
Neuroticism	0.03	0.13	.831
Social interaction experiences			
Liking Others T1	0.04	0.11	.683
Being Liked T1	-0.09	0.14	.529
Expressive behavior IP	**0.54**	0.21	.012
Expressive behavior TP	0.22	0.12	.064
R²			.079
Δchange4 ~			
Intercept	-0.14	0.49	.771
Meta-liking T1	0.1	0.09	.246
Extraversion	0.03	0.13	.788
Self-Esteem	-0.11	0.10	.267
Neuroticism	-0.08	0.09	.376
Social interaction experiences			
Liking Others T1	0.01	0.09	.928
Being Liked T1	-0.01	0.11	.893
Expressive behavior IP	-0.21	0.27	.429
Expressive behavior TP	-0.08	0.11	.474
R²			.027

Model Fit	
χ^2	22.88
Robust CFI	0.983
Robust RMSEA	0.08
BIC	3823.96

Note. Significant effects are in bold font. IP = Interaction partner, TP = Target person. Gender coded as 0 = female, 1 = male. Condition coded as 0 = cooperative, 1 = competitive. RMSEA = root-mean-square error of approximation, CFI = comparative fit index, BIC = Bayesian information criterion.

Table OS 8

Univariate Latent Neighbor-Change Models with Ipsatized Personality Scores

	Extraversion			Agreeableness			Neuroticism		
	Est.	SE	*p*	Est.	SE	*p*	Est.	SE	*p*
Meta-liking T1 ~									
Intercept	**4.38**	0.44	< .001	**4.31**	0.45	< .001	**4.24**	0.45	< .001
Personality	**0.52**	0.18	.005	-0.05	0.20	.812	**-0.56**	0.12	< .001
Age	0.06	0.06	.285	0.06	0.06	.296	0.04	0.06	.488
Gender	0.08	0.14	.587	0.11	0.15	.434	0.03	0.14	.842
Condition	0.43	0.26	.094	0.44	0.26	.097	0.42	0.26	.098
Social interaction experiences									
Liking Others T1	**0.49**	0.10	< .001	**0.50**	0.10	< .001	**0.46**	0.10	< .001
Being Liked T1	0.03	0.11	.794	0.03	0.12	.788	0.05	0.11	.666
R^2			.258			.237			.283
Δchange2 ~									
Intercept	**3.49**	0.48	< .001	**3.26**	0.5	< .001	**3.36**	0.48	< .001
Meta-liking T1	**-0.51**	0.09	< .001	**-0.47**	0.10	< .001	**-0.52**	0.10	< .001
Personality	**0.70**	0.18	< .001	0.03	0.17	.855	**-0.46**	0.14	.001
Social interaction experiences									
Liking Others T1	**0.35**	0.08	< .001	**0.33**	0.09	< .001	**0.33**	0.09	< .001
Being Liked T1	0.12	0.12	.327	0.12	0.12	.329	0.14	0.13	.282
R^2			.269			.225			.259
Δchange3 ~									
Intercept	**1.50**	0.63	.018	**1.60**	0.63	.011	**1.57**	0.61	.011
Meta-liking T1	-0.19	0.12	.126	-0.21	0.12	.085	-0.19	0.13	.127
Personality	-0.32	0.22	.145	0.02	0.20	.924	0.15	0.16	.335
Social interaction experiences									
Liking Others T1	0.05	0.11	.670	0.05	0.11	.639	0.05	0.11	.623
Being Liked T1	-0.09	0.14	.527	-0.09	0.14	.520	-0.09	0.14	.508
Expressive behavior IP	**0.53**	0.21	.013	**0.53**	0.21	.013	**0.54**	0.21	.011
Expressive behavior TP	**0.24**	0.12	.034	**0.26**	0.11	.023	**0.24**	0.12	.036
R^2			.080			.080			.081
Δchange4 ~									
Intercept	-0.05	0.46	.918	-0.11	0.47	.813	-0.06	0.46	.897
Meta-liking T1	0.09	0.08	.305	0.09	0.08	.287	0.09	0.09	.295
Personality	0.02	0.16	.880	0.21	0.17	.205	0.01	0.10	.891

Social interaction experiences									
Liking Others T1	0.02	0.09	.858	0.00	0.09	.977	0.02	0.09	.863
Being Liked T1	-0.01	0.11	.894	0.00	0.10	.989	-0.01	0.10	.893
Expressive behavior IP	-0.20	0.26	.442	-0.19	0.26	.479	-0.21	0.27	.431
Expressive behavior TP	-0.09	0.11	.403	-0.09	0.11	.380	-0.09	0.11	.413
R^2			.018			.024			.019
Model Fit									
χ^2			27.60			31.60			30.11
Robust CFI			0.99			0.98			0.98
Robust RMSEA			0.05			0.06			0.06
BIC			3806.64			3829.56			3800.61

Note. Significant effects are highlighted in bold font. IP = Interaction partner, TP = Target person. Gender coded as 0 = female, 1 = male.

Condition coded as 0 = cooperative, 1 = competitive. RMSEA = root-mean-square error of approximation, CFI = comparative fit index,

BIC = Bayesian information criterion.

Table OS 9

Univariate Neighbor-Change Models with Personality and Separate Behavioral Channels Predicting Levels and Changes in Average Meta-Liking

	Extraversion			Agreeableness			Neuroticism			Self-Esteem		
	Est.	SE	*p*	Est.	SE	*p*	Est.	SE	*p*	Est.	SE	*p*
Meta-liking T1 ~												
Intercept	**4.26**	0.44	< .001	**4.27**	0.44	< .001	**4.44**	0.45	< .001	**4.49**	0.46	< .001
Personality	**0.33**	0.08	< .001	0.09	0.11	.424	**-0.25**	0.09	.003	**0.24**	0.06	< .001
Age	0.06	0.06	.322	0.06	0.06	.331	0.06	0.06	.333	0.05	0.06	.347
Gender	0.14	0.14	.313	0.12	0.15	.403	0.01	0.14	.919	-0.03	0.14	.838
Condition	0.43	0.26	.092	0.44	0.26	.091	0.43	0.26	.097	0.45	0.26	.081
Social interaction experiences												
Liking Others T1	**0.49**	0.10	< .001	**0.48**	0.10	< .001	**0.48**	0.10	< .001	**0.47**	0.09	< .001
Being Liked T1	0.03	0.11	.812	0.04	0.11	.709	0.04	0.11	.733	0.03	0.11	.766
R²			.275			.239			.262			.293
Δchange2 ~												
Intercept	**3.51**	0.50	< .001	**3.27**	0.49	< .001	**3.44**	0.48	< .001	**3.54**	0.50	< .001
Meta-liking T1	**-0.52**	0.10	< .001	**-0.47**	0.10	< .001	**-0.51**	0.10	< .001	**-0.53**	0.10	< .001
Personality	**0.32**	0.08	< .001	0.05	0.10	.633	**-0.26**	0.08	.002	**0.18**	0.05	< .001
Social interaction experiences												
Liking Others T1	**0.35**	0.09	< .001	**0.32**	0.09	< .001	**0.34**	0.08	< .001	**0.35**	0.08	< .001
Being Liked T1	0.12	0.12	.344	0.12	0.13	.328	0.13	0.12	.302	0.12	0.12	.313
R²			.264			.225			.256			.260
Δchange3 ~												
Intercept	**1.56**	0.65	.016	**1.64**	0.63	.010	**1.58**	0.65	.015	**1.51**	0.67	.023
Meta-liking T1	-0.20	0.13	.126	-0.21	0.13	.092	-0.20	0.13	.120	-0.19	0.13	.157
Personality	-0.06	0.10	.541	0.05	0.11	.679	0.08	0.10	.398	-0.08	0.07	.284
Social interaction experiences												
Liking Others T1	0.05	0.10	.620	0.05	0.11	.667	0.05	0.10	.613	0.05	0.10	.644
Being Liked T1	-0.10	0.14	.483	-0.10	0.14	.480	-0.11	0.14	.444	-0.10	0.14	.445
Expressive Gestures IP	-0.07	0.39	.861	-0.07	0.39	.855	-0.06	0.39	.869	-0.06	0.39	.870
Expressive Mimic IP	0.44	0.29	.132	0.46	0.29	.120	0.45	0.29	.124	0.45	0.29	.125
Expressive Verbal Content IP	-0.56	0.30	.063	-0.55	0.30	.066	-0.55	0.30	.066	-0.55	0.30	.066
Paraverbal Expressiveness IP	0.38	0.20	.058	0.37	0.20	.068	0.37	0.20	.067	0.37	0.21	.073
Expressive Gestures TP	0.03	0.21	.881	0.07	0.21	.736	0.06	0.21	.789	0.06	0.21	.779
Expressive Mimic TP	-0.09	0.19	.649	-0.09	0.19	.620	-0.08	0.19	.669	-0.08	0.19	.672
Expressive Verbal Content TP	-0.16	0.21	.452	-0.15	0.21	.468	-0.15	0.22	.471	-0.16	0.22	.470

Paraverbal Expressiveness TP	**0.25**	0.11	.018	**0.26**	0.11	.016	**0.26**	0.10	.010	**0.26**	0.11	.013
R^2			.112			.120			.128			.125
Δchange4 ~												
Intercept	0.04	0.42	.914	0.07	0.41	.858	0.03	0.44	.938	-0.05	0.47	.922
Meta-liking T1	0.07	0.07	.357	0.06	0.07	.394	0.07	0.08	.368	0.09	0.09	.312
Personality	-0.03	0.10	.731	0.13	0.11	.251	0.03	0.07	.645	-0.06	0.06	.316
Social interaction experiences												
Liking Others T1	0.04	0.09	.640	0.02	0.09	.784	0.04	0.09	.638	0.04	0.09	.679
Being Liked T1	0.00	0.11	.973	0.01	0.11	.916	0.00	0.11	.983	-0.01	0.11	.960
Expressive Gestures IP	-0.44	0.38	.246	-0.47	0.38	.210	-0.44	0.38	.245	-0.43	0.38	.263
Expressive Mimic IP	0.63	0.33	.060	0.68	0.34	.048	0.62	0.33	.065	0.59	0.34	.082
Expressive Verbal Content IP	0.36	0.32	.258	0.35	0.32	.273	0.36	0.31	.254	0.36	0.31	.249
Paraverbal Expressiveness IP	-0.63	0.21	.002	-0.64	0.21	.003	-0.63	0.21	.003	-0.61	0.21	.004
Expressive Gestures TP	0.22	0.21	.281	0.22	0.21	.313	0.22	0.21	.297	0.23	0.21	.269
Expressive Mimic TP	-0.10	0.19	.590	-0.12	0.19	.549	-0.11	0.19	.569	-0.12	0.18	.512
Expressive Verbal Content TP	-0.01	0.22	.974	-0.02	0.23	.921	-0.01	0.23	.980	0.01	0.23	.959
Paraverbal Expressiveness TP	-0.18	0.12	.116	-0.20	0.11	.079	-0.19	0.11	.095	-0.19	0.11	.100
R^2			.092			.101			.094			.096
Model Fit												
χ^2			32.53			41.11			42.04			42.11
Robust CFI			1.00			0.99			0.99			0.99
Robust RMSEA			0.00			0.03			0.03			0.03
BIC			3834.76			3860.75			3843.64			3828.82

Note. Significant effects are highlighted in bold font. IP = Interaction partner, TP = Target person. Gender coded as 0 = female, 1 = male. Condition coded as

0 = cooperative, 1 = competitive. RMSEA = root-mean-square error of approximation, CFI = comparative fit index, BIC = Bayesian information criterion

Figure OS 2

Univariate Latent Neighbor-Change Model with Covariates to Predict Initial Meta-Liking and Meta-Liking Changes
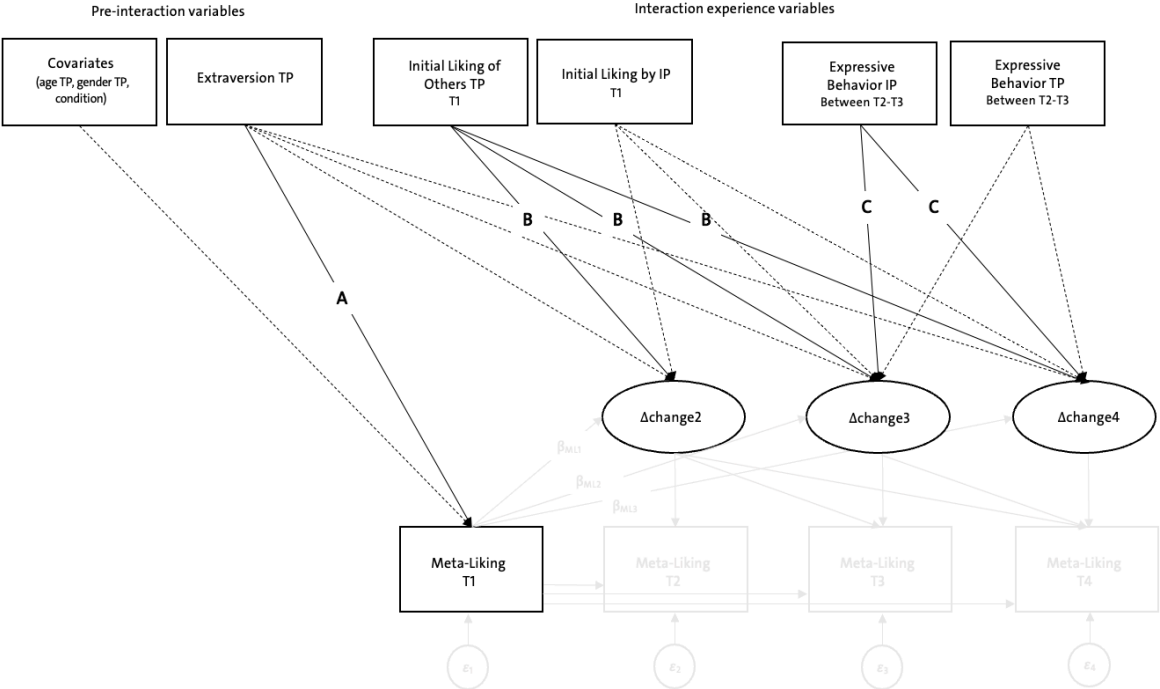
Note. ML = Meta-liking, TP = Target person, IP = Interaction partners. A, B, and C denote the key pathways of interest also depicted in the conceptual framework in Figure 1. Dotted lines represent controlled paths. The model depicts a simplified version of the statistical model without covariances.

3.   The Role of Interpersonal Perceptions of Social Inclusion and Personality in Momentary Self-Esteem and Self-Esteem Reactivity

Abstract

Empirical research has demonstrated that self-esteem is significantly shaped by social interactions and perceptions of social inclusion; however, less is known about individual differences in the reactivity of momentary self-esteem to social inclusion. Zooming into social interactions, we used data from two adolescent samples (overall $N > 200$) in two different social settings (i.e., a standardized laboratory interaction vs. real-life interactions) to examine the associations between different interpersonal perceptions (i.e., self-, other- and metaperceptions) of social inclusion and momentary self-esteem. Further, we investigated how these associations are shaped by an individual's personality (i.e., neuroticism, extraversion, and agreeableness). Multilevel modelling revealed differential associations between interpersonal perceptions and momentary self-esteem, with perceptions formed by the individual (i.e., self- and metaperceptions) more consistently related to momentary self-esteem than perceptions of others. Personality did not emerge as a consistent moderator of these associations but displayed differential effects: Neuroticism dampened self-esteem reactivity in group interactions with unfamiliar interaction partners, but not in dyadic interactions with familiar others. In light of these findings, we discuss the role of the social context and the interaction partner for the dynamic interplay of interpersonal perceptions and the functionality of personality traits.

Keywords: momentary self-esteem, interpersonal perceptions, personality, adolescence

The Role of Interpersonal Perceptions of Social Inclusion and Personality in Momentary Self-Esteem and Self-Esteem Reactivity

Self-esteem is defined as the general tendency to evaluate oneself positively or negatively (Leary & Baumeister, 2000). Empirical research has highlighted its predictive relevance for social, psychological, and health-related outcomes (Orth et al., 2014; Orth & Robins, 2014), prompting numerous studies to address the question of how self-esteem is formed. Over the past decades, it has been repeatedly demonstrated that self-esteem is shaped by social interactions and relationships with others (de Moor et al., 2021; Denissen et al., 2008; Harris & Orth, 2019; Leary, Tambor, et al., 1995). While a great amount of research supports the link between the perception of feeling socially included and self-esteem, first studies show considerable differences in the degree to which momentary self-esteem fluctuates in response to these perceptions (Poorthuis et al., 2014; Schmidt et al., 2021; Thomaes et al., 2010). Given the limited understanding of these individual differences in self-esteem reactivity, that is, the sensitivity to socially evaluative situations, it is necessary to take a closer look at the relationship between momentary self-esteem and perceptions of inclusion within social interactions. Insights into these micro-level processes underlying self-esteem and its reactivity may prove particularly important for understanding intra- and interindividual variations in self-esteem trajectories during adolescence, a period characterized by many developmental changes (Hutteman et al., 2015; Wagner et al., 2018).

Since the experience of social inclusion can only come about through social interactions with others, several theories suggest that the relationship between social inclusion and self-esteem is best understood by complementing the unique perspective of one individual with additional interpersonal perceptions (Cooley, 1902; Harter, 2012; Leary & Baumeister, 2000). Interpersonal perceptions refer to different perspectives within social interactions, such as self-perceptions, perceptions of and by others, and metaperceptions, defined as the beliefs of how one is viewed by others (Kenny, 1994). Alongside interpersonal perceptions, social experiences and relationships are shaped by an individual's unique pattern of thoughts, feelings, and behaviors – their personality (Back, Baumert, et al., 2011; Harris & Vazire, 2016). Therefore, we would like to argue that the link between momentary self-esteem and social inclusion, as an indicator of satisfying social interactions, is formed by interpersonal perceptions and their interplay, as well as the unique personality makeup of an individual.

With the current study, we aim to answer two intertwined research questions: First, to what degree are interpersonal perceptions of the self, others, and metaperceptions of social inclusion related to momentary self-esteem in social interactions? Second, how are certain

personality traits related to individual differences in self-esteem and its reactivity, i.e., the degree to which different types of perceptions of social inclusion relate to momentary self-esteem in adolescence? In addressing these questions, we hope to extend existing knowledge on individual differences in state self-esteem and its reactivity in at least three important ways. First, this is the first study to explore the relationship between different types of interpersonal perceptions of social inclusion and self-esteem in adolescence. Second, by differentiating between perceptions, we aim for a deeper understanding of the link between social inclusion and self-esteem. Finally, we provide insights into micro-processes of daily social interactions and focus on the role of an individual's personality therein.

Self-esteem and its link to social inclusion

The most widely known framework for understanding interpersonal influences on self-esteem is the sociometer theory (SMT; Leary et al., 1995; Leary & Baumeister, 2000). SMT proposes that self-esteem functions as an index of an individuals' social inclusion by others: Perceptions of social acceptance lead to an increase in self-esteem, whereas signs of being excluded lead to decreases. As such, self-esteem is considered a universal mechanism that operates both in the short and long run – while state self-esteem monitors immediate cues of social acceptance within social interactions, trait self-esteem functions as an index of one's general feelings of inclusion based on past experiences (Blackhart et al., 2009; Denissen et al., 2008). According to SMT, understanding changes in self-esteem thus requires considering an individual's social context.

Social contexts are diverse and accordingly, the experience of social inclusion can take different forms. This is reflected in the variety of different operationalizations used in past research on self-esteem: Studies investigating the association between social inclusion and self-esteem in group settings (e.g., classrooms) have indicated that liking may be a valid indicator of social inclusion that relates to an individual's self-esteem (e.g., "My classmates quite like me"; Wagner et al., 2018; Schmidt et al., 2021). In contrast, studies focusing on dyads (e.g., romantic partners, family members) have shown that relationship or interaction quality can also serve as markers of social inclusion, which also positively relates to self-esteem (de Moor et al., 2021; Denissen et al., 2008). Taken together, previous findings suggest that the association between social inclusion and self-esteem can be, first, captured using different indicators of social inclusion, and second, across different social settings (groups vs. dyadic interactions).

Looking at different social settings is of particular interest during adolescence – a time of social reorientation in which individuals reform their social networks in spending less time with their parents and forming new ties with peers (Smetana et al., 2006). At the same time,

one of the most critical tasks of adolescence is to develop a stable picture of oneself and gain awareness of one's values, attitudes, and abilities (Eccles et al., 1989; Erikson, 1968; Klimstra, 2013). To achieve this, adolescents rely strongly on their social environment (Erikson, 1968; Harter, 2012; Van Dijk et al., 2014), meaning that the opinions of peers and close others are vital for how they see themselves. However, most empirical studies to date have focused exclusively on self-perceptions, contrasting the notion that social experiences are shaped by different individuals and interpersonal perceptions (Back et al., 2011).

Interpersonal Perceptions of Social Inclusion

Within social interactions, individuals observe their own feelings and cognitions, make judgments about others, and are judged by others (Back et al., 2011). In addition, individuals constantly consider what others think of them in the form of metaperceptions (Kenny, 1994). In the following subsections, we distinguish between the three types of perceptions.

Self-Perceptions – The Inner Perspective

Broadly defined, self-perceptions of social interactions refer to how individuals regard themselves within social interactions. Individuals form an image of themselves by observing their own behavior, thoughts, and emotions, for example seeing oneself as particularly outgoing or talkative in a certain situation (Back, 2021). Focusing on self-esteem, empirical research has consistently demonstrated positive associations between self-perceived social inclusion and self-esteem both at state (Denissen et al., 2008; Schmidt et al., 2021) and trait level (Hutteman et al., 2015; Magro et al., 2019).

Other-Perceptions - The Outer Perspective

Beyond an individual's perception, both theory and research have highlighted that perceptions of and by others meaningfully shape interaction behavior and social experiences (Back et al., 2011; Rau et al., 2019). To illustrate, if interaction partners perceive a conversation as positive, this is most likely reflected in their behavior. This in turn may be picked up by the target person, affecting how they feel about themselves. In line with this idea, several studies have considered the relationship between other-perceptions of social inclusion and self-esteem (Reitz et al., 2014; Srivastava & Beer, 2005; Thomaes et al., 2010). Focusing on state self-esteem, one study indicated that other-rated liking after a social interaction impacted a person's momentary self-esteem, even when no explicit feedback was given (Srivastava & Beer, 2005). While these findings support the idea that others' perceptions of social inclusion directly influence self-esteem, a recent longitudinal study suggests that the relationship between other-perceptions and self-esteem may be more complex (Wagner et al., 2018). The findings suggest

that when considering the associations between self- and other-perceived social inclusion and trait self-esteem simultaneously, only self-perceptions displayed stable effects on self-esteem across time.

Overall, little is known about how different perceptions of social inclusion relate to momentary self-esteem when considered simultaneously. According to Leary and colleagues (1995), changes in self-esteem should occur in response to perceived rather than actual social inclusion: The way people think others see them might be more relevant than actual other-perceptions. Following this reasoning, we moved one step further in the current paper and considered metaperceptions of social inclusion in addition to self- and other-perceptions.

Metaperceptions: Looking Inward to See Outward

The awareness of others' evaluations of oneself is thought to be a key process highlighted by several theories. As an early notion, symbolic interactionism proposed metaperceptions to be an important driver in self-concept development (Cooley, 1902). Since then, empirical research has shown that metaperceptions steer interpersonal behavior, impact social relationships, and serve as a source of self-knowledge (Cameron & Vorauer, 2008; Carlson, 2016; Tissera et al., 2021; Vazire & Carlson, 2010). Despite their potential importance, the exact role of metaperceptions in social interactions has been difficult to identify due to their close connection to other interpersonal perceptions.

Metaperceptions and Self-Perceptions. Meta and self-perceptions are formed by the same individual but concern different viewpoints: Whereas an individual's own experience (e.g., an interesting conversation with a fellow student) is captured in their self-perception, said person might believe that their interaction partner found the conversation rather boring, reflecting their metaperception. While this difference is evident at the conceptual level, it has been difficult to detect empirically (Srivastava, 2012). Several findings show strong convergences between self- and metaperceptions of personality traits, to the extent that researchers have argued that in most cases, individuals think that others see them exactly how they perceive themselves (Kenny & Depaulo, 1993; Kenny & West, 2013). However, research has shown that metaperceptions of affect (e.g., liking) are in large parts based on reciprocity dynamics: If a person likes their interaction partner, they will assume that the interaction partner likes them back (Kenny, 2020). However, no study to this date has attempted to disentangle metaperceptions from self-perceptions of social inclusion. Thus, one aim of the present study was to look at the relationship between social inclusion and self-esteem from the different perspectives.

Metaperceptions and Other-Perceptions. While both meta and other-perceptions concern themselves with the perspective of others (e.g., the interaction partner), they also contain unique information that might differentially relate to individual's momentary self-esteem. Empirical studies have indicated that metaperceptions are hardly based on the actual perception of others (Chambers et al., 2008; Malloy et al., 2007), suggesting that metaperceivers use different information than their interaction partners. In line with this idea, one study investigated whether metaperceptions serve as the necessary link between other-perceptions of social inclusion and self-esteem (Srivastava & Beer, 2005). Rather than finding a mediating effect, results showed that metaperceptions and other-perceptions independently predicted momentary self-esteem. As an alternative to the mediation hypothesis, we propose a novel approach: While metaperceptions and other-perceptions may both relate to momentary self-esteem as indicated by prior research, metaperceptions might also moderate the link between other-perceptions of social inclusion and self-esteem. Since the perceptions of interaction partners are not directly observable, they are conveyed through behavioral signals within interactions (Back et al., 2011; Nestler & Back, 2013), which are then picked up by the individual. The recognition and interpretation of these signals can therefore be influenced by a person's metaperceptions on social inclusion: People with an overly negative metaperception may not expect positive signals (e.g., a smile) from others and are therefore less likely to notice them. In contrast, overly positive metaperceptions may lead individuals to expect positive signals from others and thus interpret others' reactions more favorably.

The role of personality on the interplay of social inclusion and self-esteem

In addition to situational characteristics, social experiences are shaped by the unique pattern of an individual's personality (Back et al., 2011; Breil et al., 2019; Schaffhuser et al., 2014). In particular, the personality traits neuroticism, extraversion, and agreeableness are known to be relevant in social interactions and relationships (Cuperman & Ickes, 2009; Wilson et al., 2015).

Neuroticism

High levels of neuroticism are associated with the experience of more negative affect and emotional instability (Costa & McCrae, 1995; Denissen & Penke, 2008). Previous findings have repeatedly associated neuroticism with lower trait self-esteem (Farmer et al., 2001; Robins et al., 2001; Zeigler-Hill et al., 2015) and stronger fluctuations of state self-esteem (i.e., self-esteem instability; Zeigler-Hill et al., 2015). Above this, neuroticism has been linked to a heightened sensitivity to social evaluations, meaning that individuals high in neuroticism react stronger to situations in which they are negatively judged by others (Evans et al., 2016). Thus,

individuals with high neuroticism levels are more concerned about how others see them, which in turn could cause stronger self-esteem reactions to differential perceptions of social inclusion. In line with this reasoning, first empirical evidence demonstrates that neuroticism is associated with self-esteem sensitivity, indicating that the link between self-perceived social inclusion and self-esteem is stronger for people with high levels of neuroticism (Denissen & Penke, 2008; Poorthuis et al., 2014). Although these studies provide initial support that neuroticism moderates the relationship between perceptions of inclusion and self-esteem, they are limited in their scope since they focus exclusively on self-perceptions of social inclusion.

Extraversion

In contrast to neuroticism, individuals high in extraversion generally experience social interactions in a positive manner (Breil et al., 2019; Cuperman & Ickes, 2009), are well-liked, and popular among their peers (de Vries et al., 2020; Hubers et al., 2016). They engage in more social interactions with others (Srivastava et al., 2008) and show higher overall levels of positive affect (Lucas et al., 2007). In addition, findings consistently show that high extraversion levels relate to higher global self-esteem (Farmer et al., 2001; Gebauer et al., 2015; Robins et al., 2001). In contrast, empirical research focusing on the role of extraversion in self-esteem reactivity is sparse. Only two studies included extraversion as a moderator of the link between social inclusion and self-esteem, with neither finding evidence of moderation (Mahadevan et al., 2019; Poorthuis et al., 2014). However, both studies focused exclusively on the relationship between self-perceived social inclusion and trait self-esteem, and consequently no information is available on the interplay between extraversion and different types of interpersonal perception and their impact on momentary self-esteem. Recent findings suggest that the connection between perceptions of social inclusion and momentary self-esteem is weaker for individuals who generally experience higher levels of social inclusion (Schmidt et al., 2021). Such general feelings of social inclusion might be especially likely for extraverted individuals, who report larger social networks (Wagner et al., 2014) and higher levels of available social support (Swickert et al., 2002). Accordingly, we suggest that extraversion moderates the link between perceptions of inclusion and self-esteem at state level.

Agreeableness

Next to extraversion, agreeableness is the most socially oriented trait and relates to many social outcomes and relationship processes: Agreeable individuals are more likely to enjoy social interactions (Cuperman & Ickes, 2009) are more often selected as friends, liked by their peers (de Vries et al., 2020; Wortman & Wood, 2011), and have fewer conflicts with others (Harris & Vazire, 2016). As with extraversion, empirical research on the role of agreeableness

in self-esteem reactivity is limited to two findings (Mahadevan et al., 2019; Poorthuis et al., 2014). While one study found no evidence for a moderating effect of agreeableness (Poorthuis et al., 2014), Mahadevan and colleagues (2019) indicated that individuals with high levels of agreeableness experienced stronger increases in trait self-esteem in response to self-perceived social inclusion. However, it is unknown whether agreeableness also impacts the relationship between different perceptions of social inclusion and state self-esteem. Previous findings have established that the central motive associated with agreeableness is to get along with others and to maintain positive relationships (Graziano & Tobin, 2013); thus, individuals high in agreeableness might be more attuned to their social environment, which could result in stronger momentary self-esteem reactivity.

The Present Study

The overall aim of the current study was to investigate the associations between adolescents' momentary self-esteem and different interpersonal perceptions of social inclusion. Above this, we sought to explore how an individual's level of neuroticism, extraversion, and agreeableness may shape these associations. Since research on interpersonal perceptions has shown that different perception types continually influence each other within and across social interactions (Back et al., 2011), we sought to explore the link between interpersonal perceptions of social inclusion by using data from two different social settings: In Study Part A, we investigated associations of interpersonal perceptions and momentary self-esteem in a laboratory group study with zero-acquainted peers, while Study Part B focused on experience sampling data (ESM) with reports on daily interactions with familiar interaction partners (see Table S1 in the Supplement for an overview of the two study parts, the hypotheses addressed and relevant variables).

