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DISSERTATION

Die Rolle von Emotionsregulation in der Entstehung psychotischer Störungen

Beiträge aus Fragebogenstudien, experimentellen Untersuchungen und Experience Sampling Studien

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Inhaltsverzeichnis

1. Zusammenfassung

Psychotische Störungen gehen mit erheblichem Leidensdruck einher und bisherige medikamentöse wie auch psychotherapeutische Behandlungen erzielten kleine bis moderate Effekte. Zur notwendigen Optimierung psychosespezifischer Interventionen durch Ableitung wesentlicher Foki der Behandlung ist die Untersuchung zugrundeliegender Entstehungs- und Aufrechterhaltungsmechanismen höchst relevant. Zahlreiche Studien belegen die zentrale Rolle von negativem Affekt in der Entstehung und Aufrechterhaltung von Wahn und legen damit die Frage nahe, inwiefern Menschen mit psychotischen Störungen Schwierigkeiten in der Emotionsregulation aufweisen. Bisherige Befunde deuten in der Tat darauf hin, dass diese im Vergleich zu gesunden Kontrollprobanden[1] häufiger maladaptive (z.B. Suppression) und seltener adaptive Emotionsregulationsstrategien (z.B. kognitives Umbewerten) habituell, d.h. gewohnheitsmäßig, einsetzen. Andere Forschungsmethoden aber, wie experimentelle Untersuchungen zum Erfolg der eingesetzten Strategien im Labor und Experience Sampling Studien zur Untersuchung von Emotionsregulation im Alltag lieferten bislang konzeptuell schwer zu vereinende Ergebnisse. So ist weiterhin zu klären, wo die konkreten emotionsregulativen Defizite von Menschen mit Psychosen liegen (Studie I), ob diese sich auch im Alltag zeigen und ob sie anhand einer reduzierten Effektivität charakterisiert sind (Studie II), und inwiefern sie tatsächlich den Zusammenhang zwischen negativem Affekt und Paranoia moderieren (Studie III).

Für einen detailgenauen Einblick in die Rolle von Emotionsregulation bei psychotischen Störungen wurden in Studie I zunächst Fragebogenstudien zur habituellen Emotionsregulation und experimentelle Studien meta-analytisch zusammengefasst. Der situative Einsatz einer Bandbreite von Emotionsregulationsstrategien sowie der bewussten Wahrnehmung von Emotionen im Alltag von Probanden mit akutem Wahn (PSY, n=71) im Vergleich zu gesunden Kontrollprobanden (KG, n=42) wurde in Studie II anhand der Experience Sampling Methode beleuchtet. Darüber hinaus wurde die Effektivität der situativ eingesetzten Strategien anhand der Analyse sukzessiver Differenzen zwischen zwei konsekutiven Zeitpunkten im Alltag der Probanden geprüft. In Studie III wurde anhand derselben klinischen Stichprobe der prospektive Zusammenhang zwischen negativem Affekt und Paranoia und der moderierende Einfluss

[1] Zur besseren Lesbarkeit wird auf die zusätzliche Formulierung der weiblichen Form verzichtet. Die ausschließliche Verwendung der männlichen Form soll explizit als geschlechtsunabhängig verstanden werden.

verschiedener Emotionsregulationsstrategien sowie der bewussten Wahrnehmung von Emotionen auf diese Assoziation im Alltag von PSY untersucht.