Specifically, our study had two main goals: The first goal was to explore the relationship between momentary self-esteem and social inclusion by considering three types of interpersonal perceptions: self-, other-, and metaperceptions. Building on the assumptions of the SMT and related empirical research, we expected that the relationship between social inclusion and self-esteem is differentially shaped by different perception types. In Study Part A, we addressed the different roles of metaperceptions and other-perceptions: We expected that the belief of being socially included relates to momentary self-esteem in social interactions, whereas the actual perception of others does not (Hypothesis 1a). Expanding on this, we assumed that metaperceptions would moderate the degree to which other-perceptions of social inclusion relate to momentary self-esteem (Hypothesis 1b). Study Part B addressed the differential roles of self- and metaperceptions. Based on previous findings, we expected that momentary self-

esteem is associated with self-perceptions of social inclusion (Hypothesis 2a). Above self-perceptions, we assumed that metaperceptions would be associated with momentary self-esteem as well: Despite sharing a substantial amount of variance, we hypothesized that a clear distinction between self- and metaperceptions reveals unique information of each perception type, both of which are relevant to self-esteem (Hypothesis 2b). Finally, we also tested our first and second hypotheses simultaneously in Study Part B, using a subsample of the ESM study with all three perception types.

The second goal was to extend existing research in exploring the degree to which an individual's personality impacts self-esteem and influences its sensitivity to interpersonal perceptions of social inclusion (i.e., self-esteem reactivity) within interactions across different social settings. Specifically, our third hypothesis focused on the differential effects of the three most socially relevant personality traits neuroticism, extraversion, and agreeableness. Based on past findings, we expected that individuals with higher levels of neuroticism show higher self-esteem reactivity in response to different perceptions of social inclusion (Hypothesis 3a). Second, we assumed that the link between social inclusion and self-esteem is weaker for individuals scoring high on extraversion (Hypothesis 3b). Finally, we expected that individuals with high agreeableness levels place more value on being socially included, causing higher self-esteem reactivity to interpersonal perceptions (Hypothesis 3c). Since few studies made the distinction between self-perceptions, other-perceptions, and metaperceptions of social inclusion in self-esteem research, we refrained from making specific hypotheses regarding the influence of personality and the different perception types.

In our last, exploratory research question, we integrated our first and second goal by testing whether the moderation role of metaperception is also moderated by an individual's personality. As such, we assumed that individuals with high levels of neuroticism react more sensitive to the belief of being included by others, which in turn moderates the extent to which others' actual impressions associate with momentary self-esteem. Likewise, we explored this three-way interaction between metaperceptions, peer-perceived social inclusion, and personality for extraversion and agreeableness, but without having strong hypotheses about it. To address our interrelated research goals, we apply multilevel modeling to data from two adolescent samples (overall $N > 200$) in two different social settings: A laboratory study in which adolescents took part in an interactive group task with zero-acquaintance peers (Study Part A), and an experience sampling study (ESM) during which adolescents reported on their daily social interactions (Study Parts B).

Study Part A: Momentary Self-Esteem in Zero-Acquaintance Interactions—The Role of Other- and Metaperceptions of Social Inclusion

Method

      The current research used data from SELFIE study, a longitudinal multimethod study investigating the development of personality and self-esteem across two important transitional phases of life, namely during late adolescence in the final year of high school, and during the period of retirement. In this study, two separate samples were collected: The first sample was recruited from June 2018 to March 2019, while the second sample was recruited from March to December 2019. Participants in the first sample started the study with a laboratory session during which they met and interacted with three to five other participants in a zero-acquaintance situation. In contrast, the second sample was assessed exclusively in an online setting, meaning that participants did not take part in a lab session, but otherwise went through the same study phases as the first sample. In Part A, we used the data from the first sample, focusing on data from the lab session. All data in the study were collected according to ethical standards and were reviewed and approved by the ethics committee of the German Psychological Society (DGPs).[20]

Procedure

      Participants were recruited via social media and schools based in Germany. The lab session comprised a round-robin design, for which participants were randomly assigned to one of 30 groups with group sizes varying between two to six participants ($M = 3.37$, $SD = 1.03$). On arrival, participants were asked not to communicate with any other participants present, to ensure that the experiment would take place in a zero-acquaintance context. The entire session lasted about three hours, during which the participants delivered a short self-representation, filled in questionnaires concerning their demographic information and personality, and participated in an interactive group task (i.e., participants were asked to build a tower out of sheets of paper). In total, the session comprised three rating rounds (at the very beginning, after the self-presentation, and after the interactive task). All questionnaires were administered using the open-source software formR (Arslan et al., 2020).

Participants

      Of the 103 adolescents who took part in the lab session, we excluded two participants from the analysis: One individual had to be excluded due to incomplete data (presumably due

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[20] More detailed information on recruitment procedures and assessment can be found on the OSF-page of the SNAP project (OSF-link to project).

to a technical error), and we detected a response pattern in the data of one other participant.[21] The final sample consisted of $N = 101$ individuals with an average age of 17.52 ($SD = 1.06$, 71.29% female).[22] Participants rated themselves and all other group members three times during the session, resulting in $N = 303$ observations. Power simulations were conducted with the R Package 'SimR' (Green & MacLeod, 2016). We applied a stepwise procedure, simulating power for different multilevel estimates (more detailed information can be found in the Supplement). Results indicated that the Study Part A sample size provided a power of 88% for detecting unstandardized multilevel estimates of $b = .35$ (76.50% for $b = .30$) at level 1, and 84.60% power to detect level 2 estimates of $b = .45$ (74.20% for $b = .40$). Power was assessed as the relative number of p-values below .05 (see Supplement Table S2 for full results of the power simulation).

Measures

Momentary Self-Esteem. In each of the three rating rounds, momentary self-esteem was assessed with the item "All things considered, how content are you with yourself right now?" on a scale ranging from 0 (*not at all*) to 10 (*very*).

Metaperception of Social Inclusion. Participants reported the degree to which they thought the other group members liked them on a scale from 0 (*not at all*) to 10 (*very*). For each rating round, we aggregated the metaperceptions regarding all other group members to a mean score.

Other-Perception of Social Inclusion. To parallel the wording of the metaperception item, all participants rated how much they liked each group member on a scale from 0 (*not at all*) to 10 (*very much*) in each of the three rating rounds. These other-perceptions were aggregated to a mean score per rating round, indicating how much the other group members liked the participant.

Personality Traits. Personality traits were assessed with the German version of the Big Five Inventory 2 (BFI-2; Danner et al., 2019). The traits neuroticism, extraversion, and agreeableness were each measured with 12 items on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Internal consistency was good with values ranging from $\omega = .91$ for neuroticism to $\omega = .91$ for extraversion, and $\omega = .85$ for agreeableness.

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[21] All analyses were run with and without the participant. We found no significant differences in the results.
[22] One participant reported an age of 13. Before excluding the participant, we cross-checked this information with the reported date of birth, showing that the participant was 15 years old. We therefore assumed a typing error and recalculated the participants' age as the difference between the birthdate and the submission-date of the questionnaire.

Demographics. Participants indicated their age and gender, which we coded 0 for male and 1 for female.

Data-Analysis

Data cleaning, structuring, and all analyses were performed with R (Version 4.0.2; R Core Team, 2020). All analyses were preregistered on OSF (https://osf.io/vdneq/) and the R scripts for all analyses are provided on the OSF platform. To account for the nested data structure (measurement points nested in individuals), we estimated linear multilevel regression models specified on two levels: within-person (level 1) and between-person (level 2).[23] Following the recommended procedure for separation of between- and within-person associations (Bolger & Laurenceau, 2013), we centered all within-person variables at the participants' mean, and all between-person variables at the respective sample mean prior to the analyses. We specified separate models for the personality traits neuroticism, extraversion, and agreeableness. For each personality trait, we preregistered a basic model with the interpersonal perception variables at the within-person level (denoted by the suffix _wp) and the respective personality trait, and an extended model with the aggregated perceptions (i.e., the respective perceptions were aggregated across the three rating rounds per individual, denoted by the suffix _bp) as predictors at level 2. This way, we were able to differentiate among within- and between-person effects of interpersonal perceptions. In addition, the extended model contained gender as a control variable, which has been found to be an important predictor of self-esteem across different age groups (e.g., Robins et al., 2002; Wagner et al., 2013). To illustrate, we specified the extended model with neuroticism as personality trait as follows (level 1 equation):

$$
\begin{aligned}
\text{self-esteem}_{ti} = {} & \beta_{0i} + \beta_{1i}\,(\text{metaperception\_wp}_{ti}) + \beta_{2i}\,(\text{other-perception\_wp}_{ti}) \\
& + \beta_{3i}\,(\text{metaperception\_wp}_{ti} \times \text{other-perception\_wp}_{ti}) + e_{ti},
\end{aligned}
\tag{1}
$$

where a person *i*'s momentary self-esteem in interaction *t* is modeled as a function of a person-specific intercept β_{0i}, reflecting the mean level of self-esteem with all other predictors given a value of zero. The parameters β_{1i} and β_{2i} indicate the slopes (i.e., the linear relationships) between metaperceptions and other-perceptions of social inclusion and momentary self-esteem, whereas β_{3i} reflects the extent to which metaperceptions moderate the

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[23] Please note that strictly speaking, all individuals were also nested within groups, which can be represented by a three-level structure. Since the results (fixed effects and *p*-values) of the more complex three-level models did not differ from the two-level models, we report the more parsimonious models throughout the paper. For the analyses including the three-level model, please refer to our OSF page (https://osf.io/vdneq/).

association between other-perceptions and momentary self-esteem. Finally, e_{ti} represents an error term that is assumed to be normally distributed. Between-person differences in the person-specific coefficients were simultaneously modeled as (level 2 equations):

$$\beta_{0i} = \gamma_{00} + \gamma_{01} \text{ (metaperception\_bp}_i) + \gamma_{02} \text{ (other-perception\_bp}_i) + \gamma_{03} \text{ (gender)} \quad\quad (2)$$
$$+ \gamma_{04} \text{ (neuroticism)} + u_{0i},$$
$$\beta_{1i} = \gamma_{10} + \gamma_{11} \text{ (neuroticism}_i),$$
$$\beta_{2i} = \gamma_{20} + \gamma_{21} \text{ (neuroticism}_i),$$
$$\beta_{3i} = \gamma_{30} + \gamma_{31} \text{ (neuroticism}_i)$$

On the between-person level, the γ-parameters indicate how the average momentary self-esteem of an individual relates to the aggregated metaperceptions and other-perceptions, gender, and neuroticism. For our first research question, the parameters γ_{10} to γ_{30} are relevant as they indicate the degree to which an individuals' momentary self-esteem with an average level of neuroticism is linked to the metaperception of social inclusion, other-perception, as well as the interaction of meta- and other-perceived social inclusion. For our second research question, the parameters γ_{11} and γ_{21} are of interest: They describe the extent to which the associations between metaperceptions and other-perceptions of social inclusion and self-esteem are moderated by an individuals' level of neuroticism. Lastly, γ_{31} indicates the extent to which the interaction between meta- and other-perceived social inclusion is moderated by neuroticism (i.e., a three-way interaction). For all analyses, we used maximum likelihood estimation. While we preregistered to fit all models as random slope models, we finally ran all models as random intercept models.[24] For a more concise presentation of results, we deviated from the order of our preregistered analysis steps: In a first step, we fitted a model with interpersonal perceptions (i.e., meta and other-perceptions) both at level 1 and level 2, which is denoted as Model 1. In a second step, we added the respective personality traits as level 2 predictors, as well as the cross-level interactions between interpersonal perceptions and personality (denoted as Model 2a, 2b, and 2c). As estimates for the amount of explained variance in each model, we calculated R^2_w and R^2_b, which reflect the proportional reduction in the mean squared prediction error at the within-person level and the between-person level (Snijders & Bosker, 1994). For all models, we report exact p values. All effects significant up to $p < .05$ are discussed. In view of the

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[24] When fitted with random slopes, all models in Study Part A failed to converge or displayed warnings of singular fit. We therefore fitted all models with random intercepts and fixed slopes instead, which allowed for between-person differences in intercepts, but not in the slope of the regression line. The complete analyses with R-code for the random slope models can be found on our OSF page (https://osf.io/vdneq/).

multiple tests performed with the data, we additionally controlled our findings by applying the procedure by Benjamini and Hochberg (1995). Since the results remained fairly stable after the correction, we report the original *p*-values in the main text. Results contrasting the original *p*-values for all effects of interest are explicitly discussed, and all adjusted *p*-values can be found in Supplement Table S6.

Results and Discussion

Descriptive statistics, correlations, and intraclass correlations (ICC) of the relevant variables are presented in Tables 1 and 2. As illustrated in Table 1, momentary self-esteem correlated weakly with other-perceptions (*r* = .13), and moderately with metaperceptions of social inclusion (*r* = .42). The two perception types correlated only weakly with each other (*r* = .13), suggesting that the way participants thought they were liked by others and actual liking ratings of group members did not agree strongly in this zero-acquaintance setting.

Other-Perceptions and Metaperceptions of Social Inclusion

Table 3 displays the results of the multilevel models. As indicated by the R_w^2 of the basic model, the within-person predictors accounted for 22% of explained variance in momentary self-esteem at the within-person level. In line with our expectations (Hypothesis 1a), metaperceptions of social inclusion significantly predicted momentary self-esteem at the within-person level in the basic model (γ_{10} = .34, *p* = .002). That is, individuals reported higher momentary self-esteem in interactions where they thought that other group members liked them. The models with neuroticism and extraversion as predictors showed that participants reported higher momentary self-esteem when their group members liked them (γ_{20} = .25, *p* = .039), however, neither effect was significant after adjusting the *p*-values (see Table S6). The model with neuroticism revealed a positive interaction effect between meta- and other-perceived social inclusion on momentary self-esteem (γ_{30} = .56 *p* = .001; Hypothesis 1b). A Johnson-Neyman plot (Bauer & Curran, 2005; see Figure S1 in the Supplement) showed that in the model with neuroticism, metaperceptions well below the average within-person perception (values below -1.5) dampened the relationship between other-perceptions of social inclusion and momentary self-esteem, while metaperceptions that were just above the average within-person perception (values above 0) strengthened the association between other-perceptions and momentary self-esteem. At the between-person level, the aggregated metaperceptions were associated with momentary self-esteem (range γ_{01} = .48 – .77, *p*s < .001). That is, the general tendency to believe to be liked was associated with higher self-esteem within social interactions.

The Role of Personality in Self-Esteem Reactivity

Our second research question addressed the extent to which personality traits were associated with self-esteem and its reactivity to interpersonal perceptions of social inclusion (see Table 3, Model 2a, 2b, 2c). Higher levels of neuroticism went hand in hand with lower momentary self-esteem ($\gamma_{04} = -.70$, $p < .001$). The amount of explained variance at the between-person level increased from $R_b^2 = 0.29$ in the basic model to $R_b^2 = 0.44$ in the model with neuroticism, indicating that neuroticism explained a substantial proportion of between-person variance in momentary self-esteem. The main effects of extraversion and agreeableness did not remain significant after controlling for multiple testing (see Table S6 for adjusted p-values). Contrary to our third hypothesis, personality traits did not appear as a consistent moderator of the relationship between interpersonal perceptions and momentary self-esteem. Across all models, only one interaction reached significance, indicating that neuroticism moderated the interaction between meta- and other-perceived social inclusion ($\gamma_{31} = -.35$, $p = .015$). As illustrated in Figure 1, high neuroticism levels seemed to reduce self-esteem reactivity (see right panel), as these individuals experienced only small increases in momentary self-esteem in response to either metaperceptions or other-perceived inclusion compared to participants with average or low levels of neuroticism. To approximate the magnitude of this effect, we considered the amount of explained variance. With the inclusion of the cross-level interactions between perceptions at the within-person level and neuroticism, R_w^2 increased from 0.22 to 0.33, suggesting that a considerable proportion of variance in momentary self-esteem at the within-person level can be explained by the moderating effect of neuroticism.

Figure 1

Three-way Interaction among Neuroticism, Other-Perceptions, and Metaperceptions of Social Inclusion on Momentary Self-Esteem
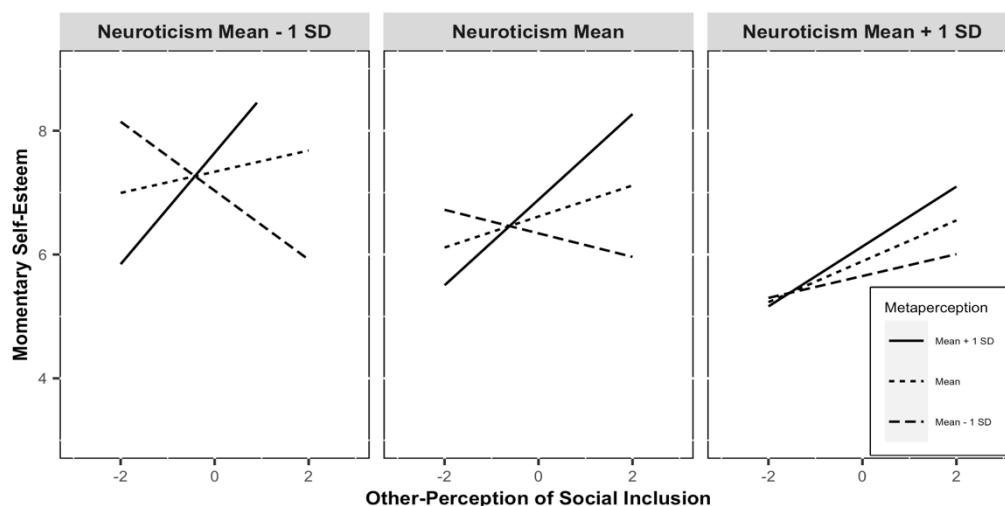
Table 1

Intercorrelations among Within-Person Variables

Variable	M	SD	ICC	1	2
1. Momentary Self-Esteem	6.71	2.14	.53		
2. Metaperception	5.69	1.36	.49	.42**	
3. Other-Perception	7.14	1.33	.56	.13*	.13*

Note. N = 303 observations nested in 101 individuals. *M* and *SD* represent mean and standard deviation. ICC represents the intraclass correlation, calculated with a null model. * indicates *p* < 05. ** indicates *p* < .01.

Table 2

Intercorrelations among Between-Person Variables

Variable	M	SD	1	2	3	4	5	6	7
1. Momentary Self-Esteem	6.71	1.78							
2. Neuroticism	3.88	1.04	− .57**						
3. Extraversion	4.84	0.98	.39**	− .37**					
4. Agreeableness	5.20	0.71	.27**	− .23*	.17				
5. Metaperception	5.69	1.11	.50**	− .44**	.34**	.22*			
6. Other-Perception	7.14	1.12	.10	.06	.25*	− .01	.02		
7. Age	17.52	1.06	− .00	− .02	.04	− .11	− .04	.04	
8. Gender	0.71	0.45	− .21*	.39**	.02	.13	− .27**	.17	− .22*

Note. N = 101 individuals. *M* and *SD* represent mean and standard deviation. Situational variables (momentary self-esteem, meta and other-perception of social inclusion) were averaged across rating rounds and individuals. Gender was coded 0 for males and 1 for females. * indicates *p* < .05. ** indicates *p* < .01

Table 3

Multilevel Models explaining Momentary Self-Esteem as a Function of Meta and Other-Perceptions of Social Inclusion, Personality Traits, and Covariates

	Basic Model			Neuroticism			Extraversion			Agreeableness		
	Model 1			Model 2a			Model 2b			Model 2c		
	Est.	*SE*	*p*	*Est.*	*SE*	*p*	*Est.*	*SE*	*p*	*Est.*	*SE*	*p*
Fixed Effects												
Intercept, γ_{00}	6.94	0.29	< .001	6.55	0.27	< .001	6.97	0.28	< .001	7.06	0.26	< .001
Within-person effects												
Metaperception, γ_{10}	0.34	0.11	.002	0.34	0.11	.002	0.35	0.12	.003	0.35	0.12	.003
Other-Perception, γ_{20}	0.23	0.12	.065	0.25	0.12	.039	0.26	0.12	.036	0.22	0.12	.072
Meta x Other-Perception, γ_{30}	0.28	0.15	.057	0.56	0.17	.001	0.32	0.15	.034	0.28	0.16	.079
Between-person effects												
Metaperception, γ_{01}	0.77	0.14	< .001	0.48	0.14	< .001	0.63	0.14	< .001	0.68	0.14	< .001
Other-Perception, γ_{02}	0.15	0.13	.265	0.16	0.12	.187	0.06	0.13	.661	0.17	0.13	.212
Gender, γ_{03}	− 0.41	0.35	.235	0.09	0.32	.772	− 0.48	0.33	.155	− 0.57	0.35	.099
Personality, γ_{04}				− 0.70	0.15	< .001	0.37	0.17	.026	0.47	0.22	.034
Cross-level interactions												
Personality x Metaperception, γ_{11}				− 0.04	0.15	.705	− 0.11	0.11	.321	0.01	0.16	.961
Personality x Other-perception, γ_{21}				0.08	0.12	.509	0.07	0.11	.515	− 0.02	0.19	.916
Personality x Meta x Other-perception, γ_{31}				− 0.35	0.14	.015	− 0.26	0.16	.113	0.04	0.26	.877
Random Effects												
Variance Intercept, $\sigma^2_{u_0}$	1.57			1.13			1.41			1.46		
Residual Variance, σ^2_e	1.99			1.91			1.95			1.99		
ICC	0.44			0.37			0.42			0.42		
AIC	1208.27			1185.31			1205.45			1211.44		
R^2_w / R^2_b	0.22 / 0.29			0.33 / 0.44			0.26 / 0.34			0.25 / 0.32		

Note. N = 101 individuals providing 303 observations. Gender was coded 0 for males and 1 for females, therefore the intercepts of the respective models refer to the male gender. R^2_w indicates modeled variance at the within-person level, R^2_b indicates modeled variance at the between-person level.

Study Part B: The Role of Interpersonal Perceptions and Personality for Momentary Self-Esteem in Daily Social Interactions

Method

To extend the results of Part A and to gain a better understanding of the differential roles of interpersonal perceptions of social inclusion in momentary self-esteem, we moved out of the laboratory setting and focused on everyday social interactions, using data from the ESM period of the SELFIE study. Since participants of both recruitment waves took part in the week-long ESM, we combined the two samples to increase statistical power. Thus, the sample in Part B consisted both of participants who attended the laboratory session (Study Part A) and participants who were recruited at a later time.

Procedure

On seven consecutive days, participants received five daily questionnaires (9 a.m., 12 p.m., 3 p.m., 6 p.m., and 9 p.m.) on their smartphones, asking about their current activities, affect, and social interactions since the previous questionnaire (or in the case of the first daily questionnaire, since getting up). We included all ESM surveys in which participants reported a social interaction. As a special feature of the study, each time participants reported an interaction, they were asked whether their interaction partner was still present and willing to answer a few questions. This way, an additional perspective was captured next to the participants' own perceptions (i.e., self- and metaperceptions) whenever the participant passed on their smartphone.

Participants

Of the 103 participants in the first recruitment wave and the 143 participants in the second wave, $n = 102$ and $n = 116$ individuals participated in the ESM. Compared to participants who did not take part in the ESM, individuals who participated reported higher agreeableness levels ($t(35.57) = 4.18$, Cohen's $d = 0.75$, $p < .001$). The two groups did not differ in terms of age, levels of neuroticism, or extraversion. Once again, we examined the data for unusual response patterns and discovered 18 surveys with zero variance across the twenty-two questions of the ESM survey. Dropping these surveys did not change the number of participants but reduced the number of included surveys. The final sample consisted of $N = 218$ participants (76.15% women) with an average age of 17.7 ($SD = 0.98$) and a total of 2,928 ESM surveys. On average, participants reported 13.43 social interactions ($SD = 6.81$, range: 1-29) during the ESM week. Most of these encounters involved friends (32.71%), followed by interactions with family members (28.88%), peers or colleagues (13.36%), and romantic

partners (10.82%). Overall, participants reported knowing their interaction partners quite well: On a scale from zero to ten, the average level of acquaintance with the interaction partner was $M = 7.76$ ($SD = 2.69$). Power simulations revealed that the sample size provided 95.80% power for detecting level 1 estimates of $b = .10$ and 80% power for detecting level 2 estimates of $b \le .25$ at a significance level of $\propto = .05$ (see Table S2).

Subsample. For our second set of preregistered analyses, we focused on a subset of this sample, selecting only ESM entries which included all three types of perceptions (i.e., with a report of the interaction partner). This subsample consisted of $N = 178$ participants providing 628 surveys (average age: 17.62, $SD = 0.93$, 78.09% women), with each participant reporting 3.53 social interactions on average ($SD = 2.85$, range: 1-21).[25] Since the sample size decreased considerably after selecting only ESM surveys with informant-reports, we ran several analyses to explore differences in the relevant study variables between individuals. Compared to participants who did not pass on their smartphone to their interaction partners at all ($n = 40$), participants who passed on their smartphone at least once were younger ($t(52.10) = -2.26$, Cohen's $d = -0.44$, $p = .028$), more extraverted ($t(61.16) = 3.26$, $d = 0.55$, $p = .002$), and more agreeable ($t(53.62) = 2.27$, $d = 0.43$, $p = .027$). Also, participants in this subsample reported both higher general self-perceptions of social inclusion ($t(54.17) = 4.43$, $d = 0.83$, $p < .001$) and metaperceptions ($t(56.11) = 3.04$, $d = 0.55$, $p = .004$) and higher self-esteem (averaged across interactions; $t(53.82) = 2.18$, $d = 0.41$, $p = .033$). Moreover, the average level of acquaintance with the interaction partner was even higher for participants who passed on their smartphone ($t(1919.8) = 14.87$, $d = 0.48$, $p < .001$). The two groups did not differ in terms of gender or levels of neuroticism. Power simulations revealed that the sample size yielded a power of 82.60% for the detection of multilevel estimates of $b = .20$ at level 1 and a power of 84% for detecting estimates of $b = .35$ (76% for $b = .30$) at level 2.

Measures

Momentary Self-esteem. Participants were asked "How content are you with yourself right now?" on a scale from 0 (*not at all*) to 10 (*very*) after every interaction.

Self-Perception of Social Inclusion. After every interaction, participants indicated how positive and interesting the social encounter was to them on a scale from 0 (*not at all*) to 10 (*very*). By calculating the mean, the two items were aggregated into an index of self-perceived social inclusion. Since researchers have argued that Cronbach's alpha may not be a suitable

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[25] We examined the informant-reports for unusual data patterns, identifying six surveys in which interaction partners answered all items concerning the social interaction in the same way (i.e., zero variance in responses). The exclusion of these surveys did not significantly alter the results of the analysis.

indicator for internal consistency of two items (Eisinga et al., 2013), we instead report the Spearman-Brown coefficient, which is good at $r_{SB} = .76$ in the total sample and $r_{SB} = .77$ in the subsample.

Metaperception of Social Inclusion. Paralleling the wording of the self-perception items, participants reported the degree to which they thought that their interaction partner experienced the social interaction as positive and interesting on a scale from 0 (*not at all*) to 10 (*very*). We calculated a composite score of the two items, representing an index of social inclusion ($r_{SB} = .77$ in the total sample; $r_{SB} = .78$ in the subsample).

Other-Perception of Social Inclusion. Other-perceptions provided by interaction partners were measured with two items paralleling those of the self- and metaperceptions: The interaction partners rated the degree to which they found the interaction positive and interesting on scales from 0 (*not at all*) to 10 (*very*). The aggregated score displayed an internal consistency of $r_{SB} = .81$.

Personality Traits. As in Study Part A, the BFI-2 (Danner et al., 2019) was used to assess neuroticism, extraversion, and agreeableness. The internal consistencies for the scales were $\omega = .92$ (.92) for neuroticism, $\omega = .90$ (.90) for extraversion, and $\omega = .84$ (.84) for agreeableness; the values in brackets indicate the internal consistencies for the subsample.

Interaction Characteristics. After every social interaction, participants indicated the nature of their relationship (i.e., friends, family, romantic partner) and the level of acquaintance with their interaction partner on a scale from 0 (*not at all*) to 10 (*very*). Also, we included a variable indicating the individual starting date of the ESM period, ranging from day 1 to 7 (coded 0-6).

Demographics. Participants reported their age and gender (coded 0 for male and 1 for female). In the subsample analysis, we also included the gender of the interaction partner (coded 0 for same-sex and 1 for other-sex).

Data-Analysis

To assess the associations between interpersonal perceptions of social inclusion, personality, and momentary self-esteem in daily social interactions, we again specified multilevel models. All models were preregistered, and we used the same configurations and analysis steps as in Study Part A. Using the whole ESM sample in our first set of analysis, we first fitted a model with self- and metaperceptions of social inclusion at level 1 and level 2, as well as with control variables. In addition to gender, we also included the level of acquaintance of the interaction partner and the day of the ESM period as control variables. Previous research has shown that the level of acquaintance plays an important role when considering interpersonal

perceptions, their dynamics, and implications (Kenny, 2020). Second, analyses of ESM data should also take into account the time of assessment (see Bolger & Laurenceau), for instance, whether momentary self-esteem differs systematically on different days of the week. In a second step, the three personality traits were included as level-2 predictors in separate models.[26]

In the subsample analysis, we extended the previous models by including other-perceptions of social inclusion at the within- and at the between-person level, as well as the interaction between other- and metaperceptions. In addition to the previously described control variables, we also took into account the gender of the interaction partner. During adolescence, individuals increasingly begin to interact with peers of the opposite sex (Lam et al., 2014), and we sought to account for any difference in interaction dynamics between same-sex and opposite-sex interactions. As in Part A, we controlled our findings for multiple testing with the procedure outlined by Benjamini and Hochberg (1995; see Supplement Tables S7 to S9).

Results and Discussion

The first section presents the results of the analysis focusing on self- and metaperceptions of social inclusion and personality as predictors of momentary self-esteem. In the second section, we focus on the subsample analysis examining the roles of all three perception types and personality on momentary self-esteem in daily interactions of adolescents.

Full ESM-Sample: Self- and Metaperceptions of Social Inclusion

Descriptive statistics, ICC, and correlations are presented in Tables 4 and 5. Both self- and metaperceptions of social inclusion correlated moderately with momentary self-esteem ($r = .31$ and $r = .30$), but they were highly correlated with each other ($r = .81$), suggesting that the participants' self-perceptions strongly overlapped with their beliefs of how their interaction partner experienced the interaction.

Table 6 summarizes the results of the multilevel models. In line with Hypothesis 2a, the results of the basic model indicated a positive association between self-perceptions of social inclusion and momentary self-esteem at the within-person level ($\gamma_{10} = .24$, $p < .001$), which remained consistent in all models. Addressing Hypothesis 2b, metaperceptions of social inclusion were positively associated with momentary self-esteem. However, this effect proved non-significant after adjusting the p-values (see Table S7).

Similarly, associations between metaperceptions and momentary self-esteem at the between-person level did not remain significant after controlling for multiple testing. Also,

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[26] As in Study Part A, most of the models failed to converge when including random slopes for the Level-1 predictors. Since the results of the converged random slope models (e.g., with extraversion as a predictor) were almost identical to the random-intercept models, we only report random-intercept models in the manuscript. The complete R-scripts with random slope models can be found on OSF (https://osf.io/vdneq/).

none of the models revealed associations between aggregated self-perceptions and momentary self-esteem, suggesting that a general tendency to perceive social interactions as positive did not relate to momentary self-esteem. However, the high correlation between self- and metaperceptions at the between-person level warrants caution in interpreting any between-person effects since increased multicollinearity of the two predictors may have prevented other between-level effects from emerging in the models.

Of the control variables, the level of acquaintance with the interaction partner emerged as a significant predictor of momentary self-esteem across all models ($\gamma_{30} = -.03$, $p = .007$). Also, women reported lower momentary self-esteem than men on average in the basic model ($\gamma_{03} = -.75$, $p = .002$) and in the models with extraversion and agreeableness.

Full ESM-Sample: The Role of Personality in Momentary Self-Esteem and Self-Esteem Reactivity

Focusing on the role of personality traits, we extended the basic model by including the respective traits as predictors. We found significant associations between neuroticism and momentary self-esteem ($\gamma_{04} = -.76$, $p < .001$), meaning that higher levels of neuroticism were related to lower self-esteem. Individuals with high extraversion levels reported higher momentary self-esteem ($\gamma_{04} = .40$, $p < .001$). In the model with neuroticism, the proportion of explained variance at the between-person level increased from $R_B^2 = 0.22$ in the basic model to $R_B^2 = 0.40$, suggesting that neuroticism accounted for a considerable amount of variance in momentary self-esteem. In contrast, the model with extraversion displayed an $R_B^2 = 0.27$, indicating that extraversion could explain some variance in momentary self-esteem, but not as much as neuroticism. Finally, agreeableness did not significantly predict momentary self-esteem.

As in Part A, personality did not consistently moderate the relationship between interpersonal perceptions or metaperceptions of social inclusion and momentary self-esteem (Hypothesis 3). Deviating from our previous findings, only agreeableness emerged as a moderator of the link between self-perceptions of inclusion and self-esteem in the context of daily social interactions ($\gamma_{11} = 0.08$, $p = .005$), which remained significant after controlling for multiple testing (see Table S6). However, because the amount of variance explained does not improve substantially at either the within-person or between-person level compared to the basic model, we assume that this cross-level effect does not play a strong role for adolescents' momentary self-esteem.

ESM-Subsample: Self-, Other-, and Metaperceptions of Social Inclusion

The results of the multilevel models are summarized in Table 7 (for descriptive statistics, see Supplement Tables S3 and S4). As illustrated, self-perceptions of social inclusion consistently predicted momentary self-esteem ($\gamma_{10} = .34$, $p < .001$), while neither meta nor other-perceptions nor their interaction had a significant effect in any model. At the between-person level, none of the three perception types was significantly associated with momentary self-esteem.

Since these results differed substantially from the results of Part A, we rerun the analyses with only other- and metaperceptions of social inclusion, i.e., in parallel to the model configurations in Part A (see Supplement Table S5). Removing self-perceptions of social inclusion from the analysis resulted in a significant and consistent effect of metaperceptions at the within-person level (range $\gamma_{10} = .20 - .22$, ps $= .001$). At the between-person level, metaperceptions related to momentary self-esteem in the basic model ($\gamma_{01} = .34$, $p = .010$) and the agreeableness model ($\gamma_{01} = .30$, $p = .021$) but not in the models with neuroticism and extraversion after adjusting the p-values for multiple testing (Table S8). In contrast, other-perceptions showed no associations with momentary self-esteem. With these simplified models, we were thus able to partially replicate our findings regarding the metaperceptions from Part A. Also, our results extend previous findings concerning trait self-esteem (Wagner et al., 2018): We found that self-perceptions of social inclusion had the strongest and most stable relationship with momentary self-esteem, while other-perceptions did not show significant associations with momentary self-esteem in interaction with familiar social interaction partners.

ESM-Subsample: The Role of Personality in Momentary Self-Esteem and Self-Esteem Reactivity

The main effects of personality traits mirrored the results of the first analysis set: Neuroticism and extraversion predicted momentary self-esteem ($\gamma_{01} = -.76$, $p < .001$ and $\gamma_{01} = .43$, $p = .002$), while agreeableness showed no significant association with self-esteem. Moreover, personality did not significantly moderate the relationship between interpersonal perceptions or metaperceptions of social inclusion and momentary self-esteem (Hypothesis 3), with cross-level interactions in the model with agreeableness not reaching significance after adjusting the p-values.

Table 4

Intercorrelations among Within-Person Variables

Variable	M	SD	ICC	1	2	3	4
1. Momentary Self-Esteem	6.65	2.26	.50				
2. Self-Perception	7.93	1.93	.21	.31**			
3. Metaperception	7.72	1.87	.27	.30**	.81**		
4. Level of Acquaintance	7.76	2.68	.16	.09**	.24**	.28**	
5. Day of ESM	3.75	2.10	.12	− .00	.06**	.09**	− .01

Note. N = 2928 observations nested in 218 individuals. *M* and *SD* represent mean and standard deviation. ICC represents

the intraclass correlation, calculated with a null model. * indicates *p* < .05, ** indicates *p* < .01.

Table 5

Intercorrelations among Between-Person Variables

Variable	M	SD	1	2	3	4	5	6	7
1. Momentary Self-Esteem	6.58	1.74							
2. Neuroticism	3.88	1.07	− .57**						
3. Extraversion	4.68	0.96	.34**	− .30**					
4. Agreeableness	5.07	0.80	.22**	− .23**	.25**				
5. Self-Perception	7.87	1.10	.43**	− .25**	.28**	.38**			
6. Metaperception	7.69	1.14	.45**	− .27**	.30**	.37**	.91**		
7. Age	17.70	0.98	− .03	− .02	− .07	− .07	− .11	− .11	
8. Gender	0.76	0.43	− .20**	.35**	− .06	.10	.02	-.02	− .14*

Note. N = 218 individuals. *M* and *SD* represent mean and standard deviation. Situational variables (momentary self-esteem, self- and meta-perception of social inclusion)

were averaged across social interactions. Gender was coded 0 for males and 1 for females. * indicates p < .05, ** indicates p < .01

Table 6

Multilevel Models explaining Momentary Self-Esteem as a Function of Self- and Metaperceptions of Social Inclusion, Personality Traits, and Covariates

	Basic Model			Neuroticism			Extraversion			Agreeableness		
	Model 1			Model 2a			Model 2b			Model 2c		
	Est.	*SE*	*p*	*Est.*	*SE*	*p*	*Est.*	*SE*	*p*	*Est.*	*SE*	*p*
Fixed Effects												
Intercept, γ_{00}	7.19	0.21	< .001	6.67	0.20	< .001	7.18	0.21	< .001	7.22	0.21	< .001
Within-person effects												
Self-perception, γ_{10}	0.24	0.03	< .001	0.25	0.03	< .001	0.25	0.03	< .001	0.26	0.03	< .001
Metaperception, γ_{20}	0.06	0.03	.041	0.06	0.03	.038	0.06	0.03	.038	0.05	0.03	.079
Level of Acquaintance, γ_{30}	− 0.03	0.01	.007	− 0.03	0.01	.006	− 0.03	0.01	.006	− 0.03	0.01	.007
Day of ESM	− 0.01	0.02	.510	− 0.01	0.02	.503	− 0.01	0.02	.503	− 0.01	0.01	.472
Between-person effects												
Self-perception, γ_{01}	0.21	0.23	.351	0.15	0.20	.458	0.18	0.22	.404	0.19	0.23	.414
Metaperception, γ_{02}	0.48	0.22	.028	0.35	0.19	.073	0.41	0.21	.056	0.46	0.22	.035
Gender, γ_{03}	− 0.75	0.24	.002	− 0.07	0.23	.748	− 0.70	0.24	.003	− 0.78	0.24	.001
Personality, γ_{04}				− 0.76	0.09	< .001	0.40	0.11	< .001	0.16	0.14	.265
Cross-level interactions												
Personality x Self-perception, γ_{11}				− 0.01	0.02	.804	− 0.02	0.03	.487	0.08	0.03	.005
Personality x Metaperception, γ_{21}				− 0.01	0.02	.809	0.06	0.03	.064	− 0.02	0.03	.514
Random Effects												
Variance Intercept, $\sigma^2_{u_0}$	2.03			1.50			1.89			2.01		
Residual Variance, σ^2_e	2.34			2.34			2.34			2.33		
ICC	0.46			0.39			0.45			0.46		
AIC	11338.63			11286.43			11326.64			11331.54		
R^2_w / R^2_b	0.16 / 0.22			0.26 / 0.40			0.19 / 0.27			0.16 / 0.22		

Note. $N = 218$ individuals providing 2,928 observations. Gender was coded 0 for males and 1 for females, therefore the intercepts of the respective models refer to the male gender. R^2_w indicates modeled variance at the within-person level, R^2_b indicates modeled variance at the between-person level.

Table 7

Multilevel Models explaining Momentary Self-Esteem as a Function of Self-, Meta, and Other-Perceptions of Social Inclusion, Personality Traits, and Covariates for the Subsample Analysis in Study Part B

	Basic Model			Neuroticism			Extraversion			Agreeableness		
	Model 1			Model 2a			Model 2b			Model 2c		
	Est.	SE	p	Est.	SE	p	Est.	SE	p	Est.	SE	p
Fixed Effects												
Intercept, γ_{00}	7.26	0.29	< .001	6.76	0.28	< .001	7.22	0.29	< .001	7.32	0.29	< .001
Within-person effects												
Self-perception, γ_{10}	0.34	0.07	< .001	0.34	0.07	< .001	0.33	0.07	< .001	0.31	0.07	< .001
Metaperception, γ_{20}	0.01	0.07	.909	0.01	0.07	.897	0.00	0.08	.952	0.03	0.07	.654
Other-Perception, γ_{30}	0.00	0.05	.972	−0.01	0.05	.833	0.01	0.05	.875	0.01	0.05	.788
Meta x Other-Perception, γ_{40}	0.03	0.05	.578	0.01	0.05	.785	0.03	0.05	.480	0.04	0.05	.443
Level of Acquaintance, γ_{50}	0.02	0.05	.710	0.02	0.05	.683	0.02	0.05	.691	0.03	0.05	.490
Day of ESM, γ_{60}	−0.02	0.03	.503	−0.02	0.03	.470	−0.02	0.03	.498	−0.03	0.03	.400
Gender of Interaction Partner, γ_{70}	0.25	0.15	.083	0.25	0.14	.085	0.25	0.15	.082	0.27	0.15	.067
Between-person effects												
Self-perception, γ_{01}	0.10	0.20	.626	0.09	0.18	.611	0.09	0.19	.637	0.10	0.20	.619
Metaperception, γ_{02}	0.27	0.19	.144	0.16	0.17	.331	0.21	0.18	.260	0.24	0.18	.197
Other-perception, γ_{03}	0.12	0.16	.448	0.11	0.14	.424	0.14	0.16	.355	0.09	0.16	.571
Gender, γ_{04}	−0.56	0.32	.085	0.16	0.31	.615	−0.52	0.31	.097	−0.62	0.32	.054
Personality, γ_{05}				−0.76	0.12	< .001	0.43	0.14	.002	0.23	0.18	.197
Cross-level interactions												
Personality x Self-perception, γ_{11}				0.11	0.06	.079	0.05	0.08	.509	−0.04	0.09	.667
Personality x Metaperception, γ_{21}				−0.09	0.06	.134	−0.02	0.08	.827	0.18	0.08	.031
Personality x Other-Perception, γ_{31}				0.04	0.05	.502	−0.07	0.05	.162	−0.05	0.06	.420
Personality x Meta x Other-Perception, γ_{41}				−0.00	0.04	.989	0.03	0.06	.635	0.14	0.06	.013
Random Effects												
Variance Intercept, $\sigma_{u_0}^2$	2.20			1.60			2.05			2.12		
Residual Variance, σ_e^2	1.93			1.91			1.91			1.98		
ICC	0.53			0.46			0.52			0.53		
AIC	2479.57			2445.07			2477.03			2559.70		
R_w^2 / R_b^2	0.10 / 0.11			0.23 / 0.31			0.14 / 0.16			0.13 / 0.14		

Note. N = 178 individuals providing 628 observations. Gender was coded 0 for males and 1 for females, therefore the intercepts of the respective models refer to the male gender. R_w^2 indicates modeled variance at the within-person level, R_b^2 indicates modeled variance at the between-person level.

General Discussion

With the present study, we investigated the differential roles of interpersonal perceptions of social inclusion in momentary self-esteem of adolescents. Furthermore, we explored how these relationships are shaped by an individual's personality. This is the first study to consider the link between social inclusion and self-esteem in adolescence from three different angles, supplementing an individual's self-perceptions by the perceptions of others, and highlighting the in-between role of metaperceptions. By studying social interactions of adolescents in two different settings—laboratory and daily life—we gained first insights into the complex micro-processes within social interactions that underlie adolescents' momentary self-evaluations. We highlight two main findings: First, interpersonal perceptions may be differentially related to momentary self-esteem. We found that perceptions formed by the individual (i.e., self- and metaperceptions) were more consistently related to momentary self-esteem than other-perceptions of social inclusion. Second, across both study parts, personality did not emerge as a consistent moderator of the associations between interpersonal perceptions and momentary self-esteem (see Supplement Table S1 for an overview of the hypotheses addressed and results of the two study parts). In the following, we discuss the role of different interpersonal perceptions across the two studied social settings (laboratory group interaction vs. daily interactions with familiar interaction partners), as well as the role of the different personality traits and their interplay with perceptions for momentary self-esteem.

Interpersonal Perceptions of Social Inclusion and Momentary Self-Esteem

In line with our expectations, we found that metaperceptions of social inclusion were associated with momentary self-esteem in zero-acquaintance group interactions across all models, both at the within- and the between-level in Study Part A. Since perceptions formed by the individual can be differentiated into self- and metaperceptions, we sought to disentangle the respective associations between these two perceptions of social inclusion with an individual's momentary self-esteem in Study Part B. While self-perceptions of social inclusion were consistently related to momentary self-esteem at the within-person level, metaperceptions showed no robust associations across models. Also, the associations between other-perceptions and momentary self-esteem did not reach significance in any model of either study after controlling for multiple testing, suggesting that other-perceptions and momentary self-esteem are not robustly related when perceptions formed by the individual (i.e., self- and metaperceptions) are considered simultaneously.

Importantly, we note that the results of the two study parts are only comparable to a limited extent due to their different designs and the different variables studied: While Study Part A solely focused on other- and metaperceptions of social inclusion, Part B mainly focused on self- and metaperceptions. Nevertheless, we believe that the different social contexts can provide two important insights for a better understanding of the role of different interpersonal perceptions. The present results suggest that perceptions of social inclusion by the individual (i.e., self- and metaperceptions) generally relate more consistently to momentary self-esteem than other-perceptions both in zero-acquaintance interactions and daily interactions with familiar others. This is in line with the general assumption of the sociometer theory (Leary et al., 1998), and also mirrors earlier findings on self-esteem (Wagner et al., 2018).

Answering the question of why different types of perceptions are differentially related to self-esteem is complex. One decisive factor might be the level of acquaintance with interaction partners. Several studies have demonstrated that as the level of acquaintance of interaction partners increases, so does the agreement between their perceptions (Letzring & Funder, 2017) – the more individuals get to know each other, the more their perceptions become intertwined. In line with this, previous findings indicate that peer-perceptions of social inclusion may predict individuals' self-perceptions over time, which in turn are positively linked to their self-esteem (Reitz et al., 2016). Likewise, the present results may also point to the dynamic interplay of different perceptions of social inclusion: As the perceptions of significant others become more integrated into adolescents' perceptions of themselves, their direct link to self-esteem may be less visible.

The level of acquaintance may also hold implications for the link between metaperceptions of social inclusion and momentary self-esteem. Research has demonstrated that metaperceptions concerning affect, such as liking or attraction, are often grounded in assumed reciprocity, which increases with the level of familiarity (Kenny, 2020b; Malloy, 2018). Given the high level of acquaintance with interaction partners reported in Part B, and especially in the subsample, individuals possibly assumed that their interaction partners rated interactions positively whenever they themselves experienced the interaction in a positive manner. As a result, they might have felt little need to look beyond their self-perceptions to infer how their interaction partners experienced the situation. In contrast, participants in Part A did not know each other well and might have been more attentive to actual cues from others that related to their momentary self-esteem.

Next to the level of acquaintance, the broader social context likely also plays an important role for the link between metaperceptions and self-esteem. Prior research has

demonstrated that people are aware that they make different impressions depending on their social environment (Carlson et al., 2011; Carlson & Furr, 2009) – for instance, adolescents might know that their parents experience interactions with them differently than their peers do. During adolescence, individuals strive for autonomy from their parents, seek the opinions of their peers, and how one is perceived by peers becomes increasingly important (de Vries et al., 2020; Smetana et al., 2006). Accordingly, reflecting on how one is seen by others might be more prominent in interactions with peers. Moreover, group interactions with unacquainted peers might be perceived as more socially evaluative than dyadic interactions, which might make self-evaluations more sensitive to metaperceptions in group settings.

In sum, the present findings and recent research (Wagner et al., 2018) indicate that perceptions of social inclusion formed by adolescents seem to be more strongly related to their momentary self-esteem than other-perceptions of social inclusion. However, the role of different perceptions for an individual's self-esteem may differ according to central features of the social interaction, such as the familiarity with the interaction partner. Given the limited comparability across social settings in the present study, one challenge for future research will be to disentangle the implications of different perceptions in social interactions with different types of interaction partners and at different levels of acquaintance. We encourage readers to consider the present findings as a first step in this direction.

The Role of Personality in Momentary Self-Esteem and Self-Esteem Reactivity

To address our second research question, we investigated the role of three socially relevant personality traits, that is, neuroticism, extraversion, and agreeableness for momentary self-esteem. In line with previous research, we found that high levels of neuroticism were consistently associated with lower levels of momentary self-esteem (e.g., Gebauer et al., 2015; Zeigler-Hill et al., 2015). The positive association between extraversion and momentary self-esteem was less robust across the study parts, being significant only in Study Part B. In contrast, agreeableness did not significantly relate to momentary self-esteem in either the laboratory setting or in daily social interactions after controlling for multiple testing. Similarly, previous research has often produced mixed results regarding the relationship between agreeableness and self-esteem (Gebauer et al., 2015; MacDonald & Leary, 2012). Apart from main effects, we found few interaction effects between personality traits and interpersonal perceptions across both study parts. In zero-acquaintance interactions (Part A), neuroticism seemed to dampen the positive relationship between other- and metaperceptions of social inclusion and momentary self-esteem. This stands in line with prior research findings suggesting that neuroticism plays an important role in individuals' reactivity to daily stressors (e.g., (Dunkley & Mandel, 2014;

Hutchinson & Williams, 2007). However, in contrast to previous findings (e.g., Denissen & Penke, 2008), our results did not indicate that individuals with high neuroticism scores experienced higher self-esteem reactivity to self-perceived social inclusion after interactions with close others (Part B). Agreeableness, on the other hand, seemed to elevate the associations between self-perceptions of social inclusion and self-esteem in daily interactions with familiar others. However, the effect of this cross-level interaction in Part B was quite small. What conclusions can be drawn from these results?

Similar to the functionality of interpersonal perceptions, we propose that personality may impact the association between perceptions of social inclusion and self-esteem differently across social contexts. The idea that the effects of personality traits on social and emotional experiences are at least partially contingent on situational characteristics is central to several theoretical frameworks (Back et al., 2011; Fleeson, 2007; Rauthmann et al., 2015). However, social interactions contain a variety of elements that potentially interact with personality (psychological characteristics such as task-relatedness, or physical aspects such as the place or the interaction partner; see Rauthmann et al., 2015), and identifying person-situation interactions has been challenging for empirical studies. An increasingly emerging picture suggests that interactions between personality and situational characteristics need to be considered in a more differentiated light, with specific personality traits (or on an even narrower level, personality facets) interacting with specific situational characteristics (Breil et al., 2019; Mueller et al., 2019; Sherman et al., 2015).

In this regard, recent findings indicate that the type of interaction partner is an important situational feature to consider along with neuroticism. Individuals high in neuroticism seem to benefit more from interactions with specific interaction partners: Two recent experience sampling studies demonstrate that people high in neuroticism experience lower levels of negative affect in the company of close others (Shackman et al., 2018) and report higher levels of momentary happiness when interacting with friends compared to interactions with family members or colleagues (Mueller et al., 2019). Here, our findings hint at the role of neuroticism regarding self-esteem reactivity further differing across familiar vs. unfamiliar partners: Individuals with high neuroticism may have benefited less from group interactions with unfamiliar others, as the positive associations between perceptions and momentary self-esteem were attenuated in these interactions. However, given the methodological differences of the two study parts, further research is needed to explore possible context-specific effects of neuroticism on momentary self-esteem and its reactivity. Additionally, previous findings suggest that rather than being more sensitive to both negative and positive perceptions of social

inclusion, neuroticism may particularly enhance the reactivity to negative perceptional cues (Evans et al., 2016; Suls & Martin, 2005). Since both self- and metaperceptions of social inclusion were rated very highly in the ESM sample, we may have been unable to find moderating effects of neuroticism in Study Part B.

Regarding the role of agreeableness, it makes sense that its moderating effects might also depend on the type or familiarity of the interaction partner. Agreeableness has been related to relationship quality and the motivation to maintain existing relationships, both of which are particularly important in existing relationships (Graziano & Tobin, 2013; Wagner et al., 2014). Focusing on social interactions, previous findings have linked agreeableness with self-perceived rapport and a heightened need to communicate with the interaction partner (Cuperman & Ickes, 2009). We note, however, that first, the effect was found only in Part B and does not contribute significantly to the proportion of variance explained in momentary self-esteem, suggesting that it is unlikely to play a large role for momentary self-esteem. Second, the statistical power in Study Part A was not high enough to detect small interaction effects such as we found for agreeableness in Part B. Accordingly, we can only draw preliminary inferences and strongly emphasize the need to replicate the findings with regard to the moderating role of agreeableness across diverse social settings.

Finally, contrary to our expectations, we found no evidence in any of the study parts that extraversion moderated the relationship between perceptions of social inclusion and momentary self-esteem. Two previous studies reported similar results, finding no moderating effect of extraversion on the association between self-perceived social inclusion and global self-esteem (Mahadevan et al., 2019; Poorthuis et al., 2014). However, we note that the sample sizes did not provide sufficient power (especially in Part A) to detect effects below .45 of extraversion. In summary, the results of the present study suggest that personality traits may play a relevant role in social interactions across different contexts in adolescence by shaping social experiences. At the same time, our results also emphasize the need for a more differentiated approach: Zooming into perceptual, behavioral, or affective processes within social interactions and linking them to specific characteristics of an individual can enhance our understanding of the dynamic interplay of social experiences and personality.

Limitations and Outlook

The present study has several strengths, the most significant being the use of data collected in different social settings (i.e., laboratory vs. real-life), across different social situations (group vs. dyadic interactions), and at different levels of acquaintance (zero-acquaintance vs. familiar interaction partners). Additionally, by explicitly focusing on

adolescents, our study provides initial findings in a relatively understudied but highly relevant phase for personality and social development. Nevertheless, several limitations should be considered when interpreting the results.

One limitation concerns different operationalizations of social inclusion across the two study parts: In Part A, other- and metaperceptions of social inclusion were indexed by liking, while perceptions of social inclusion were operationalized by the quality of the interaction (i.e., how positive and interesting the interaction was) in Part B. Both have been established as valid indicators of social inclusion in previous research (e.g., (Denissen et al., 2008; Reitz et al., 2016; Wagner et al., 2018), and it stands to reason that the different operationalizations, while perhaps capturing partly different aspects of social inclusion, make sense at different levels of acquaintance and in different social settings (groups vs. dyads). However, we cannot rule out that the varying measures contributed to the differences in results regarding the associations between interpersonal perceptions and momentary self-esteem across the study parts and we therefore caution that the two Study Parts are only comparable to a limited extend. Furthermore, we note that interaction quality itself is a broad construct for which a wide range of social interaction characteristics may serve as indicators. Future research could consider a faceted, multi-layered measure of social inclusion that can be applied across different social contexts when investigating the link between social inclusion and self-esteem. At the same time, we would like to point out that especially in ESM studies, researchers should carefully evaluate the number of items, as questionnaires that are too long and have to be completed repeatedly can quickly become too high of a burden for participants.

Second, while the use of innovative research methods such as experience sampling and capturing others' perceptions in daily social interactions via smartphone surveys is a major strength of the current study, these methods are not without flaw. For instance, because participants were able to decide for themselves to whom they gave their smartphone, other-perceptions were possibly rather selective, which might be reflected in the overly positive ratings of interaction partners in the subsample analysis. Despite these shortcomings, however, we argue that the novel nature of the data and our findings provides new insights regarding the interplay of different perception types and momentary self-esteem, thus laying a foundation for further research.

Third, our power simulations indicated that our sample in Part A was not large enough to detect moderate or small effects at both levels. While we acknowledge that this is a serious shortcoming, we would nevertheless argue that Part A still offers valuable insights as part of the overall framework of our study in three respects. First, with respect to the possibility that

small effects of other-perceptions of social inclusion were not detected, we note that the subsample analysis in Part B with a larger sample yielded similar results and concurs with previous findings (Wagner et al., 2018). Second, while we found a moderating effect of neuroticism in Part A, we did not find an effect of neuroticism in the larger, well-powered analysis in Part B, suggesting that there may context-specific effects when it comes to neuroticism. However, we emphasize that further research is needed to understand the role of neuroticism in self-esteem and its reactivity across different social contexts. Third, we would like to point out the uniqueness of the data. To our knowledge, there have been no studies to date that have examined adolescents in zero-acquaintance interactions from multiple perspectives under laboratory conditions. Finally, we would like to note that by preregistering all our hypotheses and analyses, we prevented the problem of *p*-hacking in our study, which is often a concern associated with low power. While we acknowledge that collecting data of large adolescent samples is challenging, we emphasize the need for replication. Given the limited access to adolescent populations, future studies might build on collaborative data collection to achieve larger samples in and outside of the laboratory. This may also be important with regard to the generalizability of the results. The samples used in the present study were mainly composed of students attending the highest school form in Germany, and we are therefore cautious about commenting on the generalizability of our findings to other adolescent populations.

Fourth, while our study design offers a differentiated, new perspective on interpersonal perceptions within different social situations and their relation to momentary self-esteem, it does not allow causal interpretations. Several studies have indicated a bidirectional relationship between trait self-esteem and social relationships (e.g., Harris & Orth, 2019), implying that self-esteem may not only predict social outcomes such as relationship satisfaction, but that initial relationship satisfaction can also impact subsequent trait self-esteem (de Moor et al., 2021). Additionally, preliminary findings suggest that depressive symptoms and lower levels of trait self-esteem are associated with more negative metaperceptions (Moritz & Roberts, 2020) and therefore may also relate to momentary self-esteem. Accordingly, we urge future studies to, first, consider longitudinal designs and appropriate statistical methods (e.g., cross-lagged effects) to address the directionality of effects when investigating the dynamic interplay of interpersonal perceptions of social inclusion and their respective associations with momentary self-esteem. Second, future studies may also consider important variables that may impact interpersonal perceptions (e.g., trait self-esteem, depressive symptoms) and how they shape their associations with momentary self-esteem.

Finally, we cannot preclude that the more consistent relations between momentary self-esteem and self-reported perceptions (i.e., self- and metaperceptions) compared to its link with other-perceptions of social inclusion may reflect a potential method effect, as self-esteem was also measured by self-report across both study parts. Future research could consider the use of other-reports of self-esteem (Hirschmüller et al., 2018) as an extension to avoid potential method biases arising from the exclusive use of self-reports (Podsakoff et al., 2003). At the same time, we would like to highlight that self-reported self-esteem in particular should be considered the most appropriate approach to gain insight into self-perceived levels of self-evaluation.

The present study offers several additional directions for further research. First, recent research shows that not only different interpersonal perceptions, but also the agreement between them might be important for self-esteem: In a longitudinal study, Luan and colleagues (2018) demonstrated that the agreement between adolescent and parent ratings of personality traits predicted adolescent self-esteem development. Hence, future studies could explore the relevance of agreement between self- and other-perceptions or between meta- and other-perceptions of specific interaction partners for momentary and trait self-esteem.

Second, it is important to note that in the current study, we looked at between-person differences in personality. A growing body of research demonstrates that investigating within-person differences in personality states (i.e., situation-specific manifestations of personality; Fleeson, 2001; Horstmann et al., 2020) and their associations with situational and social variables provides valuable insights into person-situation dynamics. Accordingly, exploring how personality states are related to momentary perceptions of social inclusion and to self-esteem within social interactions may provide a valuable avenue for future research.

Conclusion

In the present study, we explored the differential roles of three types of interpersonal perceptions of social inclusion in momentary self-esteem within social interactions in both a laboratory and a real-life setting. Further, we examined how these associations are shaped by an individual's personality traits. Our findings suggest that interpersonal perceptions of social inclusion may be differentially related to momentary self-esteem across social contexts, with perceptions formed by the individual displaying stronger and more consistent associations with momentary self-esteem than the actual perceptions of others when considered simultaneously. In addition, both interpersonal perceptions and personality traits are independently associated with momentary self-esteem in social interactions, with few interactive effects: In zero-acquaintance interactions in a laboratory setting, neuroticism dampened the association

between interpersonal perceptions of social inclusion and momentary self-esteem, but not in interactions with familiar interaction partners in daily life.

We encourage future research to expand our efforts unraveling how specific personality characteristics may have a differential functionality depending on the social context and type of interaction partner, enhancing our understanding of the complex interplay between an individual's personality and their social environment.

Data accessibility statement

All study materials are provided at the OSF page of the SELFIE study (https://osf.io/4gnz9/). The data and analysis scripts used for this article can be accessed at our OSF page (https://osf.io/vdneq/).