Insgesamt stellen die Ergebnisse der drei Studien die Sinnhaftigkeit einer singulären Perspektive auf Emotionsregulation für die Ableitung belastbarer klinischer Implikationen für psychotische Störungen infrage. Dies zeigte sich in zum Teil großen Effekten für die übermäßige habituelle Nutzung maladaptiver und der weniger häufigen Nutzung adaptiver Strategien bei PSY im Vergleich zu KG (Studie I und II), während experimentelle Studien auf weniger eindeutige Unterschiede in der Effektivität von Emotionsregulationsstrategien im Labor hinwiesen (Studie I). Im Alltag zeigte sich entgegen der Befunde aus Fragebogenstudien ein gänzlich anderes Muster, im Sinne einer entweder ebenso intensiven wenn nicht sogar vermehrten Nutzung durch PSY im Vergleich zur KG, unabhängig von der bislang angenommenen (Mal)Adaptivität der einzelnen Strategien (Studie II). Darüber hinaus zeigte Studie II, dass solche Strategien, welche sich für die KG als effektiv in der Hoch- bzw. Herunterregulierung von positivem bzw. negativem Affekt erwiesen, auch von PSY effektiv eingesetzt wurden. In Studie III bestätigte sich der bereits vielfach gezeigte längsschnittliche Zusammenhang zwischen negativem Affekt und Paranoia bei Probanden mit akutem Wahn. Während Rumination exazerbierend auf diesen Pfad wirkte, war das bewusste Wahrnehmen der Emotionen protektiv. Damit konnte ein wesentlicher Beitrag zur Erforschung der Relevanz von Emotionsregulation in der Entstehung psychotischer Störungen und zur Überwindung einer isolierten Betrachtung des Konstrukts geleistet werden. Die Dissertation liefert neben einer empirischen Grundlage, auf der integrative Ansätze zur Erforschung von Emotionsregulation aufbauen können, Impulse für zukünftige Forschung sowie klinische Implikationen.

2. Abstract

Psychotic disorders are associated with marked distress. Treatments with both drugs and psychological interventions achieve, at most, only moderate effects. Studying the underlying mechanisms of psychotic disorders in order to develop more tailored interventions may offer new approaches. Numerous studies suggest that negative affect may be a pivotal factor for delusion formation and maintenance. We can therefore hypothesise that patients with psychosis will have particular difficulties in regulating negative affect. Supporting this idea, cross-sectional questionnaire-based studies found psychosis to be associated with a decreased use of adaptive strategies (e.g. cognitive reappraisal) and an increased use of maladaptive strategies (e.g. suppression). However, experimental designs aiming to assess the effectiveness of instructed strategies and experience sampling studies of emotion regulation in the daily life, demonstrate contradictory findings. Particular gaps in the knowledge include, whether patients with psychotic disorders have specific patterns of emotional regulation deficits as reported in questionnaire-based and experimental studies (study I), whether these deficits are also present in the daily life of patients and whether they are characterised by a reduced effectivity (study II), and whether emotion regulation strategies moderate the path between negative affect and paranoia (study III).

For a fine-grained understanding of the role of emotion regulation in psychotic disorders, cross-sectional questionnaire-based data as well as experimental data were meta-analysed (study I). In an experience sampling study, the momentary deployment of a range of emotion regulation strategies and the ability to be aware of one's emotions by patients with acute delusions (PSY, *n*=71) compared to non-clinical controls (NC, *n*=42) was analysed (study II). In addition, the effectiveness of the strategy use was analysed and operationalised by examining successive differences in positive and negative affect. The prospective association between negative affect and paranoia, and the moderating effect of emotion regulation strategies and of the ability to be aware of one's emotions were analysed in study III.

Overall, the findings from the three studies challenge a singular perspective on the construct of emotion regulation. The results from questionnaires indicated an increased use of maladaptive and a decreased use of adaptive strategies (study I and II), whereas experimental studies pointed to less pronounced group differences (study I). Analysing the daily life of participants showed a different pattern, characterised by a more frequent use of maladaptive but, either no differences in individual adaptive strategies, or an unexpected more frequent use

(cognitive reappraisal) in PSY compared to controls. The strategies which were effective in NC were equally effective in the psychosis group. In study III, the data confirmed the well-established time-lagged association between negative affect and paranoia in PSY. Multilevel regression analysis revealed that higher awareness at one timepoint reduced the time-lagged association between negative affect and paranoia, whereas rumination had an opposite, amplifying moderation effect.

Despite limitations, which are discussed critically, this dissertation contributes to the understanding of the relevance of emotion regulation in the development of psychotic disorders and provides important clinical implications as well as a stimulus for future research.

3. Theoretischer Hintergrund

3.1 Schizophrenie und andere psychotische Störungen

Psychotische Störungen stellen eine Gruppe heterogener Störungen dar, welche unter anderem durch Symptome wie Wahn und Halluzinationen gekennzeichnet sind. Im Diagnostischen und Statistischen Manual Psychischer Störungen werden sie unter Schizophrenie-Spektrum und andere psychotische Störungen zusammengefasst (DSM-5; American Psychiatric Association, 2015, S.117). Die am häufigsten diagnostizierte Störung ist die Schizophrenie, gefolgt von schizoaffektiven und wahnhaften Störungen. Eine Diagnose der Schizophrenie ist nach DSM-5 unter anderem erfüllt, wenn in der floriden Phase mindestens zwei oder mehr Hauptsymptome psychotischer Störungen über einen Zeitraum von mindestens einem Monat auftreten. Zu diesen Hauptsymptomen zählen zum einen Wahn, Halluzinationen, desorganisiertes Denken, grob desorganisiertes Verhalten oder gestörte Motorik, welche gemeinsam die Positivsymptomatik charakterisieren. Zum anderen werden ein verminderter emotionaler Ausdruck, reduzierte Willenskraft, Freudverlust, Abnahme sprachlicher Äußerungen und sozialer Rückzug unter Negativsymptomatik als letztes Hauptsymptom zusammengefasst (APA, 2015, S. 119). Angesichts dieser Bandbreite unterschiedlicher Symptome kann das klinische Bild innerhalb einer eng definierten Störungskategorie wie der Schizophrenie entsprechend variieren. In Abgrenzung zu bisheriger Grundlagenforschung, welche sich meist auf die diagnostische Kategorie Schizophrenie fokussiert, setzt sich so zunehmend eine Untersuchung einzelner Symptome durch (Cannon & Keller, 2006; Garety, Bebbington, Fowler, Freeman, & Kuipers, 2007). Eine prominente Rolle in der Untersuchung von Psychosen wird dabei meist dem Wahn zugeschrieben, welcher bei ca. 65-70% der Betroffenen vorkommt und damit das häufigste Symptom darstellt (Appelbaum, Robbins, & Roth, 1999; Breier & Berg, 1999). Dieser ist als eine feste Überzeugung charakterisiert, welche mit apriorischer Evidenz auftritt und an der mit erfahrungsunabhängiger Gewissheit festgehalten wird (AMDP, S. 57f, 2016). Verfolgungswahn stellt dabei die häufigste Form des Wahns dar (78.4% wahnhafter Patienten; Appelbaum, Robbins, & Roth, 1999). Gegenwärtig wird von einem sogenannten Paranoia Spektrum in der Allgemeinbevölkerung ausgegangen, dessen extremes Ende der klinisch relevante Wahn ist (Freeman & Garety, 2014). Der Fokus der vorliegenden Dissertation liegt auf der Untersuchung von Positivsymptomatik und im Speziellen auf Verfolgungswahn bzw. Paranoia.