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Supplemental Material Paper 2

Figure S1

Johnson-Neyman Plot Showing the Interaction between Metaperceptions and Other-Perceptions of Social Inclusion on Momentary Self-Esteem in the Model with Neuroticism as a Predictor at Level 2
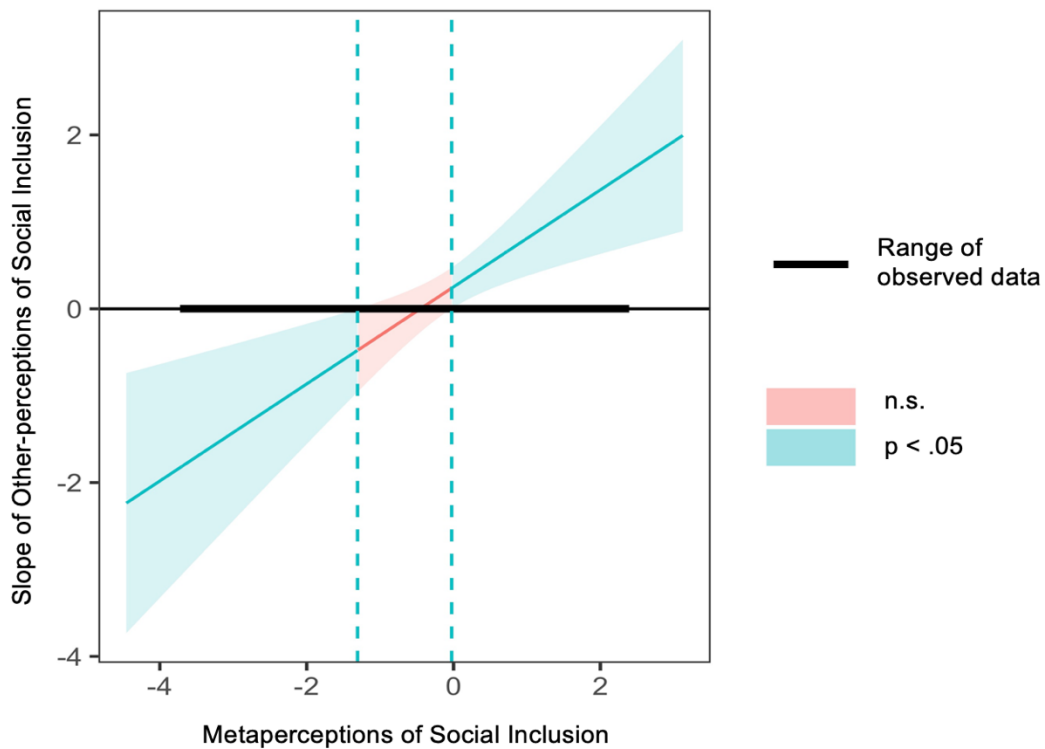
Note. Significant moderation effects of metaperceptions on other-perceptions of social inclusion are indicated by the green line, whereas non-significant moderation effects are indicated by a red line. Accordingly, the figure shows that positive metaperceptions above a value of 0 significantly strengthen the association between other-perceptions and momentary self-esteem, while negative metaperceptions below a value of -1.5 weaken this link.

Table S1

Overview of Study Parts, Research Variables, Hypotheses, and Results

Study Part	Relevant Variables	Preregistered Hypothesis	Results
Study Part A: Laboratory	Metaperceptions and other-perceptions of social inclusion	H1a: Metaperceptions of social inclusion are associated with momentary self-esteem, other-perceptions of social inclusion are not.	Metaperceptions positively relate to momentary self-esteem. Other-perceptions do not relate to momentary self-esteem in any model.[1]
		H1b: Metaperceptions of social inclusion moderate the association between other-perceptions and momentary self-esteem.	Metaperceptions moderated the association between other-perceptions and momentary self-esteem in 1 model.[2]
Study Part B: ESM	Self-perceptions and metaperceptions of social inclusion	H2a: Self-perceptions of social inclusion are associated with momentary self-esteem.	Self-perceptions positively relate to momentary self-esteem.
		H2b: Metaperceptions of social inclusion predict momentary self-esteem above and beyond self-perceptions.	Metaperceptions do not relate to momentary self-esteem.[1]
Study Part B: Subsample analyses	Self-perceptions, metaperceptions, and other-perceptions of social inclusion	see Hypotheses 1 and 2	Full model: Self-perceptions positively relate to momentary self-esteem; further perception types show no associations.
			Partial model[3]: Meta-perceptions positively relate to momentary self-esteem, other-perceptions do not.
Both Study Parts	Personality traits	Personality traits moderate the associations between interpersonal perceptions of social inclusion and momentary self-esteem. H3a: Neuroticism	Study Part A: N dampens the association between meta- and other-perceptions and momentary self-esteem. Study Part B: No moderating effect.
		H3b: Extraversion	No moderating effects.
		H3c: Agreeableness	Study Part A: No moderating effects. Study Part B: A strengthens association between self-perceptions and momentary self-esteem.

Note. [1] The effects did not remain significant after adjusting *p*-values to control for multiple testing. [2] The moderation was significant in the model with neuroticism. [3] Partial model without self-perceptions at predictor at the within or between-person level.

Power Simulations

Power simulations were carried out for two parameters (1) the simple within-person effect of metaperceptions (in Part A) or self-perceptions of social inclusion (in Part B and the subsample analysis), and (2) the simple between-person effect of neuroticism. We assessed power as the relative number of *p*-values below .05. All simulations were run with the R package "SimrR" (Green & MacLeod, 2016) with 500 iterations. Consistent with previous literature (Cohen, 1988), a power of 80% or more can be considered satisfactory. In our power simulation, we applied a stepwise approach and moved from larger to smaller estimates for each level, stopping when the power fell below the threshold of sufficient power (i.e., < .80).

Table S2

Power Simulations for Study Part A, Study Part B, and the Subsample Analysis

	Part A	Part B	Subsample Analysis
L1-estimate			
.40	94.60% (93.01, 95.92)	100.0% (99.26, 100.0)	100.0% (99.26, 100.0)
.35	88.00% (84.82, 90.72)	/	/
.30	76.50% (73.75, 79.10)	/	99.00% (97.68, 99.67)
.20	/	/	82.60% (78.99, 85.82)
.15	/	/	59.80% (55.35, 64.13)
.10	/	95.80% (93.65, 97.38)	/
L2-estimate			
.45	84.60% (81.13, 87.65)		
.40	74.20% (70.13, 77.98)	98.80% (97.41, 99.56)	91.80% (89.04, 94.05)
.35	63.00% (58.60, 67.24)	/	84.00% (80.49, 87.10)
.30	/	90.60% (87.70, 93.01)	76.00% (72.01, 79.68)
.25	/	80.00% (70.82, 87.33)	56.60% (52.13, 60.99)
.20	/	53.80% (49.32, 58.24)	/

Note. Values in brackets indicate 95% confidence interval.

Table S3

Intercorrelations among Within-Person Variables for the Subsample-Analysis in Study Part B

Variable	*M*	*SD*	*ICC*	1	2	3	4	5	6
1. Momentary Self-Esteem	6.93	2.16	.54						
2. Self-Perception	8.48	1.48	.32	.26**					
3. Metaperception	8.09	1.54	.43	.26**	.75**				
4. Other-Perception	8.68	1.52	.16	.17**	.47**	.48**			
5. Level of Acquaintance	8.75	1.53	.22	.13**	.12**	.23**	.07		
6. Day of ESM	2.61	2.11	.04	− .01	.10*	.09*	.06	− .02	
7. Gender of Interaction Partner	0.34	0.47	.22	.01	− .05	− .05	− .03	− .04	.05

Note. $N = 628$ observations nested in 178 individuals. *M* and *SD* represent mean and standard deviation. Gender of interaction partner was coded 0 for same-sex and 1 for other-sex regarding the gender of the participant. * indicates $p < .05$, ** indicates $p < .01$.

Table S4

Intercorrelations among Between-Person Variables for the Subsample-Analysis in Study Part B

Variable	M	SD	1	2	3	4	5	6	7	8
1. Momentary Self-Esteem	6.92	1.83								
2. Neuroticism	3.88	1.09	− .47**							
3. Extraversion	4.77	0.95	.27**	− .26**						
4. Agreeableness	5.13	0.78	.17**	− .27**	.20**					
5. Self-Perception	8.47	1.25	.27**	− .13	.14	.32**				
6. Metaperception	8.14	1.37	.28**	− .18*	.17*	.33**	.82**			
7. Other-Perception	8.70	1.14	.23**	− .12	.07	.32**	.62**	.66**		
8. Age	17.62	0.93	− .02	− .07	− .02	− .07	− .03	− .07	.00	
9. Gender	0.78	0.41	− .12	.35**	− .05	.10	.05	.00	− .01	− .16*

Note. $N = 178$ individuals. *M* and *SD* represent mean and standard deviation. Situational variables (momentary self-esteem, self-, meta-, and other-perceptions of social inclusion) were averaged across rating rounds and individuals. Gender was coded 0 for males and 1 for females. * indicates $p < .05$, ** indicates $p < .01$.

Table S5

Multilevel Models explaining Momentary Self-Esteem as a Function of Meta, and Other-Perceptions of Social Inclusion, Personality Traits, and Covariates for the Subsample-Analysis in Study Part B

	Basic Model			Neuroticism			Extraversion			Agreeableness		
	Model 1			Model 2a			Model 2b			Model 2c		
	Est.	*SE*	*p*	*Est.*	*SE*	*p*	*Est.*	*SE*	*p*	*Est.*	*SE*	*p*
Fixed Effects												
Intercept, γ_{00}	7.25	0.29	< .001	6.74	0.27	< .001	7.22	0.29	< .001	7.31	0.29	< .001
Within-person effects												
Metaperception, γ_{10}	0.21	0.06	.001	0.22	0.06	< .001	0.20	0.06	.001	0.22	0.06	< .001
Other-Perception, γ_{20}	0.04	0.05	.469	0.02	0.05	.721	0.04	0.05	.401	0.05	0.05	.344
Meta x Other-Perception, γ_{30}	0.01	0.05	.833	− 0.01	0.05	.912	0.02	0.05	.743	0.02	0.05	.670
Level of Acquaintance, γ_{40}	− 0.01	0.05	.871	0.00	0.05	.996	− 0.01	0.05	.896	0.01	0.05	.813
Day of ESM, γ_{50}	− 0.02	0.03	.565	− 0.02	0.03	.512	− 0.02	0.03	.555	− 0.02	0.03	.448
Gender of Interaction Partner, γ_{60}	0.25	0.15	.092	0.26	0.15	.074	0.24	0.15	.101	0.26	0.15	.080
Between-person effects												
Metaperception, γ_{01}	0.34	0.13	.010	0.23	0.12	.055	0.27	0.13	.038	0.30	0.13	.021
Other-perception, $_{02}$	0.13	0.16	.400	0.12	0.14	.380	0.15	0.15	.316	0.10	0.16	.523
Gender, γ_{03}	− 0.54	0.32	.095	0.18	0.31	.566	− 0.50	0.31	.108	− 0.60	0.32	.060
Personality, γ_{04}				− 0.76	0.12	< .001	0.43	0.14	.002	0.24	0.18	.188
Cross-level interactions												
Personality x Metaperception, γ_{11}				− 0.03	0.05	.587	0.00	0.07	.999	0.19	0.07	.188
Personality x Other-Perception, γ_{21}				0.06	0.05	.270	− 0.06	0.05	.254	− 0.07	0.06	.240
Personality x Meta x Other-Perception, γ_{31}				− 0.01	0.04	.743	0.01	0.06	.846	0.16	0.06	.008
Random Effects												
Variance Intercept, $\sigma^2_{u_0}$		2.16			1.56			2.01			2.09	
Residual Variance, σ^2_e		2.02			2.02			2.02			1.98	
ICC		0.52			0.44			0.50			0.51	
AIC		2498.18			2465.22			2494.76			2489.44	
R^2_w / R^2_b		0.09 / 0.11			0.22 / 0.31			0.12 / 0.16			0.12 / 0.14	

Note. $N = 178$ individuals providing 628 observations. Gender was coded 0 for males and 1 for females, therefore the intercept of model 2 refers to the male gender. R^2_w indicates modeled variance at the within-person level, R^2_b indicates modeled variance at the between-person level. Coefficients values in bold are significant at a significance level of $p < .05$.

Table S6

Unstandardized Regression Effects of Meta and Other-Perceptions and Personality on Momentary Self-Esteem in Study Part A, Including Unadjusted and Adjusted p-Values

| | Basic Model | | | Neuroticism | | | Extraversion | | | Agreeableness | | |
| | Model 1 | | | Model 2a | | | Model 2b | | | Model 2c | | |
	Est.	*p*	BH	*Est.*	*p*	BH	*Est.*	*p*	BH	*Est.*	*p*	BH
Fixed Effects												
Within-person effects												
Metaperception, γ_{10}	0.34	.002	.010	0.34	.002	.010	0.35	.003	.010	0.35	.003	.010
Other-Perception, γ_{20}	0.23	.065	.120	0.25	.039	.078	0.26	.036	.077	0.22	.072	.122
Meta x Other-Perception, γ_{30}	0.28	.057	.109	0.56	.001	.007	0.32	.034	.077	0.28	.079	.126
Between-person effects												
Metaperception, γ_{01}	0.77	< .001	< .001	0.48	< .001	.004	0.63	< .001	< .001	0.68	< .001	< .001
Other-perception, $_{02}$	0.15	.265	.356	0.16	.187	.275	0.06	.661	.756	0.17	.212	.298
Personality, γ_{04}				− 0.70	< .001	< .001	0.37	.026	.072	0.47	.0.34	.077
Cross-level interactions												
Personality x Metaperception, γ_{11}				− 0.04	.705	.611	− 0.11	.321	.412	0.01	.961	.961
Personality x Other-Perception, γ_{21}				0.08	.509	.778	0.07	.515	.611	− 0.02	.916	.946
Personality x Meta x Other-Perception, γ_{3}				− 0.35	.015	.042	− 0.26	.113	.172	0.04	.877	.935
Random Effects												
Variance Intercept, $\sigma^2_{u_0}$		1.57			1.13			1.41			1.46	
Residual Variance, σ^2_e		1.99			1.91			1.95			1.99	
ICC		0.44			0.37			0.42			0.42	
AIC		1208.27			1185.31			1205.45			1211.44	
R^2_w/ R^2_b		0.22 / 0.29			0.33 / 0.44			0.26 / 0.34			0.25 / 0.32	

Note. N = 101 individuals providing 303 observations. R^2_w indicates modeled variance at the within-person level, R^2_b indicates modeled variance at the between-person level. *p* = unadjusted *p*-value, BH = adjusted *p*-value after Benjamini & Hochberg (FDR).

Table S7

Unstandardized Regression Effects of Meta and Other-Perceptions and Personality on Momentary Self-Esteem in Study Part B, Including Unadjusted and Adjusted p-Values

	Basic Model			Neuroticism			Extraversion			Agreeableness		
	Model 1			Model 2a			Model 2b			Model 2c		
	Est.	*p*	BH	*Est.*	*p*	BH	*Est.*	*p*	BH	*Est.*	*p*	BH
Fixed Effects												
Within-person effects												
Self-perception, γ_{10}	0.24	< .001	< .001	0.25	< .001	< .001	0.25	< .001	< .001	0.26	< .001	< .001
Metaperception, γ_{20}	0.06	.041	.085	0.06	.038	.085	0.06	.038	.085	0.05	.079	.124
Between-person effects												
Self-perception, γ_{01}	0.21	.352	.489	0.15	.458	.546	0.18	.404	.518	0.19	.414	.518
Metaperception, γ_{02}	0.48	.028	.085	0.35	.073	.123	0.41	.056	.110	0.46	.035	.085
Personality, γ_{04}				− 0.76	< .001	< .001	0.40	< .001	.001	0.16	.265	.391
Cross-level interactions												
Personality x Self-perception, γ_{11}				− 0.01	.804	.809	− 0.02	.487	.553	0.08	.005	.016
Personality x Metaperception, γ_{21}				− 0.01	.809	.809	0.06	.064	.114	− 0.02	.514	.559
Random Effects												
Variance Intercept, $\sigma_{u_0}^2$		2.03			1.50			1.89			2.01	
Residual Variance, σ_e^2		2.34			2.34			2.34			2.33	
ICC		0.46			0.39			0.45			0.46	
AIC		11338.63			11286.43			11326.64			11331.54	
R_w^2 / R_b^2		0.16 / 0.22			0.26 / 0.40			0.19 / 0.27			0.16 / 0.22	

Note. $N = 218$ individuals providing 2,928 observations. R_w^2 indicates modeled variance at the within-person level, R_b^2 indicates modeled variance at the between-person level. p = unadjusted p-value, BH = adjusted p-value after Benjamini & Hochberg (FDR).

Table S8

Unstandardized Regression Effects of Meta and Other-Perceptions and Personality on Momentary Self-Esteem in Study Part B Subsample Analysis, Including Unadjusted and Adjusted p-Values

| | **Basic Model** | | | **Neuroticism** | | | **Extraversion** | | | **Agreeableness** | | |
| | Model 1 | | | Model 2a | | | Model 2b | | | Model 2c | | |
	Est.	*p*	BH	*Est.*	*p*	BH	*Est.*	*p*	BH	*Est.*	*p*	BH
Fixed Effects												
Within-person effects												
Self-perception, γ_{10}	0.34	< .001	< .001	0.34	< .001	< .001	0.33	< .001	< .001	0.26	< .001	< .001
Metaperception, γ_{20}	0.01	.909	.978	0.01	.897	.978	0.00	.952	.989	0.05	.079	.870
Other-Perception, γ_{30}	0.00	.972	.989	−0.01	.833	.968	0.01	.875	.976	0.01	.788	.968
Meta x Other-Perception, γ_{40}	0.03	.578	.870	0.01	.785	.968	0.03	.480	.870	0.04	.443	.870
Between-person effects												
Self-perception, γ_{01}	0.10	.626	.870	0.09	.611	.870	0.09	.637	.870	0.19	.414	.870
Metaperception, γ_{02}	0.27	.144	.566	0.16	.331	.870	0.21	.260	.747	0.46	.198	.610
Other-perception, γ_{03}	0.12	.448	.870	0.11	.424	.870	0.14	.355	.870	0.09	.571	.870
Personality, γ_{04}				− 0.76	< .001	< .001	0.43	.002	.015	0.16	.265	.610
Cross-level interactions												
Personality x Self-perception, γ_{11}				0.11	.079	.377	0.05	.509	.870	− 0.04	.667	.870
Personality x Metaperception, γ_{21}				− 0.09	.134	.566	− 0.02	.827	.968	0.18	.031	.167
Personality x Other-Perception, γ_{31}				0.04	.502	.870	− 0.07	.162	.579	− 0.05	.420	.870
Personality x Meta x Other-Perception, γ_4				− 0.00	.989	.989	0.03	.635	.870	0.14	.013	.079
Random Effects												
Variance Intercept, $\sigma_{u_0}^2$			2.20			1.60			2.05			2.12
Residual Variance, σ_e^2			1.93			1.91			1.91			1.98
ICC			0.53			0.46			0.52			0.53
AIC			2479.57			2445.07			2477.03			2559.70
R_w^2 / R_b^2			0.10 / 0.11			0.23 / 0.31			0.14 / 0.16			0.13 / 0.14

Note. N = 178 individuals providing 628 observations. R_w^2 indicates modeled variance at the within-person level, R_b^2 indicates modeled variance at the between-person level. p = unadjusted p-value, BH = adjusted p-value after Benjamini & Hochberg (FDR).

Table S9

Unstandardized Regression Effects of Meta and Other-Perceptions and Personality on Momentary Self-Esteem in Study Part B Subsample Analysis, Including Unadjusted and Adjusted p-Values

	Basic Model			Neuroticism			Extraversion			Agreeableness		
	Model 1			Model 2a			Model 2b			Model 2c		
	Est.	*p*	BH	*Est.*	*p*	BH	*Est.*	*p*	BH	*Est.*	*p*	BH
Fixed Effects												
Within-person effects												
Metaperception, γ_{20}	0.21	.001	.007	0.22	< .001	.005	0.20	.001	.009	0.22	< .001	.005
Other-Perception, γ_{30}	0.04	.469	.682	0.02	.721	.849	0.04	.401	.611	0.05	.344	.611
Meta x Other-Perception, γ_{40}	0.01	.833	.902	− 0.01	.912	.941	0.02	.743	.849	0.02	.670	.849
Between-person effects												
Metaperception, γ_{02}	0.34	.010	.036	0.23	.055	.149	0.27	.038	.113	0.30	.021	.032
Other-perception, γ_{03}	0.13	.400	.611	0.12	.380	.611	0.15	.316	.595	0.10	.523	.729
Personality, γ_{04}				− 0.76	< .001	< .001	0.43	.002	.010	0.24	.188	.467
Cross-level interactions												
Personality x Metaperception, γ_{21}				− 0.03	.587	.783	0.00	.999	.999	0.19	.008	.032
Personality x Other-Perception, γ_{31}				0.06	.270	.540	− 0.06	.254	.540	− 0.07	.240	.540
Personality x Meta x Other-Perception, γ_4				− 0.01	.743	.849	0.01	.846	.902	0.16	.008	.032
Random Effects												
Variance Intercept, $\sigma_{u_0}^2$		2.16			1.56			2.01			2.09	
Residual Variance, σ_e^2		2.02			2.02			2.02			1.98	
ICC		0.52			0.44			0.50			0.51	
AIC		2498.18			2465.22			2494.76			2489.44	
R_w^2 / R_b^2		0.09 / 0.11			0.22 / 0.31			0.12 / 0.16			0.12 / 0.14	

Note. $N = 178$ individuals providing 628 observations. R_w^2 indicates modeled variance at the within-person level, R_b^2 indicates modeled variance at the between-person level. p = unadjusted p-value, BH = adjusted p-value after Benjamini & Hochberg (FDR).

4. **Routes to Momentary Self-Esteem in Adolescence: Links with Interpersonal Perceptions of Liking and Personality Metaperceptions within Social Interactions**

Abstract

Objective: This study provides insights into the perceptual processes contributing to positive social experiences and momentary self-esteem in adolescents' initial social interactions.

Background: A person's self-esteem is shaped by their social experiences. However, little is known about which interpersonal perceptions are linked to momentary self-esteem within social interactions. Identifying two key interpersonal perceptions, we examined differential associations between an individual's meta-liking and other-perceptions of liking by interaction partners with momentary self-esteem. Further, we investigated how preceding personality metaperceptions (i.e., meta-accuracy and meta-positivity) extended these sociometer processes.

Method: The current study used round-robin data from N = 296 adolescents who participated in a virtual group interaction. Social accuracy modeling was used to estimate meta-accuracy and meta-positivity of personality metaperceptions, and path models were used to test associations with interpersonal perceptions of liking and momentary self-esteem.

Results: Two main findings emerged: First, meta-liking was consistently related to higher momentary self-esteem, whereas other-perceptions of liking were not. Second, meta-positivity of personality metaperceptions was linked to higher meta-liking and indirectly contributed to higher momentary self-esteem through meta-liking.

Conclusion: These findings highlight the importance of considering different interpersonal perceptions to understand social interaction experiences.

Keywords: adolescence, momentary self-esteem, interpersonal perceptions of liking, metaperceptions, personality

Routes to Momentary Self-Esteem in Adolescence: Links with Interpersonal Perceptions of Liking and Personality Metaperceptions Within Social Interactions

An individual's self-esteem is fundamentally shaped by their social environment: Having positive social interactions with others is linked to higher self-esteem, while negative social experiences are accompanied by decreases in self-esteem (Leary et al., 1998; Leary & Baumeister, 2000). However, while extensive research on self-esteem has emphasized its social nature (e.g., Blackhart et al., 2009; Bleckmann et al., 2022; Denissen et al., 2008; Wagner et al., 2018), two aspects remain fairly unknown. First, little is known about how different interpersonal perceptions that characterize positive social interactions are associated with momentary self-esteem. Specifically, is it more important for a person's self-esteem whether a person believes they are liked by others (i.e., meta-liking), or whether interaction partners actually like them (i.e., other-perceptions of liking)? Second, there is little understanding of additional perceptual processes that precede both different interpersonal perceptions of liking and momentary self-esteem in social interactions.

In this regard, previous research has identified personality metaperceptions—a person's belief about the impression others have of their personality (Kenny & DePaulo, 1993)—as a key ingredient for positive social interactions. Personality metaperceptions play a central role in shaping behavior and how people present themselves in social situations (Lemay & Dudley, 2009; Schlenker & Weigold, 1992; Stopfer et al., 2014). Specifically, two concepts of personality metaperceptions have been put forward. First, there is meta-accuracy, which reflects whether people have insight into how others see them. Meta-accuracy has been associated with positive social interaction experiences of the target person and interaction partners (Carlson, 2016; Tissera et al., 2021). Second, there is meta-positivity, which reflects whether individuals believe that others view them in a positive light. Meta-positivity has been associated with greater enjoyment of social interactions by the target person (Carlson, 2016; Tissera et al., 2021).

While the associations between meta-accuracy, meta-positivity, and positive social interaction experiences have been studied predominantly in young adult samples, the role of personality metaperceptions in other age groups remains unclear. Gaining insights into potential markers of positive social interactions and how these link to self-esteem is important for all age groups, but it could be considered especially relevant for adolescents. In adolescence, social connections with peers intensify, and individuals must learn how to interact with others to successfully expand their networks beyond the family (Cillessen & Borch, 2006; Smetana et al., 2006; Wagner et al., 2014a). Additionally, social interactions represent an important source

for the development of a clear self-concept and stable self-esteem in adolescence (Harter, 2012). To date, however, little is known about the degree to which adolescents display meta-accuracy and meta-positivity in their personality metaperceptions and the role they play for different interpersonal perceptions of liking or momentary self-esteem.

Addressing the outlined research gaps, the current study aims to answer two research questions: First, how are interpersonal perceptions of liking—meta-liking and other-perceptions of liking—linked to adolescents' momentary self-esteem within social interactions? Second, how are preceding perceptual processes within the interaction—meta-accuracy and meta-positivity of personality metaperceptions—connected to perceptions of liking and momentary self-esteem? By answering these questions, this study aims to contribute to the understanding of interpersonal processes that may contribute to positive social interactions among adolescents. In doing so, we offer new insights into how well adolescents understand the impressions they make while getting to know each other.

Momentary Self-Esteem: Associations with Perceptions of Liking

Past research has demonstrated that positive social interactions with others shapes how individuals view themselves (Back, Schmukle, et al., 2011). One of the most supported theories in this regard is sociometer theory, stating that the experience of positive social interactions leads to increases in a person's self-esteem (Leary, Terdal, et al., 1995). In line with this, various studies have shown that different indicators of positive social interactions, such as interaction quality (Denissen et al., 2008) or perceptions of liking (Bleckmann et al., 2022; Schmidt et al., 2021, Wagner et al., 2018), are linked to increases in self-esteem. However, while the bulk of research has focused on individuals' self-perceptions of interaction experiences, little is known about how different interpersonal perceptions relate to momentary self-esteem. Filling this gap, the present study considers two interpersonal perceptions of liking as early indicators of positive social interactions in a getting-to-know context: meta-liking and other-perceptions of liking.

According to sociometer theory, meta-liking plays a central role for momentary self-esteem (Leary, Terdal, et al., 1995). Empirical evidence is ambiguous, however, since many prior studies addressing sociometer processes did not differentiate clearly between self-perceptions and metaperceptions. Although self- and metaperceptions are often related (Carlson & Kenny, 2012; Kenny & DePaulo, 1993), they are conceptually different in that metaperceptions require a reflective process of guessing how one is seen by others. This inherent interpersonal focus should be particularly important regarding a person's momentary self-esteem in social interactions, as it reflects one's perceived social standing with others.

Next to meta-liking, empirical findings suggest that other-perceptions of liking are relevant for momentary self-esteem as well (Reitz et al., 2016; Srivastava & Beer, 2005; Thomaes et al., 2010b). Conceptually, other-perceptions of liking contain different information than metaperceptions (Malloy et al., 2007b) and may thus be differentially linked to momentary self-esteem. In line with this, Srivastava and Beer (2005) found that meta-liking and other-perceptions of liking were independently linked to self-esteem. However, recent findings question whether meta-liking and other-perceptions of liking play the same role for momentary self-esteem in social interactions: When examined concurrently, meta-liking, but not other-perceptions of liking, related consistently to self-esteem (Bleckmann et al., 2022; Wagner et al., 2018). In the current study, we investigate how both meta-liking and other-perceptions of liking are linked to momentary self-esteem to extend these findings on sociometer processes.

What Fuels Positive Social Interactions? The Role of Personality Metaperceptions

Beyond interpersonal perceptions of liking, little is known about what precedes sociometer processes in social interactions. Research with adult samples suggests that the degree to which individuals have insight into the impressions they make on others—their personality metaperceptions—is one characteristic related to positive social interactions (Carlson, 2016; Carlson & Barranti, 2016). Below, we discuss two key concepts of personality metaperceptions: meta-accuracy and meta-positivity.

Two Characteristics of Personality Metaperceptions: Meta-accuracy and Meta-positivity

Since most research to date has focused on personality metaperceptions of adults, little is known about whether adolescents achieve statistically significant levels of meta-accuracy and meta-positivity and how this may impact their social interactions. Three observations from previous research suggest that adolescents may already have insight into their impressions. Social-cognition research demonstrates that reflective abilities improve as part of the neurobiological development in adolescence (Blakemore & Mills, 2014; Pfeifer et al., 2009). In line with this, empirical findings suggest that perspective taking abilities develop considerably during adolescence (Van der Graaff et al., 2014). Finally, studies focusing on metaperceptions in younger age groups illustrate that children as early as first-grade form accurate metaperceptions of popularity or mathematical ability (Malloy et al., 2007b). Building on this, we expect that adolescents achieve meta-accuracy and display meta-positivity in their personality metaperceptions.

While there are different routes to estimating the accuracy and positivity of perceptions (see Back & Nestler, 2016), one of the most frequently used is the profile approach (Biesanz, 2021). With the profile approach, accuracy is calculated across several personality items: Does

Harry think others see him as shy rather than funny, and does that correspond to how others see his pattern of personality traits? Using the profile approach allows to statistically distinguish accuracy from positivity (Biesanz, 2021; Borkenau & Leising, 2016). That is, higher levels of meta-accuracy would indicate that Harry understands how a specific interaction partner sees him differently from the average person; whereas a high degree of meta-positivity would suggest that Harry believes that others generally see him similarly to the average person, which is usually very positive.[27]

Links between Personality Metaperceptions, Perceptions of Liking, and Momentary Self-Esteem

To understand the role of meta-accuracy and meta-positivity of personality metaperceptions for the experience of positive social interactions, previous research has investigated their links with different markers of relationship quality (Carlson, 2016). Building on and extending such findings, the current research investigates not only the specific links between meta-accuracy and meta-positivity with two types of interpersonal perceptions of liking, but also examines how these pathways may extend sociometer processes related to adolescents' momentary self-esteem (see Figure 1).
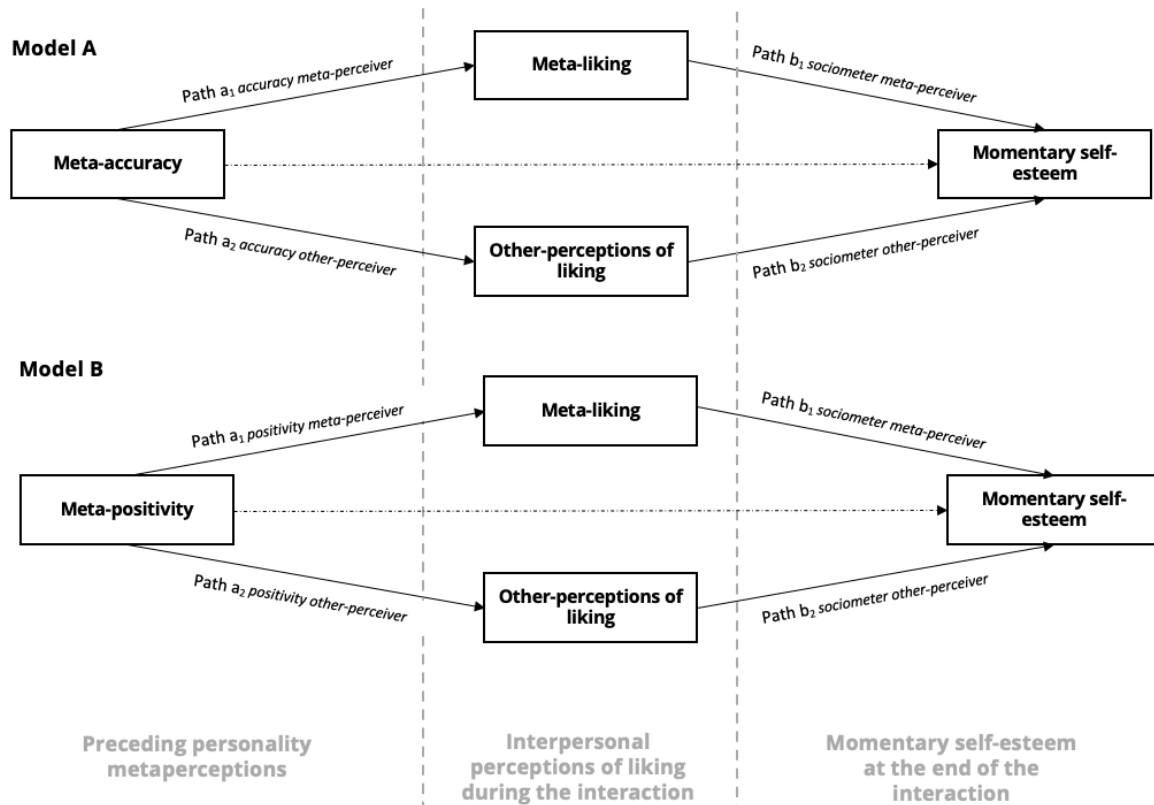
The Role of Meta-Accuracy in Personality Metaperceptions

Research has shown that individuals with high levels of meta-accuracy are liked more by their interaction partners, both in interactions with unacquainted others (Tissera et al., 2021) and in relationships with familiar others (Carlson, 2016). The theoretical reasoning behind this positive link is that an accurate understanding of how one is seen by others promotes smooth social encounters and facilitates communication between interaction partners. As such, meta-accuracy could enable individuals to adapt their behavior in social interactions, ensuring effective impression management (e.g., Cameron & Vorauer, 2008; Tissera et al., 2021). Additionally, meta-accuracy may indicate greater self-knowledge (i.e., knowing how one behaves), which has been associated with being liked (Tenney et al., 2013). On these grounds, we would expect that if Harry has a good understanding of how others see him in a social interaction (high meta-accuracy), he is liked more by others (high other-perceptions of liking; see Figure 1A, Path a_2), which in turn may boost his momentary self-esteem (Path b_2).

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[27] While several findings show that the normative personality profile is highly socially desirable, reflecting positivity of perceptions (Borkenau & Leising, 2016; Human et al., 2013), research suggests that the normative profile may also contain information independent of social desirability (Wessels et al., 2021). We address this distinction between normative and socially desirable profiles in our Method section.

Figure 1

Conceptual Model of the Associations Between Meta-Accuracy and Meta-Positivity of Personality Metaperceptions, Perceptions of Liking, and Momentary Self-Esteem

Note. Conceptual overview displaying the links between meta-accuracy (Model A) and meta-positivity (Model B) of personality metaperceptions early in the interaction with interpersonal perceptions of liking during the interaction and momentary self-esteem at the end of the interaction.

In contrast, it is unclear how meta-accuracy is linked to meta-liking. People with high meta-accuracy in personality metaperceptions do not seem to enjoy social interactions more or like their interaction partners more (Carlson, 2016; Tissera et al., 2021). Analogously, meta-accuracy is not necessarily positively associated with meta-liking. For instance, Harry might understand accurately that others see him differently from how he would like to be seen. As a result, he might conclude that he is not particularly liked by others (i.e., low meta-liking). In contrast, feeling understood in social interactions could contribute to meta-liking in a sense of self-verification (Swann, 2012): If Harry feels understood, he might also believe that others like him (Figure 1A, Path a_1). This, in turn, could affect his momentary self-esteem through the sociometer process (Path b_1).

The Role of Meta-Positivity in Personality Metaperceptions

In general, people tend to believe that others see them in a positive light (Carlson, 2016; Carlson & Kenny, 2012) and expect to receive positive feedback from others (Hepper et al., 2011). However, while past research has shown that people display a considerable amount of meta-positivity in their personality metaperceptions (Tissera et al., 2021), the link between meta-positivity and different perceptions of liking is largely unclear. Conceptually, meta-positivity in personality metaperceptions could lead to more positive interaction dynamics: If Harry believes he is seen positively, he may be more open-minded, which could resonate in higher other-perceptions of liking (Figure 1B, Path a_1). Evidence for this link is mixed: While Carlson (2016) did not find a significant link between meta-positivity and other-perceptions of liking across different relational contexts, a more recent study by Tissera et al. (2021) showed that meta-positivity was positively related to being liked by platonic interaction partners. The present study aims to extend these mixed findings by examining the relationship between meta-positivity and other-perceptions of liking in adolescent social interactions.

Finally, there are no empirical findings to our knowledge regarding the link between meta-positivity of personality metaperceptions and meta-liking. Previous work shows that higher meta-positivity is linked to enjoying social interactions more (Carlson, 2016). Along these lines, meta-positivity could be associated with higher meta-liking. If Harry believes that others see him positively, he may be more inclined to believe that his interaction partners like him (Figure 1B, Path a_2). Thus, meta-positivity may not just be a perceptual bias but could have an adaptive function that contributes to more positive interaction dynamics and a more positive subjective experience of the individual. Like meta-accuracy, meta-positivity may therefore relate to meta-liking and other-perceptions of liking and thereby play a role for sociometer processes (Path b_2).[28]

The Present Study

The present research aimed to provide new insights into sociometer processes within social interactions and illuminate the role of meta-accuracy and meta-positivity of personality metaperceptions in social interaction experiences in adolescence, a developmentally relevant but sparsely studied age group. Specifically, the study had two objectives: First, we examined how meta-liking and other-perceptions of liking relate to momentary self-esteem in social interactions (Research Objective 1). Further, we investigated how meta-accuracy and meta-

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[28] The associations between personality metaperceptions and interpersonal perceptions of liking may be bidirectional (Back, Baumert, et al., 2011), with prior perceptions of liking affecting meta-accuracy and meta-positivity The present study focuses on the specific role of meta-accuracy and meta-positivity of personality metaperceptions formed early on in an interaction and how these relate to subsequent perceptions of liking.

positivity of personality metaperceptions are associated with the different interpersonal perceptions of liking and via these, with momentary self-esteem (Research Objective 2).

Given these research objectives, we propose three sets of hypotheses. First, building on previous self-esteem research (Bleckmann et al., 2022; Wagner et al., 2018), we expected that meta-liking would link more strongly to an individual's momentary self-esteem than other-perceptions of liking (Hypothesis 1). Of note, empirical research suggests that the relationship between self-esteem and perceptions of liking is bidirectional, with self-esteem not only being a consequence but also a predictor (Harris & Orth, 2020; Hutteman et al., 2015). We controlled for the role of initial momentary self-esteem in social interactions for different perceptions of liking in our analyses to account for this potential bidirectionality.

Second, we assumed that adolescents show statistically significant levels of meta-accuracy and meta-positivity in their personality metaperceptions (Hypothesis 2). Third, based on previous findings (Carlson, 2016; Tissera et al., 2021), we expected that meta-accuracy and meta-positivity of personality metaperceptions are differentially associated with perceptions of liking: Higher levels of meta-accuracy were expected to be positively related to other-perceptions of liking (Hypothesis 3a), whereas higher levels of meta-positivity were expected to be positively related to meta-liking (Hypothesis 3b). We also examined the links between meta-accuracy and meta-liking, as well as between meta-positivity and other-perceptions of liking (see Figure 1) but did not have strong directive hypotheses. Finally, we tested whether meta-accuracy or meta-positivity would be indirectly linked (i.e., mediated by the different perceptions of liking) to momentary self-esteem (Hypothesis 4). To obtain a comprehensive picture, we also examined the direct associations between meta-accuracy and meta-positivity and momentary self-esteem.

To test these hypotheses, we focused on group interactions in a getting-to-know context, using data from $N = 296$ adolescents who participated in a virtual interactive session. In this age group, a lot of such getting-to-know contexts await individuals in their daily lives, and it becomes increasingly important to navigate social situations with peers in online contexts. Thus, although virtual social interactions may have different structural characteristics compared to real-world interactions (Lieberman & Schroeder, 2020; Sherman et al., 2013), they represent an important social context in which adolescents socialize and interact with each other (Reich et al., 2012).

Method

The present research was the first to use data from the SNAP study, a multi-method study focusing on social interaction dynamics and personality development in adolescence

(https://osf.io/w4nmj/). Ethical approval for data collection was granted by the local ethics committee at the University of Hamburg. In SNAP, adolescents (aged 14 to 18) across Germany were recruited online via social media and student job portals from May to December 2021. The study was implemented online, with several questionnaires assessing the study's core constructs (e.g., Big Five personality traits, social constructs) over three months. Additionally, participants attended a virtual interactive group session with three to four other participants. For the current research, only data collected during these virtual interactions were used. We preregistered our hypotheses and data analyses at the Open Science Framework (https://osf.io/rnehs/).

Procedure

After completing online questionnaires at the beginning of the study, participants chose a date for the virtual interaction. They did not receive any information regarding other participants or the session's content beforehand. Four trained student assistants moderated the sessions according to a standardized manual. The sessions started with all cameras switched off except for that of the moderator, who introduced the study and instructed participants to turn on their cameras simultaneously. Based on this first impression, participants began the first round-robins in which they rated their mood, personality states, and behaviors, made ratings about how they thought the other group members would rate them (i.e., personality metaperceptions and meta-liking), and provided ratings about how they viewed the other participants (i.e., other-perceptions of personality and liking). Next, all participants introduced themselves, which was followed by a second round-robin.

The main part of the session consisted of a roleplay in which participants were assigned roles in a fictional school project. Given their specific roles, they were asked to discuss who would take on predefined tasks in the project (e.g., task manager, communication with the teacher). Once finished, the third round-robin followed. Finally, participants were asked to discuss the role of schools in climate protection, without predefined roles this time. The last round-robin followed, after which participants were bid goodbye. On average, the interactive sessions lasted around 60-90 minutes. All participants received monetary compensation for their participation but did not receive feedback on other group members' ratings and did not meet again during the course of the study.

Participants

Of the 475 adolescents who completed the first questionnaire of the study, $N = 303$ took part in the virtual interactive session.[29] Although care was taken to ensure that participants did not know each other, eleven participants reported knowing another person in their group. Other- and metaperceptions for these specific persons were excluded from the analyses. Also, we detected response patterns in the data of 11 participants across their self-reported data and excluded these from analyses. One participant mistakenly took part three times in different groups. Since the participant did not know the other participants in either group, we included their meta- and other-perception ratings from all sessions. Finally, due to technical issues during some sessions, some participants did not complete all four round-robins. To avoid loss of data, we used all available points of data from all participants. The final sample consisted of $N = 296$ adolescents ($M_{Age} = 15.76$, $SD = 1.27$, 61.77% female) in 80 groups of 3 to 5 participants ($M = 3.83$, $SD = 0.78$). Of these participants, 84.64% indicated German as their first language and 81.91% attended the academic school track in Germany ("Gymnasium").

To calculate the expected power for the current study, we obtained an initial effect size estimate by computing a weighted average of the effect size concerning the distinctive meta-accuracy and other-perceptions of liking reported in Carlson (2016) and Tissera et al. (2021). This estimate ($r = .18$), together with the average sample size of the two studies, was used to compute the expected power with the fabs package for R (see github\jbiesanz\fabs). For an estimated sample size of 300 participants, the expected power was .81.

Measures

Personality Perceptions

To assess meta-accuracy and meta-positivity of personality metaperceptions, we used ratings collected in the second round-robin (i.e., after the self-presentation). We assumed that these ratings would be more valid than those in the first round-robin at complete zero acquaintance. Personality metaperceptions were assessed according to the dimensions of the Big Five (i.e., Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism). The items were taken from previous studies assessing personality states in social interaction contexts (Geukes et al., 2017; Wieczorek et al., 2021) and adapted for the younger age group in this study. Participants were asked "How do you think this person would describe you at this

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[29] The 172 participants who dropped out after the first questionnaire scored significantly lower on the personality traits agreeableness ($t(347.98) = -2.68$, Cohen's $d = -0.26$, $p = .008$) and on openness ($t(364.76) = -2.43$, Cohen's $d = -0.23$, $p = .016$) than participants who took part in the interactive session. Personality traits were assessed with the BFI-2 (German version; Danner et al., 2019). The two groups did not differ with respect to the other Big Five traits, age or gender distribution.

moment?". Each personality state was measured with one bipolar item on a scale from 1 to 10. Other-perceptions of personality were assessed using the same five bipolar items on the same scale. Participants received the following instruction: "In the following, we would like to know what you think of your fellow group members at this moment. Please answer a few questions about each person." Since all items were initially coded in a positive direction such that higher values indicated more socially desirable levels of that characteristic, we reverse-keyed two items (neuroticism and agreeableness) to obtain a balanced item set for examining positivity components within the personality ratings (see Biesanz, 2020, for a detailed explanation). The estimation of meta-accuracy and meta-positivity of personality metaperceptions is described in the Data Analysis section.

Perceptions of Liking

To assess meta-liking, participants were asked to answer the item "How much do you think this person likes you?" for each group member on a scale ranging from 0 (*not at all*) to 10 (*very*). For each participant, these ratings were aggregated to a mean score. Conversely, participants rated how much they liked each group member on a scale from 0 (*not at all*) to 10 (*very much*). These other-perceptions of liking were also aggregated to a mean score indicating how much the other group members liked the participant. We used the perceptions of liking collected in the third round-robin, that is, one round after the obtained personality perceptions.

To examine whether the averaged meta-liking and other-perceptions of liking provided reliable estimates, we conducted Social Relation Model analyses (Back & Kenny, 2010; Nestler, 2016, 2018). Specifically, we estimated SRM variance and covariance parameters for meta-liking and other-perceptions of liking, obtained the target and perceiver effects for the two variables, and correlated the perceiver effect of meta-liking (i.e., how much the metaperceiver generally thinks that they are liked by others) with the averaged meta-liking score, and the target effect of liking (i.e., how much the metaperceiver is generally liked by others) with the averaged other-perceptions of liking score. Both correlations were very high (perceiver meta-liking and averaged meta-liking: r = .94; target liking and averaged other-perceptions of liking: r = .85, see Table OS 7). Thus, we considered the average scores used in our analyses to be reliable estimates for meta-liking and other-perceptions of liking.

Momentary Self-Esteem

Momentary self-esteem was measured with the question "All things considered, how content are you with yourself right now?" on a scale ranging from 0 (*not at all*) to 10 (*very*). In the present study, we used the self-esteem ratings of the fourth round-robin at the end of the session.

Control Variables

As a first control variable, we considered initial momentary self-esteem, which was assessed in the first round-robin.[30] Additionally, sociodemographic information was assessed in an online questionnaire preceding the interaction session. For the analyses, we considered the participants' age as well as their indicated gender, coded (0) for boys and (1) for girls.

Data Analysis

We followed two consecutive steps in the data analyses. First, we used social accuracy multilevel modeling procedures (SAM; Biesanz, 2010) to estimate meta-accuracy and meta-positivity, as outlined by Tissera et al. 2021. The SAM is an established statistical approach to estimate perceptual accuracy in personality profiles and allows to distinguish between distinctive accuracy (i.e., meta-accuracy) and normative accuracy (i.e., meta-positivity). Second, we used a path analytic framework to simultaneously test associations between meta-liking, other-perceptions of liking, and momentary self-esteem (Research Objective 1), as well as the extended process idea on the respective associations of meta-accuracy and meta-positivity of personality metaperceptions with subsequent interpersonal perceptions of liking and momentary self-esteem (Research Objective 2). Data cleaning, structuring, and analyses were performed with R (R Core Team, 2020). We provide the R scripts for all analyses on our OSF page.

Estimating Meta-Accuracy and Meta-Positivity

The personality perceptions were simultaneously nested in metaperceivers and other-perceivers. To account for the resulting dependencies in the data, we used the SAM approach and fitted a multilevel model with crossed random effects. In this model, an individual's metaperception of each personality item is predicted by (1) the ratings of each other-perceiver on that item, (2) the 'normative' mean across all other-perceivers in the sample for that item, (3) the perceiver effect for each item.

To estimate meta-accuracy, other-perceptions were centered in two-steps (see Biesanz, 2010). First, we computed the mean for each item across all other-perceivers in the sample. This mean reflected the normativeness of the item and was used to center the other-perceptions within-item (i.e., the item-specific mean is subtracted from the respective other-perception item). By doing so, the other-perceptions cleanly indicated the distinctive perception of others for each item. In a second step, other-perceptions were group-mean centered to separate within- and between-person associations between metaperceptions and other-perceptions. To do this,

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[30] Initial self-esteem was not preregistered as a control variable but added based on the valuable feedback of an anonymous reviewer.

we calculated the mean of each other-perceiver for each item within an interaction group (i.e., across all the perceivers' ratings of an item of the other group members). This mean reflects a *perceiver effect*, a general tendency of how the perceiver rates others in general (Rau et al., 2021). This two-step centering approach is an extension of the original SAM approach which does not include a second centering with the perceiver effect (Biesanz, 2010).[31] This additional step ensures that the link between the centered other-perception and metaperceptions cleanly indicates a within-person association with the 'normative' mean and the perceiver effect removed. As a result, distinctive meta-accuracy indicates the degree to which metaperceivers' ratings accurately capture the unique other-perceptions of specific interaction partners, independent of the normative profile and the perceiver's typical tendencies in assessing others.

Grand-mean centered versions of the two calculated averages, that is the normative mean across all other-perceivers in the sample for each item and the perceiver effect for each item within an interaction group, were also entered as predictors into the model (see Tissera et al., 2021). The normative mean variable was centered by subtracting the mean across all items in the sample from the original variable and the perceiver effects are centered by subtracting the perceiver effect mean for each item. The full cross-random effects model is summarized in the following equation:

$$Metaperception_{moi} = \beta_{0mo} + \beta_{1mo}OtherPerception_{moi} + \beta_{2mo}NormativeMean_{i} \quad + \quad (1)$$
$$\beta_{3mo}PerceiverEffect_{oi} + \varepsilon_{moi},$$
$$\beta_{0mo} = \gamma_{00} + u_{0m} + u_{0o} \quad\quad\quad\quad (2)$$
$$\beta_{1mo} = \gamma_{10} + u_{1m} + u_{1o}$$
$$\beta_{2mo} = \gamma_{20} + u_{2m} + u_{2o}$$
$$\beta_{3mo} = \gamma_{30} + u_{3m} + u_{3o}$$

In this model, *Metaperception_{moi}* represents metaperceiver *m*'s rating of how they think the other-perceiver *o* rated them on item *i*. The parameter β_{1mo} is the meta-accuracy slope, reflecting the (linear) relationship between an individual's metaperception and the distinctive rating of an other-perceiver on item *i* (with the normative mean and the perceiver average impression on item *i* controlled for). The parameter β_{2mo} is a slope reflecting the normativity of metaperceptions, that is, the association between an individual's metaperception and the 'average' other-perception on item *i*. The parameter β_{3mo} reflects the association between metaperceptions and the other-perceiver's tendency to perceive others on item *i*, indicating the

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[31] The extension of the SAM was first presented in Tissera et al. (2021) and we adopted this new approach for our study.

extent to which a metaperceiver's belief of how they are seen by specific interaction partners is linked to how that perceiver sees others in general.[32] Finally, β_{0mo} is an intercept term and ε_{moi} represents an error term that is assumed to be normally distributed.

Following the logic of standard multilevel models, γ_{10} and γ_{20} reflect the average accuracy and positivity slope, respectively, across metaperceivers and other-perceivers. The parameters u_{1m} and u_{2m} represent how strong meta-perceiver m deviate from the average in meta-accuracy and meta-positivity. The variance of these random effects can be estimated with the cross-random effects model, and it indicates the degree of variation around mean levels due to metaperceivers. Similarly, u_{1o} and u_{2o} represent other-perceiver's o deviation from the average of meta-accuracy and meta-positivity, and the variance of these terms reflect the variation around mean levels due to the other-perceivers. We extracted estimates of the random effects u_{1m} and u_{2m} as indicators of meta-accuracy and meta-positivity from the fitted model (see Tissera et al., 2021) for use in the subsequent path models. The crossed random effects model was fitted with the lme4 package (Bates et al., 2015), whereby we used the 'nlminb' optimizer for model estimation instead of the default estimator, because it is in our experience more stable and less prone to convergence problems (see Schönbrodt et al., 2021).[33]

Path-Analytical Framework

We fitted two path models to test the associations between meta-accuracy and meta-positivity of personality metaperceptions, meta-liking and other-perceptions of liking, and momentary self-esteem. In the first path model, meta-accuracy was used to predict meta-liking (path a_1) and other-perceptions of liking (path a_2), which in turn were used to predict momentary self-esteem (paths b_1 and b_2). Path c' indicated the direct effect of meta-accuracy on momentary self-esteem, while the product of a_1 and b_1 reflected the indirect effect of meta-accuracy on momentary self-esteem through meta-liking. Similarly, the product of a_2 and b_2 indicated the indirect effect of meta-accuracy on momentary self-esteem through other-perceptions of liking. The respective sums of these indirect effects and the direct effect are denoted as the total effects of meta-accuracy on momentary self-esteem (paths c_1 and c_2). The second path model was set up identically with meta-positivity as predictor. In both models, we included the

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[32] For example, a positive slope between Harry's metaperceptions and Lea's perceiver tendencies would mean that Harry realizes that Lea sees all others within the group as very low on agreeableness and very high on neuroticism and has adjusted his metaperceptions accordingly. Thus, Harry has recognized the general stereotypes that Lea uses when judging others that have nothing to do with him individually. We included this effect as a conceptual extension of the SAM (see Tissera et al., 2021) without it being a key research interest.

[33] Fitting the model with additional dyadic random effects showed similar results for the fixed effects but displayed convergence problems, which is why we only report the preregistered models. Previous work has shown that dyads do not significantly affect meta-accuracy in zero-acquaintance group interactions (Elsaadaawy et al., 2020).

metaperceivers' initial level of momentary self-esteem as well as their age and gender as control variables.[34]

For all models, we display R^2-values as estimates of the proportion of explained variance in the dependent variable. 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 path models with a false discovery rate procedure (Benjamini & Hochberg, 1995). Since the sampling distribution of indirect effects is known to be skewed (Hayes, 2009), we used bootstrapped confidence intervals.

Results

Table 1 displays descriptive statistics and intercorrelations among the relevant study variables. Meta-liking and other-perceptions of liking correlated positively with momentary self-esteem ($r = .40$ and $r = .13$), indicating that more positive beliefs of being liked by others and other's actual liking both went along with higher momentary self-esteem at the end of the interactive session. Meta-accuracy was not correlated with either the two perceptions of liking or momentary self-esteem, while meta-positivity was correlated positively with meta-liking ($r = .56$), other-perceived liking ($r = .15$), and momentary self-esteem ($r = .42$). Thus, adolescents with more positive impressions of how others saw their personality reported to feel liked more, were somewhat more liked by others in reality, and reported to be more satisfied with themselves at the end of the interaction. Initial momentary self-esteem was positively correlated with and meta-positivity ($r = .41$), meta-liking ($r = .30$), and momentary self-esteem at the end of the interaction ($r = .63$). Thus, participants with higher momentary self-esteem at the beginning of the interaction had more positive personality metaperceptions and believed that others liked them. A positive correlation between age and other-perceptions of liking ($r = .20$) suggested that older participants (late vs. middle adolescence) were liked more by fellow group members. Finally, gender was negatively correlated with momentary self-esteem ($r = -.12$) and positively with other-perceptions of liking ($r = .12$) and age ($r = .25$). In the following, we

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[34] Rather than considering items measured in the same round-robin, we adopted a process-oriented approach and used different time points to study the associations between meta-accuracy and meta-positivity early in the interaction, liking perceptions during the interaction, and momentary self-esteem at the end of the interaction. With this modeling approach, we account for the possibility of temporal order as implied in classical mediation analysis (Baron & Kenny, 1986). Importantly, our models cannot to establish causality: Personality perceptions, liking perceptions, and momentary self-esteem may influence each other bidirectionally during the interaction. However, our approach offers the additional advantage of avoiding potential methodological biases (e.g., a common method bias) that result from assessing all variables at the same time, which can lead to artifactual covariances (Podsakoff et al., 2003).

present the results of the crossed random effects model regarding meta-accuracy and meta-positivity of personality metaperceptions.

Table 1

Intercorrelations Among Momentary Self-Esteem, Meta-Accuracy, Meta-Positivity, Liking Perceptions, and Control Variables

Variable	M	SD	1	2	3	4	5	6	7
1. Momentary self-esteem	7.62	2.05							
2. Meta-liking	6.57	1.66	**.40**						
3. Other-perceptions of liking	7.51	1.39	**.13**	**.22**					
4. Meta-accuracy	0.00	0.08	.02	.11	.02				
5. Meta-positivity	0.00	0.72	**.42**	**.56**	**.15**	**.26**			
6. Initial momentary self-esteem	6.54	2.29	**.63**	**.30**	.05	.04	**.41**		
7. Age	15.76	1.28	.06	-.09	**.20**	.06	.07	-.04	
8. Gender (1 = female)	0.61	0.49	**-.12**	-.02	**.12**	−.06	.02	**-.15**	**.25**

Note. $N = 296$ participants. *M* and *SD* represent mean and standard deviation. Meta-accuracy and meta-positivity of personality metaperceptions represent the random effects derived from the crossed random effect model. Initial momentary self-esteem was assessed in the first round-robin. All correlations in bold font were significant at $p < .05$.

Meta-Accuracy and Meta-Positivity of Personality Metaperceptions

As a precondition for all further analyses and to investigate whether adolescents showed statistically significant levels of meta-accuracy and meta-positivity in their personality metaperceptions, we estimated a crossed random effects model. The data provided $n = 296$ metaperceivers and $n = 296$ other-perceivers with a total of 3,947 observations. Tables OS 1 and OS 2 in the online supplemental material (OSM) show the mean levels for meta- and other-perceptions of all personality items and full model results.

Personality metaperceptions were significantly predicted by distinctive other-perceptions ($\gamma_{10} = 0.08$, $p = < .001$), suggesting that metaperceivers' beliefs of how they were seen by others converged with how they were actually seen by specific other-perceivers (meta-accuracy). However, this effect appeared to be small. Next to this, the association between metaperceptions and the normative other-perceptions was significant ($\gamma_{20} = 0.59$, $p < .001$), suggesting that adolescents generally believed that other group members viewed them in a positive way (meta-positivity). The perceiver effect showed no significant association with metaperceptions.[35]

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[35] In addition to the preregistered model, we fitted a model using social desirability ratings instead of the normative personality profile following the procedure of previous research (Human et al., 2020; Wessels et al., 2020). The average social desirability for each item was derived from the judgements of a subsample of the participants used in this study ($N = 40$, 60% female, $M_{Age} = 16.88$, $SD = 1.24$). Each personality item was rated on social desirability using the same bipolar scale from 1 to 10 as the original items (Table OS 10). In this

Regarding the variance terms in the model, we found that the intercept variance due to meta-perceivers (i.e., the variance of the u_{0m} terms in Equation 2) was $\text{Var}(u_{0m}) = 0.17$, indicating that adolescent meta-perceivers differed slightly in their average metaperceptions. The random slope variance terms due to the meta-perceivers were generally small; other-perception variable: $\text{Var}(u_{1m}) = 0.02$, normative mean variable: $\text{Var}(u_{2m}) = 0.58$, perceiver-effect variable: $\text{Var}(u_{3m}) = 0.00$.[36] To compute approximate effect size measures, we used an extended version of the R^2-approach of Rights and Sterba (2019). The proportion of the total outcome variance explained by the fixed effects was $R_f^2 = .20$, the proportion explained by the random intercepts due to meta-perceives was $R_m^2 = .03$ and the proportion explained by the random slopes due to meta-perceivers was $R_v^2 = .34$.

What Predicts Momentary Self-Esteem?

As displayed in Figure 2, we fitted two separate path models to test the associations between meta-accuracy and meta-positivity of personality metaperceptions, different perceptions of liking, and momentary self-esteem (see Tables OS 3 and OS 4 for the full model results). In the following, the first values in parentheses refer to the path model with meta-accuracy as a predictor, the second values refer to the path model with meta-positivity as a predictor.[37]

Associations with Interpersonal Perceptions of Liking

Addressing our first research question, we tested how meta-liking and other-perceptions of liking during the interaction predicted momentary self-esteem at the end of the interaction. In line with our Hypothesis 1, other-perceptions of liking did not predict momentary self-esteem while both models showed significant positive associations between meta-liking and momentary self-esteem (b's = .26 –.31, p's < .002). Thus, the more adolescents believed that group members liked them, the higher their momentary self-esteem was at the end of the interaction. Regarding the control variables, initial momentary self-esteem predicted momentary self-esteem at the end of the interaction in both models (b's = .45 –.49, p's < .001), indicating that participants with high momentary self-esteem at the beginning of the interaction also reported higher momentary self-esteem at the end. Additionally, older adolescents reported

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model, metaperceptions were predicted from these grand-mean centered social desirability means to estimate meta-positivity. The results (Table OS 11) were comparable to that of our main models, showing a weak positive meta-accuracy effect ($\gamma_{10} = 0.09$, $p = < .001$) and a positive meta-positivity effect ($\gamma_{20} = 0.42$, $p < .001$). In addition, the model illustrated a positive slope between perceiver effects and metaperceptions.