Mit einer Lebenszeitprävalenz von ca. 0.7% (McGrath, Saha, Chant, & Welham, 2008) sind psychotische Störungen zwar vergleichsweise selten, sie gehen jedoch häufig mit unverhältnismäßig großen persönlichen und gesellschaftlichen Kosten einher (DGPPN e.V. (Hrsg.) für die Leitliniengruppe, 2019; van Os & Kapur, 2009). Neben dem meist erheblichen Leidensdruck, der unmittelbar mit der psychischen Erkrankung assoziiert ist, und der oft eingeschränkten Lebensqualität durch ein reduziertes Funktionsniveau, steht ein doppelt bis dreifaches Mortalitätsrisiko (McGrath et al., 2008). Zu der um die 10-15 Jahre reduzierten Lebenserwartung tragen zum einen eine hohe Suizidrate (Hor & Taylor, 2010) und zum anderen körperliche Beschwerden und somatische Komorbiditäten bei. Hierzu zählen vor allem kardiovaskuläre, metabolische und infektiöse Erkrankungen (Hasan, Wobrock, & Falkai, 2012). Hohe Einbußen sowohl psychischer als auch sozialer Natur gehen zudem mit Hospitalisierungen (18% der Gesamtanzahl der Tage stationärer Aufenthalte aufgrund psychischer Erkrankungen; Evensen et al., 2016), einer niedrigen Beschäftigungsrate (ca. 10% ; Evensen et al., 2016), einem der Erkrankung anhaftendem Stigma und der damit verbundenen Diskriminierung einher (Mestdagh & Hansen, 2014; Thornicroft et al., 2009). Die gesellschaftliche Teilhabe ist entsprechend stark eingeschränkt (Millier et al., 2014). Laut einer Fragebogenuntersuchung entspricht das psychische Wohlbefinden von nahezu der Hälfte von Personen mit Verfolgungswahn dem der unteren 2% der Befragten aus der Allgemeinbevölkerung (Freeman et al., 2014). Die aktuellen S3-Leitlinien sprechen sich zwar für die Evidenz von medikamentöser Therapie durch Antipsychotika aus, doch sind unerwünschte Arzneimittelwirkungen hoch und randomisiert-kontrollierte klinische Langzeitstudien fehlen, um eine Aussage über Langzeiteffekte treffen zu können (DGPPN e.V. (Hrsg.) für die Leitliniengruppe, 2019, S. 74). Psychotherapeutische Behandlungen erzielten bislang allenfalls kleine bis moderate Effekte (Naeem et al., 2016; Sarin, Wallin, & Widerlöv, 2011; Turner, van der Gaag, Karyotaki, & Cuijpers, 2014; Van der Gaag, Valmaggia, & Smit, 2014). Um hier größere Effekte zu erzielen, bedarf es ein verbessertes Verständnis der auslösenden und aufrechterhaltenden Faktoren von psychotischen Symptomen zur Ableitung psychosespezifischer Interventionen.

Nach aktuellem Forschungsstand wird von einer multifaktoriellen Ätiopathogenese bei Psychosen ausgegangen (s. z.B. Howes & Murray, 2014). Je nach Beschreibungsebene und Perspektive werden dabei innerhalb unterschiedlicher Modelle verschiedene Aspekte in den Fokus gerückt. Klassischerweise liegt diesen Erklärungsmodellen das Vulnerabilitäts-Stress-Modell als gängiges, heuristisches Modell zugrunde. Danach wird die Symptomentstehung als Funktion des Zusammenspiels aus individueller Anfälligkeit bzw. Vulnerabilität und Stress

beschrieben (Zubin & Spring, 1977). Die Vulnerabilität einer Person wird dabei durch einzelne wie auch kombinierte Risikofaktoren bestimmt, welche sich von genetisch vermittelten oder auch perinatal erworbenen Faktoren, über neuroanatomische und -chemische Veränderungen bis hin zu psychosozialen Risikofaktoren, wie Kindheitstraumata, Migration und Diskriminierung, erstrecken können. Bringt eine Person eine solche Anfälligkeit für psychotische Störungen mit und überschreitet das Ausmaß an Stress diese individuelle Schwelle, begünstigt dies die Entwicklung und Exazerbation von Symptomen. Auf dem Weg von Vulnerabilität und Stress zur Symptombildung werden verschiedene Risikofaktoren als Vermittler diskutiert. So weist die klinische Grundlagenforschung der letzten beiden Dekaden zunehmend auf eine bedeutende Rolle verschiedener psychologischer Faktoren hin (z.B. Hartley, Barrowclough, & Haddock, 2013; Kesting & Lincoln, 2013; Reeve, Sheaves, & Freeman, 2015), die Ansatzpunkte für psychotherapeutische Interventionen liefern (Freeman, Dunn, et al., 2015; Freeman, Waite, et al., 2015). Dies steht im Einklang mit aktuellen Entwicklungen, wie die des Interventionist-Causal-Ansatzes, innerhalb dessen Interventionen direkt an den identifizierten kausalen Mechanismen ansetzen, um in der Folge Symptome zu reduzieren (Kendler & Campbell, 2009). Neben verschiedenen identifizierten Faktoren, die potentielle Ansatzpunkte für Psychotherapie darstellen, wie zum Beispiel dysfunktionale kognitive Verzerrungen und negative Selbstschemata, stehen emotionale Prozesse (Myin-Germeys & van Os, 2007), die den Fokus der Dissertation darstellen.