[36] We estimated simpler models to explore whether the low variance components due to meta-perceivers might be due to a too complex random effects structure. However, results of these models yielded similar results. The script for the models with a less complex random effects structure can be found on our OSF page.

[37] Path models fitted with the SRM variance components instead of the averaged perceptions of liking yielded very similar results (see Tables OS 8 and OS 9).

on average higher momentary self-esteem at the end (b's = .21–.22, p's < .006) and were liked more by other group members (b's = .17–.18, p's < .010). In both path models, around 47% of the variance in momentary self-esteem could be explained, indicating a moderate effect size (Cohen, 1988).

Figure 2

Path Models Testing the Associations Between Meta-Accuracy, Meta-Positivity, Perceptions of Liking, and Momentary Self-Esteem
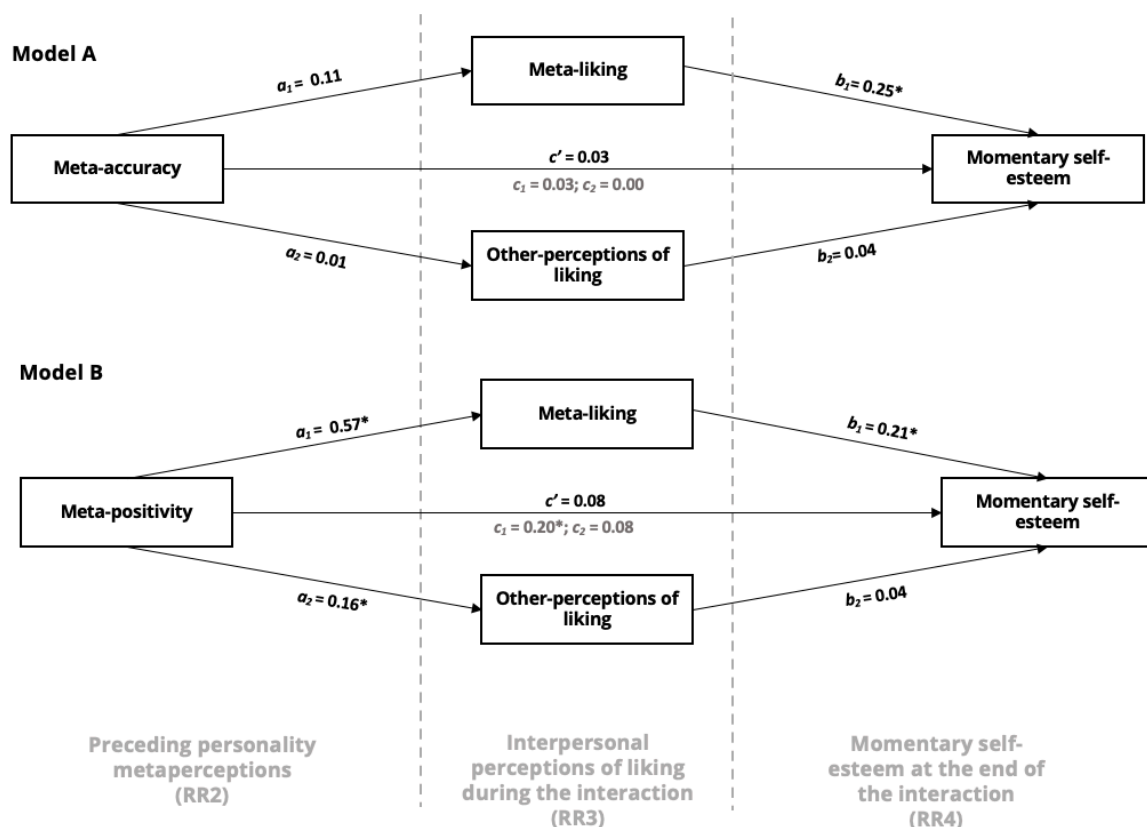
Note. Standardized regression weights are displayed with the respective paths. Total effects are presented in gray font: c_1 represents the total effect via metaperceptions of social inclusion ($c' + a_1 * b_1$) and c_2 represents the total effect via other-perceptions of social inclusion ($c' + a_2 * b_2$). The path models displayed here also included the control variables initial momentary self-esteem at the beginning of the interaction, gender, and age. * indicates $p < .05$

The Role of Meta-Accuracy and Meta-Positivity

To address the second research question, we estimated associations between meta-accuracy and meta-positivity of personality metaperceptions, interpersonal perceptions of

liking, and momentary self-esteem in the path models. In addition, we fitted two multigroup models with separated regression paths for girls and boys to address potential gender effects.[38]

Contrary to our assumptions (Hypothesis 3a), meta-accuracy did not display direct links with other-perceptions of liking or meta-liking, nor any direct or indirect links with momentary self-esteem (see Table OS 3). The second path model (Table OS 4) focused on the links between meta-positivity, perceptions of liking, and momentary self-esteem. In line with Hypothesis 3b, meta-positivity positively predicted meta-liking ($b = 1.34$, $p < .001$) and other-perceptions of liking ($b = 0.32$, $p = .012$). Thus, people who believed that others saw them positively also believed that they were liked more during the interaction and were also liked more by others in reality. Supporting Hypothesis 4, there was an indirect effect of meta-positivity via meta-liking on momentary self-esteem at the end of the interaction ($b = 0.35$, $p = .005$). At the same time, there was no direct of meta-positivity on momentary self-esteem ($b = 0.22$, $p = .226$), which means that the link between meta-positivity of personality metaperceptions and momentary self-esteem was fully mediated through meta-liking. Additionally, participants with higher initial momentary self-esteem displayed higher levels of meta-positivity ($b = 1.33$, $p < .001$). The path models with estimates derived from the social desirability profile instead of the normative profile replicated this result pattern (Tables OS 12 and OS 13) with only one exception: The positive link between meta-positivity and other-perceptions of liking was not significantly different from zero when using social desirability profiles. We address this point in the discussion.

The multigroup model with meta-accuracy (Table OS 5) illustrated only one gender-specific effect, namely that age was only significantly linked to other-perceptions of liking for boys (i.e., older boys were liked more by others). The multigroup model with meta-positivity showed that the indirect effect of meta-positivity on momentary self-esteem via meta-liking did not remain significant when modeled separately for girls and boys, which might be due to the smaller sample size of each group.

Discussion

The present research focused on the relationships between interpersonal perceptions of liking and momentary self-esteem, and the role of meta-accuracy and meta-positivity of preceding personality metaperceptions. We highlight two findings: First, meta-liking was consistently related to momentary self-esteem, whereas other-perceptions of liking were not. Second, while meta-accuracy was not related to either perceptions of liking or momentary self-

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[38] These multigroup models (Tables OS 5 and OS 6) were not preregistered and exploratory tested potential gender differences, which were not the main focus of the paper.

esteem, meta-positivity was positively associated with meta-liking and, less robustly, with other-perceptions of liking. In this way, meta-positivity posed an extension of the sociometer process by indirectly predicting momentary self-esteem via meta-liking. As an additional third finding, our models illustrated that adolescents reached statistically significant levels of meta-accuracy, suggesting that they had some idea of how others saw their personality. However, the meta-accuracy effect was modest across models and variance due to meta-perceivers was low, indicating that there were neither "good" nor "bad" meta-perceivers in the sample. Meta-positivity, on the other hand, remained robust when modeled with a normative profile and a social desirability personality profile, suggesting that adolescents generally believed that others perceived them in a positive way. Together, these findings suggest that within a getting-to-know context, adolescents draw more strongly on normative information than how they might be seen uniquely by different other-perceivers.

This study extends previous research in several ways. First, by combining perceptions of different interactants (i.e., meta- and other-perceptions) on personality and liking, we considered the complex interconnections of interpersonal perceptions within social interactions and how they may shape a person's unique momentary experience. Second, while previous studies mainly examined meta-accuracy and meta-positivity after an interaction took place (Carlson, 2016; Tissera et al., 2021), this was the first study to focus on associations *within* an interaction, factoring in the temporal ordering of different perceptions to study interaction processes. Third, the current study focused on an adolescent sample and provided new insights into the extent to which adolescents understand the first impression they make on their peers in virtual social interactions.

Meta-Liking Is Linked to Momentary Self-Esteem

The present findings demonstrate a strong link between adolescents' meta-liking and their momentary self-esteem: Believing to be liked during an interaction was linked to higher momentary self-esteem at the end of the interaction. This is in line with the main assumption of the sociometer theory (Leary, Terdal, et al., 1995) and fits well with existing research on adolescent samples (Bleckmann et al., 2022; Hutteman et al., 2015; Poorthuis, Thomaes, van Aken, Denissen, & Orobio de Castro, 2014; Wagner et al., 2018). In contrast, other-perceptions of liking did not relate to adolescents' self-esteem within social interactions: Initial momentary self-esteem at the beginning of the interaction did not predict being liked by interaction partners, and these other-perceptions of liking were not linked with self-esteem at the end of the interaction.

The current research adds clarity to the picture of mixed findings on the relationship between other-perceptions of liking and self-esteem. Despite existing bivariate associations, when meta-liking and other-perceptions of liking are considered simultaneously in the same model, the unique variance contained in other-perceptions does not seem to play a big role for momentary self-esteem (Bleckmann et al., 2022; Wagner et al., 2018). One reason for the lack of a connection between other-perceptions and momentary self-esteem could be that meta-liking and other-perceptions of liking contain different information in getting-to-know contexts. Specifically, recent research shows that initial perceptions largely reflect a person's general expectations in the absence of relational information about interaction partners (Rau et al., 2022). Our findings support this idea regarding meta-liking, revealing a strong correlation ($r = .94$, $p < .001$) between the averaged meta-liking and the perceiver effect of meta-liking (i.e., how metaperceivers generally expect to be liked) and a low association between meta-liking and other-perceptions of liking ($r = .22$, $p < .001$). Thus, expectations to be liked had little to do with how much people were actually liked, but still strongly informed their momentary self-esteem. This is reasonable given that an individual's own perceptions (meta-liking) are much more readily available as information than other-perceptions of interaction partners. According to theoretical frameworks on social interaction processes (Back, Baumert, et al., 2011; Funder, 2012), perceptions of others per se are not visible and two things need to happen within an interaction for them to have an impact. First, other-perceptions need to be translated into observable behaviors of interaction partners and, second, these behavioral signals need to be detected and interpreted correctly by the individual (Back, Baumert, et al., 2011; Nestler & Back, 2013). If there was an error in either of those two steps, other-perceptions may not feed into an individual's momentary self-esteem.

Overall, the present findings support and extend previous research on the relevance of meta-liking for momentary self-esteem in terms of a sociometer process, while showing that other-perceptions of liking are of little importance for self-esteem in zero-acquaintance interactions. However, this is not to say that other-perceptions do not play a role for self-esteem. Previous research demonstrated that other-perceptions of well-known others (in a school context) predicted trait self-esteem over time, with this effect being mediated by self-perceived social inclusion (Reitz et al., 2016). Thus, other-perceptions of significant acquaintances may converge with self-perceptions over the time of several social encounters, thereby shaping self-esteem in the long run. Future studies should examine the behavioral signals and processes that link various interpersonal perceptions to outcomes such as self-esteem (Back, Schmukle, et al.,

2011; Rau et al., 2019). By doing so, researchers will gain a better understanding of how and under what conditions other-perceptions matter for self-esteem beyond meta-liking.

Personality Metaperceptions in Adolescence

The present research was one of the first to investigate meta-accuracy and meta-positivity of personality metaperceptions in adolescence. The results suggest that adolescents do achieve meta-accuracy to some extent, but this effect was small. Meta-positivity seemed to be stronger than meta-accuracy, meaning that adolescents' metaperceptions converged more with the normative (or socially desirable) personality profile. This is in line with previous findings in adult samples showing that in zero-acquaintance settings, overlap with the normative personality profile is typically high (Carlson & Kenny, 2012).

What could explain the low levels of meta-accuracy in the current study? First, the virtual context in which the study took place may have made it difficult to form accurate metaperceptions. Arguably, it is harder to detect behavioral signals from others on a small screen than in face-to-face interactions, as individuals seem to display fewer nonverbal behavioral cues when communicating in virtual interactions (Lieberman & Schroeder, 2020). Second, regarding adolescence as a developmental phase in which cognitive and reflective abilities develop (Foulkes & Blakemore, 2016), it could also be the case that meta-accuracy is a skill that still develops across adolescence. Studies on the agreement between self- and other-perceptions of personality traits in adolescence have shown that particularly early adolescents have different conceptions of the expression and development of some personality traits (Göllner et al., 2017; Laidra et al., 2006; Luan et al., 2017) but these conceptions become more similar to other-perceptions across middle and late adolescence (Israel et al., 2022). Given the lack of findings on meta-accuracy of individual traits in adolescence at this point, our study represents an interesting starting point for future research.

Meta-Positivity, but not Meta-Accuracy is Related to Perceptions of Liking and Momentary Self-Esteem

While previous research has suggested that both meta-accuracy and meta-positivity of personality metaperceptions are linked to positive features of social interactions in adult samples (Carlson, 2016; Schmid Mast & Hall, 2018; Tissera et al., 2021), we only found associations between meta-positivity and liking perceptions in the current study. Thus, the extent to which adolescents accurately understood how they were perceived by others did not contribute to a more positive experience of the interaction, while believing to be seen positively went along with increases in feeling liked and being liked by others in reality. Two potential reasons might explain these findings.

First, the present research used a different setting compared to previous studies (e.g., Tissera et al., 2021), in which individuals indicated their metaperceptions about each group member's view of them simultaneously and early in the interaction. The combination of these two setting characteristics might have led people to state an average guess based on general (normative) rather than an informed rating about how they were seen by specific others. Thus, people may usually think that others generally see them quite positively at first glance without strongly differentiating between different interaction partners within a group context. Therefore, early meta-accuracy might not be an important predictor for subsequent perceptions of liking within a group context. This might be reflected in the little amount of variability in meta-accuracy between participants, suggesting that there were neither "good" nor truly "bad" meta-perceivers in the sample.

Second, a unique feature of the current research was its focus on virtual social interactions, which could have made it difficult for others to see whether specific individuals displayed meta-accuracy or meta-positivity. Meta-accuracy is likely reflected in subtle behavioral cues (Schmid Mast & Hall, 2018) that could be more difficult to detect in a virtual environment. Thus, while our findings illustrate that sociometer processes appear to be universally applicable to social interactions on- and offline, potential positive effects of meta-accuracy of personality metaperceptions might not be readily generalizable across settings. Since there is little to no research investigating metaperceptions in virtual contexts, more research is needed to establish the boundaries and consequences of meta-accuracy in online social interactions. Related to this, no study to date has empirically established which specific behavioral cues convey the potential positive effects of meta-accuracy (and meta-positivity) in social interactions. A key challenge for future research is therefore to look inside this black box and identify social processes and behavioral mechanisms that lead from accurate or positive personality metaperceptions to positive social outcomes. A different approach for research could be to investigate the link between meta-accuracy of specific traits and perceptions of liking. Especially in social situations, research has highlighted the importance of socially oriented traits such as agreeableness and extraversion for interpersonal outcomes (Harris & Vazire, 2016). As such, accurately guessing how others perceive these specific characteristics may be especially important to adjust interaction behaviors and gain social approval.

While we did not find a link between meta-accuracy and percpetions of liking, our study is the first to show that meta-positivity of personality metaperceptions contributes to meta-liking. This finding is in line with literature demonstrating that meta-positivity is linked to the enjoyment of positive social interactions and more positive perceptions of others (Carlson,

2016; Tissera et al., 2021). Our results build upon these previous findings by illustrating how positive social experiences may impact a person's momentary self-esteem: Individuals' belief of being viewed positively by others contributes to their belief of being liked, which potentially nurtures a feeling of social acceptance. In turn, people experience a boost in their momentary self-esteem. Within the broader context of getting to know others, this process within the first social interaction holds significant implications. For example, if Harry perceives that others view him in a negative light, leading to a decrease in his momentary self-esteem, he may adapt his behaviors to improve his impression (i.e., impression management). Alternatively, he may decide to avoid further interactions with these particular others altogether. Beyond the strong connection between meta-positivity and meta-liking, we also found that meta-positivity was related to being liked more by interaction partners, but only in the models with the normative profile. As such, this finding is less robust but corroborates recent results in a zero-acquaintance context with young adults (Tissera et al., 2021) and suggests that meta-positivity may lead to more positive interactional dynamics that are picked up by interaction partners. However, we stress that more research is needed to understand conceptual differences between normative and socially desirable personality profiles in adolescence, which so far has not been properly addressed by research.

Together, our findings provide a glimpse in the perceptual processes within first social interactions and how these may contribute to positive social experiences and adolescent's momentary self-evaluations. Given the potential relevance of these micro-processes for establishing meaningful social relationships in the long run (Back et al., 2011; Back et al. 2023), future research should examine social interaction processes in more detail (i.e., the behavioral implications of meta-positivity within social interactions) and how these can affect relationship formation.

Limitations and Future Directions

The present study has several strengths. First, it was a preregistered test of theoretically derived associations among specific variables within social interactions. Second, we rigorously tested our hypotheses, both by accounting for the temporal ordering of the hypothesized mediation structure and by modeling all hypothesized pathways simultaneously in one model. Finally, the study focused on the specific age group of adolescents and thus on a life stage about which relatively little is known in terms of social interaction processes, antecedents, and consequences. Despite these strengths, we also note several limitations of the present study.

As noted earlier, our model showed little variance in meta-accuracy between individuals. This could be due to several reasons: First, we assessed personality meta-

perceptions at quite an early stage within the interaction. Second, compared to existing studies (e.g., Carlson, 2016) we used relatively few items to estimate each personality profile, which may have contributed to the low variance. Finally, although we had a relatively large sample, the group sizes were small with fewer dyadic pairings per person compared to previous studies (e.g., Tissera et al., 2021). However, given that we intended to examine the role of personality metaperceptions and interpersonal perceptions of liking in a small group setting, it would not serve our purpose to simply increase the group size. An alternative approach for future research could be for participants to take part in multiple group sessions to increase the number of total meta- and other-perceptions per participant.

As a second limitation, we stress that our analyses remain cross-sectional despite considering the temporal ordering of variables in our analyses. This means that we cannot infer conclusions about the causality or the direction of the associations between personality metaperceptions, perceptions of liking, and momentary self-esteem. Third, when interpreting the results, one should consider a possible methodological bias (Podsakoff et al., 2003) due to the use of self-reports, which could have artificially increased the association between meta-liking and momentary self-esteem. However, this issue is difficult to eliminate, since both meta-liking and momentary self-esteem can only be adequately assessed by self-reports.

Finally, the generalizability of the study's results may be limited in several ways. First, participants who continued with the study were on average more agreeable and open than participants who dropped out of the study before the interactive session. Second, our sample was selective with respect to gender and school type, with the majority being female and reporting an academic school track. Interestingly, girls are known to report lower self-esteem on average (Bachman et al., 2011; Zeigler-Hill & Myers, 2012) and, thus, could be considered as the more vulnerable segment of the population that poses a highly relevant group for research. Third, the study's zero-acquaintance setting posed a context with fairly low social stakes, as individuals knew that they were not meet the other participants again after this initial encounter. This means that our findings may not generalize to situations with higher social stakes, such as zero-acquaintance interactions with a potential romantic partner or interactions with familiar others, in which metaperceptions (and their accuracy and positivity) might be more consequential. Moreover, while the virtual social environment of the current study represents an important social context for adolescents that is relatively unexplored, it also introduces potential noise into our measurements. For example, although participants had to use their camera and microphone, we cannot rule out whether other people were present in the same room or whether participants were doing something else in parallel (e.g., on their

smartphones), which may have affected attention regulation and thus, could make a difference in terms of perception formation. As such, we note that the present research is not comparable to traditional lab studies and might be limited in its generalizability to other social contexts and also to other age groups. Nevertheless, we would like to encourage readers to recognize the opportunities and importance of virtual social environments. Especially in adolescence, but also in later stages of life, a considerable number of social encounters take place online via video chat apps— and the last few years of a pandemic limiting social encounters in real-life show the increasing importance of these contexts. However, we know surprisingly little about how social interactions take place in virtual contexts, how people behave, how they perceive others, and how they perceive themselves. In this respect, virtual contexts offer an exciting field of research for future studies in the area of social and personality processes.

Conclusion

The present research investigated the differential associations between interpersonal perceptions of liking and momentary self-esteem in interactions of adolescents. Furthermore, we examined the role of meta-accuracy and meta-positivity of preceding personality metaperceptions for sociometer processes. First, results indicate that meta-liking plays an important role for momentary self-esteem, while other-perceptions of liking do not. Second, adolescents showed only modest levels of meta- accuracy but strong levels of meta-positivity in their personality metaperceptions. Third, meta-positivity emerged as a predictor of meta-liking and to a lesser de- gree of being liked by others in reality. Consequently, our results illustrate that meta-positivity expands the sociometer process by indirectly contributing to ado- lescent's momentary self-esteem through meta-liking. Moving forward, it is important for future research to deepen these insights on interpersonal processes to deepen these insights on interpersonal processes to enhance our understanding of how interpersonal perceptions and their interconnections shape social experiences in adolescence and beyond.

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Supplemental Material Paper 3

Table S1

Mean Levels of Meta- and Other-Perceptions of Personality

	Metaperception		Other-perception	
Personality Item	*M*	*SD*	*M*	*SD*
Neuroticism	4.53	2.36	3.15	2.17
Extraversion	5.67	2.34	6.09	2.40
Openness	6.18	2.13	6.83	2.08
Agreeableness	3.47	1.83	2.79	1.90
Conscientiousness	6.33	1.91	7.00	2.00

Note. N = 296 participants providing meta- and other-perceptions in round-robin 2. Neuroticism and agreeableness are reversed-keyed with higher values indicating socially undesirable item values.

Table S2

Crossed Random Effects Model Predicting Personality Metaperceptions with Distinctive Other-Perceptions, Normative Means, and Perceiver Effects

	Est.	SE	p
Fixed Effects			
Intercept, γ_{00}	0.02	0.04	.655
Within-person effects			
Other-Perception, γ_{10}	0.08	0.02	< .001
Normative Mean, γ_{20}	0.59	0.05	< .001
Perceiver Effect, γ_{30}	0.02	0.02	.274
Random Effects			
Variance Intercept M.ID, $\sigma^2_{u_{m0}}$			0.17
Variance Other-Perception M.ID, $\sigma^2_{u_{1m}}$			0.02
Variance Normative Mean M.ID, $\sigma^2_{u_{2m}}$			0.58
Variance Perceiver Effect M.ID, $\sigma^2_{u_{3m}}$			0.00
Variance Intercept O.ID, $\sigma^2_{u_{o0}}$			0.03
Variance Other-Perception O.ID, $\sigma^2_{u_{1o}}$			0.00
Variance Normative Mean O.ID, $\sigma^2_{u_{2o}}$			0.00
Variance Perceiver Effect O.ID, $\sigma^2_{u_{3o}}$			0.01

Note. N = 296 meta- and other-perceivers with 3,947 observations. M.ID = identification variable for metaperceivers, O.ID = identification variable for other-perceivers.

Table S3

Path Model Predicting Momentary Self-Esteem with Meta-Accuracy of Personality Metaperceptions, Average Meta-Liking, Average Other-Perceptions of Liking, and Control Variables

Variable	Parameter	*Est.*	*SE*	95% CI	*p*
Mediator model I (DV = meta-liking)					
Meta-accuracy	a_1	2.34	1.40	-0.29 – 5.33	.097
Initial momentary self-esteem		0.21	0.05	0.12 – 0.31	< .001
Age		-0.13	0.08	-0.29 – 0.01	.096
Gender (1 = female)		0.13	0.22	-0.28 – 0.57	.550
Mediator model II (DV = other-perception of liking)					
Meta-accuracy	a_2	0.08	0.97	-1.78 – 2.11	.932
Initial momentary self-esteem		0.03	0.04	-0.03 – 0.11	.342
Age		0.18	0.07	0.05 – 0.31	.007
Gender (1 = female)		0.23	0.18	-0.11 – 0.59	.204
DV model (DV = momentary self-esteem)					
Meta-accuracy	c'	-0.74	1.21	-3.61 – 1.60	.540
Meta-liking	b_1	0.31	0.07	0.17 – 0.45	< .001
Other-perception of liking	b_2	0.06	0.06	-0.06 – 0.19	.349
Initial momentary self-esteem		0.49	0.06	0.37 – 0.59	< .001
Age		0.22	0.08	0.08 – 0.38	.005
Gender (1 = female)		-0.28	0.20	-0.64 – 0.14	.170
Indirect effect I (mediator = meta-liking)	a_1b_1	0.72	0.44	-0.02 – 1.83	.099
Indirect effect II (mediator = other-perception of liking)	a_2b_2	0.01	0.08	-0.14 – 0.25	.952
Total effect I	c_1	-0.02	1.30	-2.51 – 2.55	.988
Total effect II	c_2	-0.74	1.21	-3.09 – 1.65	.543
R^2		.47			

Note. $N = 270$ participants. Meta-accuracy refers to the random effect derived from the model displayed in Table S2. 95% CI = bootstrapped confidence intervals. c_1 = total effect via meta-liking, c_2 = total effect via other-perceptions of liking. Neither age, gender, nor initial momentary self-esteem were significantly associated with meta-accuracy. All effects remained significant after adjusting *p*-values.

Table S4

Path Model Predicting Momentary Self-Esteem with Meta-Positivity of Personality Metaperceptions, Average Meta-Liking, Average Other-Perceptions of Liking, and Control Variables

Variable	Parameter	*Est.*	*SE*	95% CI	*p*
Mediator model I (DV = meta-liking)					
Meta-positivity	a_1	1.34	0.15	1.06 – 1.62	< .001
Initial momentary self-esteem		0.03	0.05	-0.06 – 0.12	.458
Age		-0.15	0.07	-0.29 – 0.02	.025[†]
Gender (1 = female)		-0.05	0.18	-0.41 – 0.30	.792
Mediator model II (DV = other-perception of liking)					
Meta-positivity	a_2	0.32	0.13	0.07 – 0.56	.012
Initial momentary self-esteem		-0.01	0.04	-0.08 – 0.07	.853
Age		0.17	0.07	0.04 – 0.31	.010
Gender (1 = female)		0.19	0.18	-0.08 – 0.07	.288
DV model (DV = momentary self-esteem)					
Meta-positivity	c'	0.22	0.18	-0.14 – -0.59	.226
Meta-liking	b_1	0.26	0.09	0.10 – 0.42	.002
Other-perception of liking	b_2	0.06	0.06	-0.06 – 0.18	.361
Initial momentary self-esteem		0.45	0.06	0.34 – 0.58	< .001
Age		0.21	0.08	0.07 – 0.38	.008
Gender (1 = female)		-0.29	0.20	-0.67 – 0.11	.150
Indirect effect I (mediator = meta-liking)	a_1b_1	0.35	0.12	0.13 – 0.61	.005
Indirect effect II (mediator = other-perception of liking)	a_2b_2	0.02	0.02	-0.01 – 0.08	.406
Total effect I	c_1	0.57	0.17	0.24 – 0.88	.001
Total effect II	c_2	0.24	0.18	-0.13 – 0.61	.192
R^2		.47			

Note. N = 270 participants. Meta-positivity refers to the random effect derived from the model displayed in Table S2. 95% CI = bootstrapped confidence intervals. c_1 = total effect via meta-liking, c_2 = total effect via other-perceptions of liking. Initial momentary self-esteem positively linked to meta-positivity (b = 1.33, p < .001). [†] indicates that *p*-value did not remain significant after adjusting for multiple testing.

Table S5

Multigroup Model Predicting Momentary Self-Esteem with Meta-Accuracy of Personality Metaperceptions, Average Meta-Liking, Average Other-Perceptions of Liking, and Control Variables Separately for Boys and Girls

Variable	Parameter	Group 1: Girls (n = 168)				Group 2: Boys (n = 102)			
		Est.	*SE*	95% CI	*p*	*Est.*	*SE*	95% CI	*p*
Mediator model I (DV = meta-liking)									
Meta-accuracy	a_1	2.31	2.00	-1.23 – 6.59	.246	2.19	1.82	-1.98 – 5.44	.230
Initial momentary self-esteem		0.19	0.06	0.07 – 0.32	.002	0.25	0.08	0.09 – 0.42	.003
Age		-0.15	0.10	-0.35 – 0.04	.153	-0.10	0.13	-0.34 – 0.17	.470
Mediator model II (DV = other-perceptions of liking)									
Meta-accuracy	a_2	-0.32	1.31	-3.15 – 2.33	.809	0.46	1.60	-2.69 – 3.54	.773
Initial momentary self-esteem		0.06	0.04	0.02 – 0.14	.163	0.01	0.07	-0.12 – 0.14	.922
Age		0.09	0.09	-0.08 – 0.25	.302	0.30	0.11	0.08 – 0.52	.007
DV model (DV = momentary self-esteem)									
Meta-accuracy	c'	-0.96	1.80	-4.42 – 2.54	.593	-0.67	1.52	-3.63 – 2.59	.661
Meta-liking	b_1	0.32	0.10	0.11 – 0.51	.002	0.30	0.10	0.12 – 0.52	.003
Other-perception of liking	b_2	0.03	0.09	-0.14 – 0.19	.706	0.08	0.11	-0.16 – 0.27	.469
Initial momentary self-esteem		0.50	0.07	0.36 – 0.62	< .001	0.49	0.09	0.30 – 0.68	< .001
Age		0.16	0.11	-0.07 – 0.36	.148	0.31	0.14	0.06 – 0.60	.023[†]
Indirect effect I	a_1b_1	0.74	0.63	-0.31 – 2.18	.264	0.64	0.58	-0.23 – 2.11	.263
Indirect effect II	a_2b_2	-0.01	0.13	-0.43 – 0.14	.934	0.04	0.22	-0.23 – 0.81	.870
Total effect I	c_1	-0.22	1.83	-3.74 – 3.38	.905	-0.02	1.63	-3.13 – 3.74	.989
Total effect II	c_2	-0.97	1.79	-4.45 – 2.48	.968	-0.63	1.54	-3.65 – 2.62	.682
R^2		0.44				0.51			

Note. Meta-accuracy indicates the random effect derived from the model displayed in Table S2. 95% CI = bootstrapped confidence intervals. c_1 = total effect via meta-liking, c_2 = total effect via other-perceptions of liking. Age and initial momentary self-esteem were not significantly associated with meta-accuracy in either group. [†] indicates that *p*-value did not remain significant after adjusting for multiple testing.

Table S6

Multigroup Model Predicting Momentary Self-Esteem with Meta-Positivity of Personality Metaperceptions, Average Meta-Liking, Average Other-Perceptions of Liking, and Control Variables Separately for Boys and Girls

Variable	Parameter	Group 1: Girls (n = 168)				Group 2: Boys (n = 102)			
		Est.	SE	95% CI	p	Est.	SE	95% CI	p
Mediator model I (DV = meta-liking)									
Meta-positivity	a_1	1.27	0.19	0.88 – 1.60	< .001	1.52	0.22	1.10 – 2.00	< .001
Initial momentary self-esteem		0.05	0.06	0.06 – 0.17	.414	-0.02	0.07	-0.16 – 0.13	.826
Age		-0.12	0.09	-0.29 – 0.05	.166	-0.22	0.11	-0.42 – 0.01	.051
Mediator model II (DV = other-perceptions of liking)									
Meta-positivity	a_2	0.22	0.16	-0.09 – 0.55	.177	0.52	0.23	0.02 – 0.95	.025[†]
Initial momentary self-esteem		0.03	0.04	-0.05 – 0.12	.443	-0.09	0.07	-0.22 – 0.06	.232
Age		0.09	0.09	-0.08 – 0.26	.279	0.26	0.12	0.02 – 0.48	.027[†]
DV model (DV = momentary self-esteem)									
Meta-positivity	c'	0.19	0.23	-0.29 – 0.65	.406	0.25	0.29	-0.34 – 0.83	.385
Meta-liking	b_1	0.27	0.13	0.02 – 0.51	.030[†]	0.24	0.12	0.10 – 0.49	.046[†]
Other-perception of liking	b_2	0.04	0.09	-0.14 – 0.20	.666	0.07	0.11	-0.17 – 0.26	.523
Initial momentary self-esteem		0.48	0.07	0.34 – 0.62	< .001	0.46	0.11	0.24 – 0.68	< .001
Age		0.15	0.11	-0.07 – 0.36	.158	0.28	0.13	0.05 – 0.57	.034[†]
Indirect effect I	a_1b_1	0.35	0.18	0.03 – 0.73	.053	0.37	0.19	0.04 – 0.83	.056
Indirect effect II	a_2b_2	0.01	0.02	-0.03 – 0.09	.334	0.04	0.06	-0.07 – 0.18	.579
Total effect I	c_1	0.54	0.20	0.12 – 0.90	.006	0.62	0.24	0.19 – 1.10	.009
Total effect II	c_2	0.20	0.23	-0.27 – 0.67	.388	0.28	0.29	-0.26 – 0.83	.992
R^2		0.44				0.51			

Note. Meta-positivity indicates the random effect derived from the model displayed in Table S2. 95% CI = bootstrapped confidence intervals. c_1 = total effect via meta-liking, c_2 = total effect via other-perceptions of liking. Initial momentary self-esteem predicted meta-positivity for girls and boys (b = 0.11; b = 0.18, p's < .001). [†] indicates that p-value did not remain significant after adjusting for multiple testing.

Table S7

Intercorrelations of Relevant Study Variables and SRM Components for Meta-Liking and Other-Perceptions of Liking

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Momentary self-esteem	7.61	2.06									
2. Meta-liking	6.56	1.67	.40**								
3. Meta-liking perceiver effect (SRM)	-0.01	1.03	.43**	.95**							
4. Other-perceptions of liking	7.48	1.38	.13*	.22**	.07						
5. Target effect of liking (SRM)	0.00	0.20	.10	.13*	.07	.85**					
6. Meta-accuracy	0.00	0.08	.02	.11	.08	.01	-.02				
7. Meta-positivity	-0.00	0.71	.41**	.56**	.56**	.17**	.20**	.25**			
8. Initial momentary self-esteem	6.55	2.30	.63**	.30**	.33**	.04	.06	.03	.41**		
9. Age	15.75	1.27	.06	-.09	-.07	.20**	.26**	.06	.08	-.04	
10. Gender (1 = female)	0.62	0.49	-.12*	-.01	-.02	.14**	.19**	-.06	.01	-.16**	.26**

Note. N = 296 participants. *M* and *SD* represent mean and standard deviation. Meta-accuracy and meta-positivity of personality metaperceptions represent the random effects derived from the model displayed in Table S2. Initial momentary self-esteem was assessed in the first round-robin. * indicates *p* < .05, ** indicates *p* < .001

Table S8

Path Model Predicting Momentary Self-Esteem with Meta-Accuracy of Personality Metaperceptions, SRM Components, and Control Variables

Variable	Parameter	*Est.*	*SE*	95% CI	*p*
Mediator model I (DV = PE meta-liking)					
Meta-accuracy	a_1	1.02	0.94	-0.69 – 2.98	.277
Initial momentary self-esteem		0.14	0.03	0.09 – 0.20	< .001
Age		-0.07	0.05	-0.17 – 0.03	.177
Gender		0.08	0.14	-0.18 – 0.35	.577
Mediator model II (DV = TE other-perception of liking)					
Meta-accuracy	a_2	-0.07	0.14	-0.35 – 0.22	.625
Initial momentary self-esteem		0.01	0.01	-0.00 – 0.02	.180
Age		0.03	0.01	0.01 – 0.05	.001
Gender		0.05	0.03	-0.01 – 0.10	.062
DV model (DV = momentary self-esteem)					
Meta-accuracy	c'	-0.53	1.23	-3.07 – 1.83	.664
PE Meta-liking	b_1	0.54	0.12	0.32 – 0.77	< .001
TE Other-perception of liking	b_2	0.42	0.45	-0.47 – 1.30	.350
Initial momentary self-esteem		0.48	0.06	0.36 – 0.58	< .001
Age		0.21	0.08	0.07 – 0.37	.005
Gender		-0.28	0.20	-0.65 – 0.12	.162
Indirect effect I (mediator = meta-liking)	a_1b_1	0.55	0.50	-0.36 – 1.66	.271
Indirect effect II (mediator = other-perception of liking)	a_2b_2	-0.03	0.09	-0.37 – 0.07	.746
Total effect I	c_1	0.01	1.31	-2.47 – 2.65	.991
Total effect II	c_2	-0.56	1.22	-3.07 – 1.86	.645
R^2		.47			

Note. $N = 270$ participants. Meta-accuracy refers to the random effects derived from the model displayed in Table S2. PE Meta-liking and TE other-perceived liking represent the perceiver effect of meta-liking and the target effect of other-perceived liking derived with SRM analyses. 95% CI = bootstrapped confidence intervals. c_1 = total effect via meta-liking, c_2 = total effect via other-perceptions of liking. Age, gender, and initial self-esteem were not associated with meta-accuracy. All effects remained significant after adjusting *p*-values.

Table S9

Path Model Predicting Momentary Self-Esteem with Meta-Positivity of Personality

Metaperceptions, SRM Components, and Control Variables

Variable	Parameter	*Est.*	*SE*	95% CI	*p*
Mediator model I (DV = PE meta-liking)					
Meta-positivity	a_1	0.80	0.09	0.62 – 0.98	< .001
Initial momentary self-esteem		0.14	0.03	0.08 – 0.10	.160
Age		-0.08	0.04	-0.16 – -0.00	.054
Gender		-0.03	0.11	-0.24 – 0.19	.809
Mediator model II (DV = TE other-perception of liking)					
Meta-positivity	a_2	0.05	0.02	0.01 – 0.08	.008
Initial momentary self-esteem		0.00	0.01	-0.01 – 0.01	.924
Age		0.03	0.01	0.01 – 0.05	.001
Gender		0.04	0.03	-0.01 – 0.09	.093
DV model (DV = momentary self-esteem)					
Meta-positivity	c'	0.20	0.18	-0.19 – 0.55	.274
Meta-liking	b_1	0.46	0.14	0.20 – 0.72	.001
Other-perception of liking	b_2	0.34	0.46	-0.57 – 1.25	.457
Initial momentary self-esteem		0.46	0.06	0.33 – 0.57	< .001
Age		0.21	0.08	0.06 – 0.37	.008
Gender		-0.29	0.20	-0.68 – 0.11	.149
Indirect effect I (mediator = meta-liking)	a_1b_1	0.37	0.12	0.16 – 0.62	.002
Indirect effect II (mediator = other-perception of liking)	a_2b_2	0.02	0.02	-0.02 – 0.08	.491
Total effect I	c_1	0.57	0.17	0.24 – 0.89	.001
Total effect II	c_2	0.22	0.18	-0.14 – 0.59	.234
R^2		.47			

Note. $N = 270$ participants. Meta-positivity refers to the random effects derived from the model displayed in Table S2. PE Meta-liking and TE other-perceived liking represent the perceiver effect of meta-liking and the target effect of other-perceived liking derived with SRM analyses. 95% CI = bootstrapped confidence intervals. c_1 = total effect via meta-liking, c_2 = total effect via other-perceptions of liking. Age, gender, and initial self-esteem were not associated with meta-accuracy. Initial momentary self-esteem positively linked to meta-positivity ($b = 0.13$, $p < .001$). All effects remained significant after adjusting *p*-values.

Table S10

Normative Personality Profile and Social Desirability Personality Profiles

Personality Item	Normative mean		Social desirability item mean	
	M	*SD*	*M*	*SD*
Neuroticism	3.15	2.17	1.59	1.64
Extraversion	6.09	2.40	6.08	2.28
Openness	6.83	2.08	7.80	1.94
Agreeableness	2.79	1.90	2.76	2.08
Conscientiousness	7.00	2.00	8.04	1.99

Note. $N = 296$ participants providing other-perceptions in round-robin 2. Social desirability was assessed in a subsample ($n = 49$ adolescents, 61.22% female, $M_{Age} = 17.27$, $SD = 1.40$).

Table S11

Crossed Random Effects Model Predicting Personality Metaperceptions with Distinctive Other-Perceptions, Social Desirability Profiles, and Perceiver Effects

	Est.	*SE*	*p*
Fixed Effects			
Intercept, γ_{00}	0.02	0.04	.722
Within-person effects			
Other-Perception, γ_{10}	0.09	0.02	< .001
Social Desirability, γ_{20}	0.42	0.03	< .001
Perceiver Effect, γ_{30}	0.11	0.02	< .001
Random Effects			
Variance Intercept M.ID, $\sigma^2_{u_{m0}}$			0.16
Variance Other-Perception M.ID, $\sigma^2_{u_{1m}}$			0.02
Variance Social Desirability M.ID, $\sigma^2_{u_{2m}}$			0.28
Variance Perceiver Effect M.ID, $\sigma^2_{u_{3m}}$			0.01
Variance Intercept O.ID, $\sigma^2_{u_{o0}}$			0.00
Variance Other-Perception O.ID, $\sigma^2_{u_{1o}}$			0.00
Variance Social Desirability O.ID, $\sigma^2_{u_{2o}}$			0.00
Variance Perceiver Effect O.ID, $\sigma^2_{u_{3o}}$			0.02

Note. N = 296 meta- and other-perceivers with 3,947 observations. M.ID = identification variable for metaperceivers, O.ID = identification variable for other-perceivers

Table S12

Path Model Predicting Momentary Self-Esteem with Meta-Accuracy of Personality Metaperceptions, Average Meta-Liking, Average Other-Perceptions of Liking, and Control Variables with Estimates from the Social Desirability Profile

Variable	Parameter	*Est.*	*SE*	95% CI	*p*
Mediator model I (DV = meta-liking)					
Meta-accuracy	a_1	3.08	1.52	0.26 – 6.28	.042[†]
Initial momentary self-esteem		0.21	0.05	0.12 – 0.31	< .001
Age		-0.13	0.08	-0.29 – 0.01	.101
Gender		0.14	0.22	-0.27 – 0.59	.514
Mediator model II (DV = other-perception of liking)					
Meta-accuracy	a_2	-0.02	1.12	-2.21 – 2.20	.985
Initial momentary self-esteem		0.03	0.04	-0.03 – 0.11	.341
Age		0.18	0.07	0.04 – 0.31	.007
Gender		0.23	0.18	-0.11 – 0.60	.204
DV model (DV = momentary self-esteem)					
Meta-accuracy	c'	-0.46	1.29	-3.11 – 1.98	.722
Meta-liking	b_1	0.31	0.07	0.17 – 0.46	< .001
Other-perception of liking	b_2	0.06	0.06	-0.06 – 0.19	.347
Initial momentary self-esteem		0.49	0.06	0.37 – 0.59	< .001
Age		0.22	0.08	0.08 – 0.38	.005
Gender		-0.28	0.20	-0.64 – 0.15	.175
Indirect effect I (mediator = meta-liking)	a_1b_1	0.95	0.48	0.12 – 2.07	.045[†]
Indirect effect II (mediator = other-perception of liking)	a_2b_2	-0.00	0.09	-0.21 – 0.20	.989
Total effect I	c_1	0.49	1.43	-2.39 – 3.39	.732
Total effect II	c_2	-0.46	1.29	-3.08 – 1.97	.721
R^2		.47			

Note. N = 270 participants. Meta-positivity refers to the random effect derived from the model displayed in Table S11. 95% CI = bootstrapped confidence intervals. c_1 = total effect via meta-liking, c_2 = total effect via other-perceptions of liking. Initial momentary self-esteem predicted meta-positivity ($b = 0.07$, $p < .001$). [†] indicates that *p*-value did not remain significant after adjusting for multiple testing.

Table S13

Path Model Predicting Momentary Self-Esteem with Meta-Positivity of Personality Metaperceptions, Average Meta-Liking, Average Other-Perceptions of Liking, and Control Variables with Estimates from the Social Desirability Profile

Variable	Parameter	*Est.*	*SE*	95% CI	*p*
Mediator model I (DV = meta-liking)					
Meta-positivity	a_1	1.84	0.22	1.42 – 2.26	< .001
Initial momentary self-esteem		0.05	0.05	-0.05 – 0.14	.326
Age		-0.14	0.07	-0.28 – -0.01	.040[†]
Gender		-0.01	0.18	-0.38 – 0.34	.947
Mediator model II (DV = other-perception of liking)					
Meta-positivity	a_2	0.34	0.19	-0.03 – 0.69	.071
Initial momentary self-esteem		0.01	0.04	-0.07 – 0.08	.903
Age		0.18	0.07	0.04 – 0.31	.009
Gender		0.21	0.18	-0.13 – 0.58	.253
DV model (DV = momentary self-esteem)					
Meta-positivity	c'	0.35	0.27	-0.20 – 0.90	.193
Meta-liking	b_1	0.26	0.08	0.09 – 0.42	.002
Other-perception of liking	b_2	0.06	0.06	-0.06 – 0.18	.329
Initial momentary self-esteem		0.47	0.06	0.34 – 0.58	< .001
Age		0.21	0.08	0.07 – 0.38	.008
Gender		-0.29	0.20	-0.66 – 0.12	.152
Indirect effect I (mediator = meta-liking)	$a_1 b_1$	0.47	0.17	0.17 – 0.84	.006
Indirect effect II (mediator = other-perception of liking)	$a_2 b_2$	0.02	0.03	-0.01 – 0.10	.421
Total effect I	c_1	0.82	0.24	0.33 – 1.28	.001
Total effect II	c_2	0.37	0.27	-0.16 – 0.93	.170
R^2		.47			

Note. $N = 270$ participants. Meta-positivity refers to the random effect derived from the model displayed in Table S11. 95% CI = bootstrapped confidence intervals. c_1 = total effect via meta-liking, c_2 = total effect via other-perceptions of liking. Initial momentary self-esteem predicted meta-positivity ($b = 0.07$, $p < .001$). [†] indicates that *p*-value did not remain significant after adjusting for multiple testing.

5.   General Discussion

The present dissertation aimed to enhance our understanding of the interplay between personality and social interactions during adolescence by posing three overarching questions: First, to what extent do adolescents' personality traits represent default settings linked to meta-liking judgments? Second, how do meta-liking judgments relate to adolescents' momentary self-esteem? Third, how are specific social interaction experiences linked to meta-liking and meta-liking changes within the social interaction? To answer these questions, I conducted three empirical studies: Study 1 establishes a framework for understanding how meta-liking emerges and changes, illustrating how personality traits and situation-specific characteristics dynamically predict meta-liking and meta-liking changes within zero-acquaintance interactions. Study 2 sheds light on sociometer processes in adolescents' social interactions and highlights the key role of meta-liking in predicting momentary self-esteem in in-person settings. In addition, the study provides insights into the moderating role of personality traits in shaping the links between meta-liking and momentary self-esteem. Finally, Study 3 further expands the understanding of sociometer processes in virtual contexts. In addition, the study provides new insights regarding situational links between personality metaperceptions (i.e., meta-accuracy and meta-positivity) and meta-liking, identifying meta-positivity of personality metaperceptions as a contributor to subsequent meta-liking judgments and, indirectly, to momentary self-esteem through meta-liking. Collectively, the three studies yield nuanced insights into the interplay of personality and social interactions in adolescence. In the following sections, I summarize the key findings and discuss their theoretical, methodological, and practical implications. To conclude this chapter, I critically address the limitations encountered in the studies and provide an outlook for future research in the interdisciplinary field of personality and social interactions in adolescence.

5.1.   Key Findings

In line with the overarching questions of this dissertation, the key findings presented below refer to the three interrelated processes characterizing the interplay between personality and social interactions in adolescence. First, I discuss the role of adolescents' personality traits as default settings in social interactions (Section 1.3.1). Next, I delve into sociometer processes linking meta-liking and adolescents' momentary self-esteem (Section 1.3.2). Lastly, I focus on situational dynamics and discuss how specific social interaction experiences (i.e., behavioral cues and individual's situation-specific perceptions) are connected to meta-liking and meta-liking changes within the social interaction (Section 1.3.3).

5.1.1. Personality Traits as Default Settings

Studies 1 and 2 investigated the role of personality traits as default settings in adolescents' social interactions. In Study 1, extraversion, trait self-esteem, and neuroticism emerged as predictors of meta-liking judgments and initial changes at zero-acquaintance. Adolescents with higher extraversion levels and higher trait self-esteem entered social interactions with more positive meta-liking judgments and experienced stronger increases in their meta-liking at the beginning of the interaction. Conversely, higher neuroticism levels were associated with lower initial meta-liking and weaker increases in meta-liking. These findings align with research among adults and paint a consistent picture of how these personality traits predict interindividual differences in metaperceptions in social contexts (Back, Schmukle, et al., 2011; Cuperman & Ickes, 2009; Hepper et al., 2011; Moritz & Roberts, 2020). Diverging from the patterns observed with extraversion, self-esteem, and neuroticism, Study 1 revealed that agreeableness did not significantly predict initial meta-liking or its changes in zero-acquaintance interactions. These results find some resonance in adult research: While some studies reported positive meta-liking judgments associated with agreeable individuals (Cuperman & Ickes, 2009), others, similar to the current findings, did not find a clear link between agreeableness and meta-liking (Back, Schmukle, et al., 2011). An explanation for these inconsistent findings at zero-acquaintance could be that as a personality trait with a communal orientation, agreeableness might have a stronger or more robust impact on social interactions and meta-liking judgments in later relationship stages compared to initial encounters, possibly due to a higher motivation to maintain existing relationships (e.g., Frederickx & Hofmans, 2014; Graziano & Tobin, 2009; Leckelt et al., 2015).

Extending the insights from Study 1, Study 2 investigated if and how personality traits moderate the links between interpersonal perceptions and momentary self-esteem and thereby account for interindividual differences in self-esteem reactivity. Results revealed a moderating role of neuroticism in zero-acquaintance interactions: Adolescents with higher neuroticism levels reported attenuated increases in momentary self-esteem in response to positive meta-liking judgments and actual liking. While this finding resonates with the conceptualization of neuroticism as a trait related to individual differences in people's reactions to social threats (e.g., Denissen & Penke, 2008a, 2008b; Poorthuis et al., 2014; Suls & Martin, 2005), the current findings illustrate that this moderating effect of neuroticism did not appear in interactions with familiar others. Further refining the picture regarding the role of neuroticism in self-esteem reactivity, the context-specific effect of neuroticism indicates that the level of acquaintance with interaction partners may be an important situational feature to consider when studying the

effects of neuroticism in social contexts: Whereas self-esteem reactivity of adolescents high in neuroticism was dampened when they interacted with unfamiliar peers, they seemed to derive greater benefits to their momentary self-esteem from positive perceptions of social inclusion when interacting with familiar others. As such, Study 2 corroborates earlier context-specific findings in adult samples suggesting that individuals high in neuroticism may benefit more from interactions with friends than with unfamiliar peers (Mueller et al., 2019; Shackman et al., 2018). In contrast to the moderating function of neuroticism, neither extraversion nor agreeableness were associated with self-esteem reactivity. Regarding extraversion, the current results align with previous research, indicating that while extraverted individuals generally experience a higher quantity of positive social interactions, neither their affect (e.g., Lucas & Baird, 2004) nor their self-esteem (Mahadevan et al., 2019; Poorthuis et al., 2014) shows consistent reactivity effects to interpersonal perceptions. Since extraversion is often conceptualized as a trait with greater sensitivity to social rewards (Denissen & Penke, 2008a), the current findings, in conjunction with prior research, underscore that further work is needed to specify the particular social situations and social rewards that are most closely associated with extraversion (e.g., Smillie et al., 2019). Regarding agreeableness, the results of Study 2 tentatively suggest at a potential role of agreeableness in self-esteem reactivity during daily interactions with familiar others: Adolescents with high agreeableness levels experienced stronger self-esteem boosts in response to perceptions of social inclusion when interacting with friends, family members, or romantic partners. Although this effect was small and requires replication, it further hints at the important role of agreeableness in existing social relationships (e.g., Graziano & Tobin, 2009).

In sum, the findings from Studies 1 and 2 shed light on the relevance of specific personality traits in social interaction experiences of adolescents: Extraversion, trait self-esteem, and neuroticism predicted initial meta-liking, while neuroticism exhibited an additional moderating role in self-esteem reactivity. While these links apply to zero-acquaintance interactions, the results suggest that the predictive and moderation functions, particularly those involving neuroticism and agreeableness, may be context-specific and depend on the level of acquaintance with interaction partners. Together, the findings indicate a comparable functionality of personality traits in adolescence and adulthood in zero-acquaintance interactions.

5.1.2.   Metaperceptions in Sociometer Processes

Studies 2 and 3 examined sociometer processes (e.g., Leary & Baumeister, 2000), demonstrating a close link between adolescents' meta-liking and their momentary self-esteem during social interactions. Study 2 revealed that adolescents with more positive meta-liking judgments reported higher momentary self-esteem in in-person interactions at zero-acquaintance. Specifically, the findings of Part A of Study 2 revealed that higher meta-liking within the moment was linked to increased momentary self-esteem (i.e., within-person association) but also illustrated that adolescents with a general tendency to expect to be liked reported higher momentary self-esteem at each timepoint in the interaction (i.e., between-person association). Going beyond previous investigations of short-term sociometer processes in adolescence (Hutteman et al., 2015; Schmidt et al., 2021; Thomaes et al., 2010), these links between meta-liking (at the within- and the between-person level) and momentary self-esteem remained robust when accounting for other-perceptions of liking by peers. As an extension, Part B of Study 2 additionally investigated how self-perceptions and metaperceptions of social interaction quality—as an indicator of social inclusion in interactions with familiar others— were linked to momentary self-esteem in daily interactions. The results illustrated that only self-perceptions of social interaction quality predicted momentary self-esteem; metaperceptions showed no robust association with momentary self-esteem. One plausible explanation for this finding is that self- and metaperceptions of interaction quality tend to be increasingly intertwined the more individuals know their interaction partners (Carlson et al., 2011; Elsaadawy & Carlson, 2022), which was likely reflected in the high overlap between self-perceptions and metaperceptions. As such, adolescents might assume that their friends and family members perceive the interaction just as positively as they do, resulting in a diminished need to differentiate between their self-perceptions and how familiar others might perceive them differently. Following from this possibility, metaperceptions of interaction quality might be more distinguishable from self-perceptions in interactions with unfamiliar peers compared to familiar ones. To put this theory to the test, additional research is needed to empirically disentangle the roles of self- and metaperceptions within sociometer processes at different stages of acquaintance.

Study 3 introduced a temporal dimension in testing the sociometer processes investigated in Study 2. The findings demonstrated that meta-liking during virtual interactions predicted momentary self-esteem at the end of said interaction. This link remained robust when considering other-perceptions of liking, which did not emerge as predictors of momentary self-esteem. As such, these results replicate the findings from Study 2, underlining the key role of

metaperceptions in sociometer processes (Leary et al., 1998). Together, the results of the two studies provide robust empirical evidence suggesting that adolescents' subjective experiences of feeling liked are more important for their momentary self-esteem than being liked in reality during zero-acquaintance interactions in in-person and virtual contexts. However, it is worth noting that other-perceptions of familiar interaction partners may display different links to momentary self-esteem and could assume a more prominent role in predicting self-esteem in later stages of social relationships (see Reitz et al., 2016).

Summarizing, the results of Studies 2 and 3 add to the extensive literature linking perceptions of social inclusion to momentary self-esteem across adult and adolescent samples (Hutteman et al., 2015; Murray et al., 2003; Srivastava & Beer, 2005; Wagner et al., 2023; Willms et al., 2023). Furthermore, the findings jointly illuminate the distinct relevance of metaperceptions in short-term sociometer processes across in-person and virtual settings. While the positive link between meta-liking and momentary self-esteem was consistently observed in zero-acquaintance interactions, disentangling the effects from metaperceptions from self-perceptions of social inclusion on momentary self-esteem proved difficult in social interactions with familiar others.

5.1.3. Situational Dynamics

Studies 1 and 3 explored how specific situational dynamics contribute to adolescents' meta-liking judgments during social interactions at zero-acquaintance. As a starting point, Study 1 demonstrated that adolescents generally increased their meta-liking over the course of social interactions. Furthermore, as the first empirical study to investigate meta-liking changes within interactions, Study 1 yielded three novel insights into what predicts meta-liking changes at different stages during the interaction. First, early changes in meta-liking were jointly predicted by personality traits (see Section 5.1.1) and social interaction experiences captured by assumed reciprocity: When adolescents liked their interaction partners, they increased their meta-liking during the initial moments of the interaction. Given that assumed reciprocity effects have been studied primarily in the context of adult social interactions (Malloy, 2018; Montoya & Insko, 2008; Rau et al., 2022), the current results extend these findings by showing that assumed reciprocity effects also occur in adolescent social interactions. Second, meta-liking changes in the middle phase of the interaction were positively but less robustly predicted by expressive behaviors of interaction partners, which generally corroborates earlier results suggesting that behavioral feedback can shape metaperceptions (e.g, Kaplan et al., 2009). Refining these insights, Study 1 illustrated that behavioral information seemed to predict

changes in group-mean meta-liking (i.e., all participants within the group tended to increase their meta-liking) but individuals did not increase their meta-liking relative to other group members in more expressive groups. As such, this observation adds a nuanced distinction between changes in meta-liking at the individual level and group-level, refining conceptual ideas of how behavioral cues may be involved in metaperception formation (Elsaadaway et al., 2022). Finally, changes in meta-liking toward the end of the interaction were not predicted by either assumed reciprocity or the expressive behavior of interaction partners. One possible explanation for this could be that individuals gradually shift from integrating social information at the broader group level to paying more attention to specific interaction partners within the group. For example, people may start liking some interaction partners more than others and increase their meta-liking for those specific persons. Such unique meta-liking changes based on dyadic assumed reciprocity might not be detectable in meta-liking judgments at group level. In light of these considerations, future research is needed to explore how social experiences predict meta-liking changes both at a group level and changes in dyadic meta-liking for specific interaction partners, as both represent meaningful sources of change in interpersonal perceptions in group contexts (Dufner & Krause, 2023).

In addition to the role of perceptions of liking others and behavioral cues in in meta-liking formation and updating, Study 3 investigated how adolescents' levels of meta-accuracy and meta-positivity of personality metaperceptions early on in an interaction predicted subsequent meta-liking judgments. Results revealed that only meta-positivity related to subsequent meta-liking: Adolescents who believed that others saw their personality positively also believed that their peers liked them more. This positive connection between meta-positivity and meta-liking also had implications for sociometer processes: Higher levels of meta-positivity translated into higher momentary self-esteem at the end of the interaction, which was mediated through meta-liking. The positive indirect effects of meta-positivity on momentary self-esteem fits well with the broader literature on self-enhancement effects on psychological well-being, emphasizing in particular the beneficial effects of having a positive self-image on self-esteem (e.g., Dufner et al., 2019; Humberg et al., 2019). In contrast to meta-positivity, meta-accuracy of personality metaperceptions was not related to meta-liking in Study 3. One possible explanation for this null-finding could be the relatively small effect of meta-accuracy observed in this study. This small effect suggests that adolescents did not strongly differentiate between how different interaction partners might have seen them, which might have rendered early meta-accuracy somewhat inconsequential for subsequent interaction dynamics. Given that this study represents the first exploration of meta-accuracy and meta-positivity in adolescents' zero-

acquaintance interactions, more research is needed to elucidate the conditions under which adolescents form more accurate perceptions, considering potential situational moderators such the number of interaction partners (i.e., dyadic versus group settings), the setting (virtual or in-person), or the level of acquaintance with interaction partners (Carlson, 2016; Tissera et al., 2021).

Summing up, the discussed findings illustrate complex situational dynamics involved in the formation and updating of meta-liking in adolescence: Liking others and expressive behaviors as social feedback predicted changes during social interactions, while adolescents' meta-positivity of personality metaperceptions predicted subsequent meta-liking perceptions within social interactions.

5.2. Theoretical Implications

The findings from the three studies establish strong connections between adolescents' personality traits, their momentary self-esteem, and situation-specific metaperceptions, thereby supporting the overarching dynamic interactionist perspective (e.g., Conger & Donnellan, 2007; Mischel & Shoda, 1995; Neyer & Asendorpf, 2001). By adopting a process-oriented approach, this dissertation yields theoretical implications that support, expand, and refine our understanding of the processes underlying the interplay of personality and social interactions in adolescence.

5.2.1. Supporting and Extending the PERSOC Framework

As a first theoretical contribution, the findings of all studies in this dissertation collectively demonstrate the usefulness of PERSOC (Back, Baumert, et al., 2011) as a metatheoretical framework for investigating the interplay between personality and social interactions in adolescence. PERSOC was originally designed to guide researchers in formulating precise research questions concerning the processes linking individuals' personalities to their social interactions. However, the framework does not explicitly consider how this interplay might manifest differently across various age groups, including adolescents, who undergo significant developmental changes in personality, social interactions, and their ability to form interpersonal perceptions (e.g., Andrews et al., 2021; Harter, 2012; Steinberg, 2020).To address this gap, this dissertation applied a developmental lens to the PERSOC framework and set out to empirically evaluate its applicability within the context of adolescence. The overall findings of this work suggests that the patterns of the interplay between personality and social interactions in adolescence closely resemble those observed in adult interactions when focusing on zero-acquaintance settings (Back, Schmukle, et al., 2011;

Cuperman & Ickes, 2009; Rau et al., 2022; Srivastava & Beer, 2005). As such, the findings align with the three overarching processes outlined in PERSOC (see Figure 1.1.): stable, cross-situational personality traits are predictive of situation-specific perceptions as demonstrated in Study 1; situation-specific perceptions predict changes in contextualized, situation-specific personality states (i.e., momentary self-esteem) as illustrated in Studies 2 and 3; and, finally, different types of situation-specific perceptions and behaviors are interconnected to form unique social experiences for adolescents, as seen in both Studies 1 and 3. This empirical alignment underscores the utility of the PERSOC framework as a valuable tool for examining and understanding the interplay between personality and social interactions in adolescence and beyond.

As an extension of the PERSOC framework, the results of Study 2 indicate the value of systematically integrating personality traits as moderators of situation-specific characteristics into the framework. Specifically, findings revealed that neuroticism attenuated self-esteem reactions to meta-liking judgments in zero-acquaintance interactions, which supports contemporary approaches that conceptualize personality traits not only as predictors but also as moderators of reactions to situation-specific characteristics (Denissen & Penke, 2008a; Mischel & Shoda, 1995; Tett & Guterman, 2000). Including this perspective of the dual functionality of personality traits into the PERSOC framework allows to investigate how personality traits can explain systematic interindividual differences in the strengths of connections between situation-specific perceptions and behaviors, often referred to as *if-then contingencies* (Back, 2021; R. A. Sherman et al., 2015). For example, beyond interindividual differences in experiencing self-esteem reactions in response to meta-liking judgments as examined in Study 2, individuals may also exhibit differences in how their perceptions are linked to specific behavioral or affective reactions within social interactions. Taking fictional Harry again to illustrate this point: Harry's high level of extraversion could trigger that he behaves particularly expressive or dominant when believing that others like him; he could also experience more positive affect in response to higher meta-liking compared to people with lower extraversion levels. As contemporary personality theories emphasize, a comprehensive conceptualization of personality traits should include how traits relate to such individual differences in if-then contingencies (Back et al., 2023; Funder, 2016; Rauthmann, 2021), therefore representing a useful extension of PERSOC.

In light of this potential extension to the PERSOC framework, the findings of Study 2 also emphasize the need for nuanced theoretical guidance when considering the role personality traits in situation-specific if-then contingencies. Specifically, neuroticism only moderated momentary self-esteem reactions in interactions at zero-acquaintance, but not in interactions

with familiar interaction partners. Along these lines, research shows that reliably identifying the role of personality traits in if-then contingencies is challenging, with studies often finding either no or small effects when investigating situation-specific interactions with personality traits (e.g., Kuper et al., 2022; Mueller et al., 2019; R. A. Sherman et al., 2015). Given these challenges, it is crucial for researchers to carefully consider the conditions under which personality traits are expected to moderate if-then contingencies. To facilitate systematic investigations into these conditions, it could be beneficial to introduce a third situation-specific category into the PERSOC framework that focuses on the unique features of social situations (e.g., positive or negative; leisure or work-related; cf. Breil et al., 2019; Judge & Zapata, 2015; Rauthmann & R. A. Sherman, 2017). This addition could help elucidate how context-specific effects, like those observed with neuroticism in Study 2, emerge in social interactions, and ultimately contribute to a more nuanced understanding of when personality traits are particularly relevant in social situations.

5.2.2. Supporting and Refining Sociometer Theory

By establishing a robust link between positive meta-liking judgments and increased momentary self-esteem among adolescents, the results of Studies 2 and 3 highlight the significance of sociometer processes in both in-person and virtual interaction group settings at zero-acquaintance. Accordingly, this dissertation adds to the body of research (e.g., Poorthuis et al., 2014; Schmidt et al., 2021; Wagner et al., 2018) supporting the sociometer theory's fundamental premise that the sociometer is a universal process that operates across diverse social contexts and age-groups (Leary & Baumeister, 2000).

Beyond substantiating the concept of the sociometer as a universal process within social interactions, the current findings refine sociometer theory (Leary & Baumeister, 2000) in two respects. First, both Study 2 and Study 3 contribute to a nuanced understanding of sociometer processes by demonstrating that metaperceptions, rather than actual perceptions of others, assume a central role in short-term sociometer processes. These results suggest that the short-term sociometer primarily functions as a subjective tool for tracking individuals' subjective beliefs of social inclusion, which may not necessarily align with the social reality of their actual level of inclusion in a given interaction (as evidenced by the moderate correlations between meta-liking and actual liking by peers across all three studies). Second, Study 2 proposes that both momentary and general metaperceptions are distinct contributors to momentary self-esteem. This finding refines sociometer theory's conceptualization of momentary self-esteem, indicating that it might not only be a reaction to immediate metaperceptions of social inclusion

within the present social contexts (e.g., Leary, 2012), but that it is also fueled by individuals' general sense of social inclusion. Consequently, the distinction between immediate situation-specific metaperceptions and an overarching sense of social inclusion in generalized metaperceptions adds depth to sociometer theory and paves the way for further investigations into the role of metaperceptions of social inclusion at different levels (i.e., situation-specific versus generalized) in shaping individual's momentary self-esteem in social contexts.

Finally, moving beyond the scope of sociometer theory, the current findings also align with the theoretical underpinnings of symbolic interactionism (Cooley, 1902). Symbolic interactionism proposes that individuals define themselves based on their beliefs about how others perceive them (Wallace & Tice, 2012), thereby suggesting that metaperceptions play a central role in the general development of individuals' self-concepts. This broader theoretical perspective regarding the function of metaperceptions allows for the consideration of metaperceptions as change agents of other social personality traits beyond self-esteem (e.g., status metaperceptions may shape momentary assertiveness in social interactions; Mahadevan et al., 2020). This conceptual idea offers an intriguing avenue for future research to deepen our understanding of how metaperceptions could function as central mechanisms in momentary personality changes in social contexts, which in turn could contribute to long-term changes in personality traits and the formation of adolescents' self-concepts (e.g., Geukes et al., 2018; Wrzus, 2021).

5.2.3. Extending Conceptual Models on Metaperception Formation

The findings from Study 1 make a theoretical contribution by introducing a temporal dimension to existing conceptual models of metaperception formation (e.g., Elsaadawy et al., 2022; Kenny & DePaulo, 1993). These models propose that people draw on two primary information sources when forming metaperceptions: their self-views (i.e., self-viewed personality traits) and their social experiences (i.e., situation-specific perceptions and behavioral feedback from interaction partners). Study 1 provides support for this general premise and extends it by demonstrating that adolescent personality traits (i.e., extraversion, self-esteem, and neuroticism) serve as default settings that are particularly important in predicting meta-liking judgments at the beginning of interactions when individuals lack information about interaction partners. As the interaction progresses, perceptions of liking others, and, to a lesser extent, the behaviors of interaction partners are associated with changes in meta-liking, suggesting that such social experiences gain importance for updating meta-liking during the interaction. In essence, these findings emphasize that stable personality self-

views and social experiences contribute differently to changes in meta-liking, depending on the phase of the interaction.

This dynamic framework of metaperception formation finds support in recent research illustrating a similar pattern in adults' perceptions of others during social interactions (Rau et al., 2022): Personality traits predict initial perceptions of others, while social experiences, including those occurring within and beyond the first interaction, become important in predicting changes in these perceptions over time. Taken together, the findings from Study 1, in conjunction with these recent results, underscore the importance of including a temporal dimension in the study of changes in interpersonal perceptions. To validate and further refine the proposed temporal dimension in frameworks focusing on interpersonal perception formation, future research should consider study designs featuring repeated measurements across a range of interpersonal perceptions (e.g., meta-liking, personality metaperceptions, other-perceptions of personality) during social interactions to study the differential and dynamic effects on personality traits and social experiences on interpersonal perceptions formatting and updating.

5.3. Methodological Implications

The empirical research conducted in this dissertation offers several methodological implications relevant to studying the interplay between personality and social interactions. Below, I discuss three implications of assessing the key variables in the interplay that have a significant impact on statistical modeling.

First, the dissertation findings underscore the value of a multi-method approach to gain a comprehensive understanding of the interplay between personality and social interaction variables (Back et al., 2023; Wrzus & Mehl, 2015). The integration of different data sources, such as self-reports of personality traits, situation-specific self-, meta-, and other-perspectives, as well as external behavioral observations, is essential for adequately capturing the diverse aspects of the three major processes characterizing this interplay. Furthermore, the current research reinforces the idea that studying metaperceptions in conjunction with other-perceptions is important for a holistic understanding of the role of metaperceptions in social interactions and sociometer processes (cf. Carlson et al., 2011; Kenny, 2020). Working with data from multiple meta- and other-perceivers within groups, researchers encounter the challenge of dealing with interdependent data structures which require the use of appropriate statistical models. The present findings underscore the relevance of multilevel modeling frameworks for this purpose, as they account for nested data structures and can be fitted using

data of small group interactions (Kenny & Kashy, 2013; Nestler, 2021; Raudenbush, 2008). Additionally, the results emphasize that these multilevel frameworks can be further specified by incorporating more complex random effects structures to accommodate simultaneous nesting in metaperceivers and perceivers, which is necessary to study the accuracy and positivity of interpersonal perceptions within social interactions, as demonstrated in Study 3 (Baayen et al., 2008; Biesanz, 2019).

Second, Study 1 highlights that valuable insights into the formation and updating processes of meta-liking can be gained by differentiating between different variance components with Social Relations Model analyses (SRM; Kenny, 1994). According to the SRM, interpersonal perceptions such as meta-liking encompass three variance components: a general tendency of the target person expecting to be liked (*perceiver effect*), a general tendency of others to perceive the target person (*target effect*), and the unique perceptions between target person and a specific interaction partner (*relationship effects*). Extracting perceiver effects of meta-liking allows to examine whether individuals adjust their meta-liking relative to their interaction partners or if changes manifest because all group members uniformly adjust their meta-liking judgments. Study 1 is the first to use this statistical approach to investigate changes in interpersonal perceptions in an adolescent sample (similar designs have been used in adult samples, see Rau et al. 2022), demonstrating that this differentiation between perceiver effects and group-level meta-liking is meaningful and should be incorporated when studying the dynamics of interpersonal perceptions in social contexts. Importantly, using SRM analyses to disentangle perceiver, target, and relationship effects requires elaborate research designs, such as a round-robin design (e.g., all participants rate themselves and everyone else in the group; Kenny & Kashy, 2013) used in the studies in this dissertation.

Third, the studies in this dissertation advance research on interpersonal perceptions by incorporating short-term repeated measures to explore temporal dynamics of these perceptions. Notably, Study 1 demonstrates that latent change score modeling can effectively capture short-term changes in meta-liking within social interactions. Additionally, Study 3 breaks new ground by investigating the immediate effects of personality metaperceptions (i.e., meta-accuracy and meta-positivity) on subsequent liking perceptions and momentary self-esteem during social interactions. This focus on short-term measures within social interactions sets this dissertation apart from prior research, which predominantly examined perceptions post-interaction (e.g., Tissera et al., 2021). Using short-term assessments and modeling processes within social interactions is necessary to empirically test theories on social interaction processes (cf. Funder, 2012) and enable researchers to capture and understand moment-to-moment fluctuations in

individuals' perceptions and behaviors states (Hampson, 2021). As illustrated in PERSOC (Back, Baumert, et al., 2011) and other theoretical approaches on personality development (e.g., Wrzus, 2021), this micro-perspective on processes is important to understand how personality and social relationships become intertwined. Therefore, a crucial next step for researchers is to combine social interaction research with long-term assessments to provide a holistic perspective on how short-term processes contribute to changes of stable personality traits and the formation of social relationships over time (see Hutteman et al., 2015; Quintus et al., 2021; M. van Zalk et al., 2020; Wagner et al., 2023 for examples of such study designs).

Drawing from these methodological implications, two key considerations emerge for studying the personality-social interaction interplay. The first consideration revolves around the assessment of time. Although this dissertation demonstrates the value of examining short-term social interaction processes—particularly in the context of adolescence—the question remains, both theoretically and empirically, as to what exactly meaningful short-term time intervals are for examining perceptual and behavioral dynamics within social interactions. While high-resolution data collected during social interactions would be ideal to explore such dynamics at greater detail, there are practical constraints. Administering different perspectives (i.e., self-, meta-, other-) repeatedly during social interactions is burdensome for participants; intensive behavioral codings are time and resource-demanding for researchers. One intriguing avenue to overcome these constraints is to explore continuous assessment techniques using joysticks to track dynamic changes in interpersonal perceptions and behaviors (Continuous Assessment of Interpersonal Dynamics System; Hopwood et al., 2020). Additionally, mobile sensing approaches to gather high-resolution behavioral (e.g., recording texting behaviors) and situational data (e.g., recording numbers of social interactions per day) offers a promising avenue for researchers to collect social interaction data with little burden on participants (e.g., Génois et al., 2023). Looking ahead to future research focusing on behavioral data within face-to-face interactions, collaborative data collection can facilitate the training of machine learning models to automate manual coding processes. To do so, it is crucial to assemble diverse samples with well-annotated data to develop effective models that can be evaluated, refined, and subsequently utilized by future studies (Schoedel et al., 2023; Stachl et al., 2020). Thus, exploring innovative approaches to data collection and processing within and beyond the field of personality and social psychology research can enhance our understanding of situational dynamics and the role of personality therein.

A second consideration refers to the vast amount of potential links and processes among personality traits, states, perceptions, behaviors, and other situational features (Back, Baumert,

et al., 2011). Given the complexity of these relationships (e.g., within the target person and between interaction partners, concurrently and over time), setting up conceptual models that include meaningful processes and translating those into statistical models that account for the complex nested and repeated measures structures is challenging (cf., Kenny & Kashy, 2013; Nestler, 2021). Adding to this, the task of collecting datasets with sufficient statistical power to run such complex statistical models presents its own challenges, especially when working with adolescent populations. Addressing these complexities requires several different approaches: First, these challenges highlight the importance of robust theoretical groundwork to formulate relevant yet empirically testable research questions concerning the interplay between personality and social interactions (see also Back & Vazire, 2015). Second, fostering collaboration within the research community becomes imperative. By pooling expertise and resources, collaborative efforts in methodological work and data collection can contribute to a greater understanding of the complex processes underlying the interplay between personality and social interactions in adolescence and beyond. Such collaborations can also provide resources for replications of specific processes across different social contexts, time-frames, or age groups, enhancing insights into generalizability and helping to identify boundary conditions of specific effects.

In summary, this dissertation highlights the potential for advancing research on the interplay between personality and social interactions by using multi-method data, integrating variance decomposition techniques, and employing short-term repeated measures designs to investigate underlying dynamic processes. Simultaneously, researchers must carefully address theoretical considerations regarding the timing and complexity of these processes by adopting appropriate research designs and statistical methods to gain reliable and meaningful results that advance insights on the interplay. These methodological implications and recommendations extend beyond the study of adolescence and can be applied to investigating the interplay between personality and social interactions in various age groups.

5.4. Practical Implications

Considering the current work alongside the existing body of research, it is evident that positive social interaction experiences play a pivotal role in fostering positive self-esteem development (e.g., Leary & Baumeister, 2000; Wagner et al., 2018) and facilitating the establishment of stable peer relationships (e.g., Brown, 2004; Hartup, 1996). As such, positive social interaction experiences contribute significantly to adolescents' social and mental well-being (Bolognini et al., 1996; Humenny et al., 2021; Mann, 2004; Parker et al., 2015). From an

applied perspective, the insights gained in this dissertation regarding the specific processes underlying the interplay between personality and social interactions therefore provide valuable leads for improving adolescents' social interactions and with that, their overall well-being.

As a first practical implication, the current results emphasize the role of metaperceptions for positive social interaction experiences and momentary self-esteem in adolescence. Along these lines, clinical models emphasize that generalized negative metaperceptions are central elements of social anxiety, marking a fear of being evaluated negatively (e.g., Rapee & Heimberg, 1997). Given that adolescence is a critical period for the onset of clinical social anxiety (Erath et al., 2007; Parker et al., 2015), the insights into the formation and development of adolescents' metaperception in social interactions gained in this dissertation can inform the development of prevention initiatives to support adolescents in navigating their social interactions and thereby reduce the risk of developing social anxiety disorder. These initiatives could incorporate cognitive-behavioral strategies aimed at modifying negatively biased metaperceptions (e.g., Hartman, 1983; Hofmann, 2007). Study 1 suggests that such strategies could be particularly beneficial for adolescents with specific personality default settings, such as high levels of neuroticism and low levels of trait self-esteem, who tend to expect to be evaluated negatively by unfamiliar peers and might be at particular risk to develop social anxiety (see also De Jong et al., 2012; Newby et al., 2017). Furthermore, across all three studies, a discrepancy between adolescents' meta-liking judgments and their peers' actual liking could be observed, which aligns with research showing individuals often underestimate how positively they are perceived (Boothby et al., 2018). Accordingly, it may be beneficial to incorporate "reality checks" into prevention efforts. Such reality checks could involve training exercises to communicate one's fears of being evaluated negatively and seeking feedback in safe social environments to reduce discrepancies between negatively biased metaperceptions and actual evaluations of peers.

Developing and implementing such low-threshold intervention strategies aimed at reducing the risk of social anxiety disorders among adolescents is crucial, since mental disorders emerging during adolescence frequently lead to persistent mental health problems throughout life (Stein et al., 2001). However, adolescents frequently encounter obstacles in accessing mental health care (e.g., Uhlhaas et al., 2023), and it is therefore particularly important to design prevention initiatives that are easily accessible to adolescents. Approaches involving the implementation of smartphone apps to track and prevent anxiety-related symptoms in adolescence are currently explored and offer promising tools of primary prevention to reach and support adolescents (Temkin et al., 2020). In light of the findings in

this dissertation, digital interventions could therefore prove a useful tool for helping adolescents to reduce negative metaperceptions and to encourage adolescents to actively engage in social interactions with peers, ultimately contributing to their long-term mental well-being.

In addition to providing practical implications for preventing mental health issues in adolescence, the findings of this dissertation also point towards the importance of creating environments that encourage and support the initiation of social interactions among peers for boosting adolescents' self-esteem and fostering the formation of friendships. Specifically, two practical implications can be derived from the results. First, Study 1 and 3 illustrate jointly with prior studies (Tissera et al., 2023) that besides face-to-face interactions, interactions in virtual contexts are important for forming positive metaperceptions which contribute to adolescents' momentary self-esteem and are a general marker of successful social interactions (Elsaadawy et al., 2023). These findings complement prior research indicating that virtual interactions can represent a controlled environment for adolescents to test and improve their social skills (Valkenburg & Peter, 2009), and may serve as a less daunting path to make positive social experiences (Baker & Oswald, 2010; N. van Zalk et al., 2011). This is particularly relevant for adolescents who find initiating contact with peers challenging, since self-esteem boosts experienced in virtual contexts can motivate adolescents to engage in peer interactions in offline settings (M. van Zalk et al., 2014). To realize these advantages, caretakers, educators, and counselors should not dismiss virtual settings as superficial and recognize their potential for enhancing social skills, experiencing momentary self-esteem boosts, and facilitating peer relationships (Odgers & Jensen, 2020).

Second, given that the school environment plays a critical role in personality and social relationship development in adolescence (e.g., Israel et al., 2023; Wagner et al., 2018), creating opportunities for peer interactions within schools holds particular promise. One approach in this regard could involve teachers to design special seating arrangements within classrooms, which can facilitate interactions for adolescents who may struggle to connect with peers. Previous studies show that classroom seating arrangements can impact the extent to which adolescents connect and interact with peers (Faur & Laursen, 2022; van den Berg & Cillessen, 2015; Wannarka & Ruhl, 2008): Placing adolescents who are at risk of being socially isolated closer to well-liked peers in the classroom has been shown to increase mutual liking among peers (van den Berg & Cillessen). Importantly, the findings of Study 1 suggests that in addition to these benefits, adolescents may gradually increase their meta-liking as they have more opportunities to interact with their peers. Consequently, strategic seating arrangements can

foster positive interaction experiences among adolescents, which not only lay the foundation for the formation of friendships but also have implications for their momentary self-esteem.

5.5. Limitations and Outlook for Future Research

Next to the outlined theoretical, methodological, and practical implications of this dissertation, it is important to acknowledge that the conducted research cannot fully capture the breadth and complexity of the interplay between personality and social interactions. Below, I discuss several conceptual and methodological limitations that should be considered when interpreting the results. Additionally, I propose potential avenues to address these limitations in future research.

First, the person-centered approach adopted in this dissertation, which places emphasis on the interplay between the personality of a target person and social interaction characteristics, has both strengths and limitations. While this approach allows for a deeper understanding of how individuals' personality traits are linked to metaperceptions and shape subjective interaction experiences, it excludes the role of *partner effects*, that is, how interaction partners' personalities and characteristics shape social interactions. While these partner effects were not the primary focus of this dissertation, interaction partners and their personality are important features of social interactions and should be considered for a holistic understanding of the interplay between adolescents' personality and their social interactions with others (Breil et al., 2019; Cuperman & Ickes, 2009). Studying partner effects in group contexts can be complex, and considering the effects of all group members' characteristics requires special methodological frameworks to account for the interdependencies within groups. In this regard, a valuable extension of the current work would be to apply the group actor-partner interdependence model (GAPIM; Garcia et al., 2015) to study effects of group composition (e.g., gender, age, personality traits) on adolescents' social interaction experiences.

Second, a related conceptual limitation is that all studies in this dissertation center on perceptions and behaviors at a group level and therefore cannot provide inferences regarding processes at a dyadic level. For example, Study 1 provides insights into the formation of adolescents generalized meta-liking, that is, how individuals think that their group members view them on average, while Studies 2 and 3 focus on how such group level meta-liking judgments are linked to momentary self-esteem. Understanding the effects of such group level perceptions is important, particularly because peer groups play a role in fostering a sense of general belonging in adolescence and social interactions happen routinely within groups during this age (Rubin et al., 2007; Sussman et al., 2007). However, perceptions and behaviors at the

group level only provide part of the picture into the personality-social interaction interplay. For instance, effects at a dyadic level might affect group-based perceptions: A negative meta-liking judgment of a particular group member might affect their meta-liking judgments for all group members (e.g., if Harry believes that Ron, whom he perceives as the popular kid, doesn't like him, he may expect that others within the group won't like him either). In addition, meta-liking of a specific person may be more relevant for momentary self-esteem than group-based meta-liking (e.g., Harry thinks that Ginny likes him most from all the group members, which might give his momentary self-esteem a particularly strong boost). Therefore, a task for future research will be to integrate dyadic and group level processes to understand how these different levels affect each other to jointly form social experiences. Notably, addressing both dyadic and group level processes requires complex study designs wherein participants interact in distinguishable dyads within groups to enable the investigation of behaviors directed toward specific interaction partners within group settings (Kenny & Kashy, 2013; Moreland, 2010).

Third, while the two original datasets (SELFIE and SNAP; Wagner et al., 2021; Wagner & Bleckmann, 2021) used in the dissertation studies offer the unique opportunity to study adolescent zero-acquaintance interactions from multiple perceptions, the sample sizes impose limitations on statistical power. This is particularly true for the moderating role of personality traits in Study 2, which should be interpreted with caution. Interaction effects involving personality and situational characteristics are often challenging to investigate because of their typically small effect sizes (Mueller et al., 2019; R. A. Sherman et al., 2015; see the discussion in Section 5.2.1), requiring large sample sizes for reliable detection (e.g., Arend & Schäfer, 2019). However, it is worth noting that detailed preregistration of the hypothesized effects of all studies helped to reduce the risk of false positive effects, a concern that is frequently associated with low power (Wicherts et al., 2016). Additionally, prior research demonstrates that even small effects can carry significant implications, particularly when they occur consistently across multiple social interactions (Funder & Ozer, 2019). For example, if adolescents high in neuroticism consistently experience slightly lower self-esteem after interacting with strangers compared to familiar acquaintances as found in Study 2, this may impact their long-term motivation to initiate new social contacts. Therefore, while it is important to communicate the limitation of low power clearly and highlight the need for replications, these findings contribute valuable first insights to our understanding of the complex interplay and the role of personality within social settings.

Fourth, while care was taken to derive directional hypotheses from theory and to account for the temporal sequencing of predictor and outcome measures, the analyses presented in this

dissertation are correlational in nature and do therefore not allow for causal inferences. This is important given the potential bidirectionality of the investigated effects: For instance, Study 3 investigated meta-positivity and meta-accuracy of personality metaperceptions as predictors of subsequent meta-liking but did not account for the possibility of prior meta-liking judgments influencing meta-positivity or the existence of an unobserved third factor impacting both meta-positivity and meta-liking (Morgan & Winship, 2014). To explore reciprocal links between situation-specific perceptions and behaviors, researchers need to consider complex modeling techniques to study simultaneous changes of variables within social interactions (e.g., Hounkpatin et al., 2018; Lüdtke et al., 2023). However, these models require large datasets which are rarely available in social interaction research, particularly for adolescent populations (see Section 5.3 for a discussion). To contribute new insights, future research should select modeling approaches based on specific process theories (cf. Lucas, 2023), consider collaborative strategies to attain larger datasets for sophisticated analyses, and ideally, make data publicly available in open data repositories to enable replications across multiple samples (Schönbrodt et al., 2016).

Broadening the scope beyond this dissertation, addressing causality is often challenging in personality research. Yet researchers developed several strategies to approach causal interpretations that can be applied to study the interplay between personality and social interactions (Asendorpf, 2021; Costantini & Perugini, 2018; Grosz et al., 2020): Controlled laboratory studies offer one opportunity for conducting experiments, including manipulations for perceptions and behaviors to investigate situational dynamics (e.g., Hepper et al., 2011; Peterson et al., 2015) or sociometer processes (e.g., Leary et al., 1998; Baumeister et al., 2005). However, it's important to consider that despite supporting causality assumptions, the external validity of such laboratory findings for real-life social interactions is limited. Moreover, ethical constraints prevent the manipulation of variables like personality traits or existing social relationships with interaction partners, meaning that not all processes can be studied with experimental manipulations. As such, naturalistic experiments can complement laboratory studies, allowing for investigating processes underlying the interplay of personality and social interactions in real-life (Shadish et al., 2002). For instance, transitional phases linked to entering new social contexts (e.g., transitioning from high school to university), can provide insights into how social characteristics are linked to changes in personality such as proposed in long-term sociometer processes (e.g., Hutteman et al., 2015; Reitz et al., 2016). Such comprehensive designs, however, are expensive and time consuming, which is why a focus on specific

variables and processes as in this dissertation can contribute to a fundamental understanding of processes and inform the design of more complex studies.

Lastly, the dissertation's findings have limited generalizability to other populations (i.e., sociodemographic backgrounds, cultures, or other age-groups) and different social settings (i.e., interactions with higher social stakes, in-person interactions). With respect to sociodemographic backgrounds, the present data comprised adolescents mostly born in Germany and from high academic school-tracks, which may limit the results' generalizability to other adolescent populations. With respect to culture, further research is needed to understand how culture-related factors impact the interplay between personality and social interactions. Cultural norms and expectations create different opportunities for peer interactions and may systematically impact metaperceptions and behaviors within interactions (Engstrom et al., 2023). Accordingly, personality traits and social interactions may interact differently in predicting social outcomes across cultural settings, underscoring the need to study the outlined processes in this dissertation in diverse environments. With respect to age, it is plausible that new insights about meta-liking formation gained in Study 1 could extend to older populations in zero-acquaintance interactions, considering that research found similar patterns of other-perception formation in adult samples (Rau et al., 2022). However, results may not generalize to younger age groups, such as early adolescence. Early adolescence is a time of profound cognitive development that significantly impacts how individuals perceive themselves and others and how they form metaperceptions (e.g., Keating, 2012). Therefore, examining the discussed processes in younger populations is important to understand the developmental nuances of personality-social interaction dynamics.

Furthermore, the generalizability of the current findings could be limited because the processes investigated in this dissertation may manifest differently according to the social stakes of a given interaction. For example, one interaction context that becomes central in adolescence is that with potential romantic partners (Furman, 2002). When adolescents engage in initial interactions with potential romantic partners, the social stakes may be higher (e.g., Does this person want to go out with me?) and could lead adolescents to pay more attention to interpreting and responding to the behavioral cues they receive from the other person. Additionally, while Studies 1 and 3 contribute important insights into adolescents' virtual social interactions, the findings regarding situational dynamics may not apply to in-person settings. Research indicates that people detect different behavioral cues in virtual settings than in in-person interactions (e.g., body movements that are not visible in a video call) which may inform meta-liking formation or the links between meta-accuracy, meta-positivity, and meta-liking

differently across these settings (cf. L. E. Sherman et al., 2013). At the same time, recent evidence demonstrates that meta-accuracy and meta-positivity of personality metaperceptions have similar implications in virtual and in-person interactions of college students (Tissera et al., 2023). As such, further work is needed to examine situational dynamics in interactions with different interaction partners and identify potential differences in the interplay between personality and social interactions in virtual and in-person settings.

5.6. Conclusion

In conclusion, this dissertation adopted a process-oriented approach to study the complex interplay between personality and social interactions in adolescence. The findings illustrate dynamic connections between stable and momentary personality traits and social interaction experiences that revolve around adolescents' metaperceptions in three distinct processes: First, stable personality traits can be regarded as default settings predicting initial meta-liking judgments in zero-acquaintance interactions with peers, complemented by the moderating role of neuroticism on self-esteem reactions to meta-liking judgments. Second, sociometer processes consistently tie meta-liking judgments to adolescents' momentary self-esteem in virtual and face-to-face interactions at zero-acquaintance. Lastly, situational dynamics encompassing situation-specific personality metaperceptions, perceptions of others, and interaction partner behaviors dynamically contribute to meta-liking and its changes within interactions. These new insights enrich our understanding regarding the role of adolescents' personality in social interactions, the potential role of metaperceptions for momentary changes in personality, and the formation of metaperceptions in adolescence. To gain further insights into the complex interplay of personality and social interactions in adolescence and beyond, future studies should include comprehensive multi-method designs that investigate social interaction processes in different social contexts and combine this process-approach with long-term assessments of personality and social relationships.

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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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Erklärung gemäß *(bitte Zutreffendes ankreuzen)*

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

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Hiermit erkläre ich,

_____Eva Bleckmann_____ (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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Hiermit erkläre ich an Eides statt,

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