3.2 Negativer Affekt und emotionale Prozesse bei Psychosen

In der letzten Dekade ist negativer Affekt als Entstehungs- und Aufrechterhaltungsfaktor zunehmend in den Fokus von Forschung und therapeutischen Behandlungsansätzen gerückt. Negativer Affekt wird dabei häufig als Indikator für Stresserleben verwendet und besteht neben einer physiologischen Komponente auch aus dem subjektiven Affekterleben, welches sich in diskreten Emotionen (z.B. Angst, Scham, Schuld oder Wut) widerspiegelt. Versetzt man sich in die Perspektive eines Menschen, der davon überzeugt ist, verfolgt und bedroht zu werden, so steht außer Frage, dass dies mit einem hohen Grad an negativem Affekt einhergehen kann. In der Tat zeigen Ergebnisse aus Fragebogenstudien (Cohen, Callaway, Najolia, Larsen, & Strauss, 2012; Strauss et al., 2013) und Experience Sampling Studien (Cho et al., 2017), dass Menschen mit Psychosen konsistent höhere Ausprägungen in negativem Affekt berichten. Epidemiologische Studien deuten zudem auf Komorbiditätsraten von bis zu 50% für Depression und 38% für Angststörungen bei Psychosen hin (Braga, Reynolds, & Siris, 2013; Buckley, Miller, Lehrer, &

Castle, 2009). Eine komorbide Depression ist dabei häufig eng mit einem niedrigeren sozialen Funktionsniveau, verringerter Lebensqualität und Suizidalität verbunden (Millier et al., 2014). Dies spiegelt sich auch im DSM-5 wider, in dem betont wird, dass der Schweregrad affektiver Symptome im Rahmen einer Psychose prognostische Bedeutung hat und entscheidend für die Behandlungsplanung ist (APA, 2015, S. 121). Interessanterweise konnten Studien zudem zeigen, dass der emotionale Leidensdruck durch Stimmenhören (Hanssen, Krabbendam, de Graaf, & Vollebergh, 2005) und Wahngedanken (Ho-wai So, Tang, & Leung, 2015; Lincoln, 2007) als besseres Unterscheidungsmerkmal zwischen klinischen und nicht-klinischen Stichproben diente als die bloße Auftretenshäufigkeit von psychotischem Erleben.

In psychologischen Konzeptualisierungen von Positivsymptomatik und im Speziellen von Verfolgungswahn wird negativem Affekt eine wesentliche Rolle zugeschrieben. Innerhalb des kognitiven Modells der Positivsymptomatik wird davon ausgegangen, dass negativer Affekt und kognitive Verzerrungen eine wahnhafte Interpretation anomaler bzw. mehrdeutiger Erfahrungen begünstigen und in einem sich selbst aufrechterhaltenden Kreislauf münden (Garety, Kuipers, Fowler, Freeman, & Bebbington, 2001; Kuipers et al., 2006). Gleichermaßen wird negativem Affekt in Preti und Cellas Heuristik zur Entstehung paranoider Interpretationen eine wesentliche Bedeutung beigemessen. Hier wird postuliert, dass unter Stress und negativem Affekt der Bedrohungscharakter neutraler Stimuli betont und die Wahrscheinlichkeit einer paranoiden Interpretation erhöht wird (Preti & Cella, 2010).

Tatsächlich wird die Relevanz von negativem Affekt in der Wahnentstehung von zahlreichen empirischen, methodisch vielfältigen Studien unterstützt. So konnten Längsschnittstudien die theoretische Annahme eines affektiven Wegs zur Entstehung von Wahn untermauern (Fowler et al., 2012; Freeman et al., 2012). Die Verwendung experimenteller Paradigmen zeigte zudem in klinischen und nicht-klinischen Stichproben, dass negativer Affekt den Einfluss von Stress auf Paranoia mediierte (Lincoln, Peter, Schäfer, & Moritz, 2009; Veling, Pot-Kolder, Counotte, Van Os, & Van Der Gaag, 2016). Experience Sampling Studien (ESM), welche Zusammenhänge direkt im Alltag der Probanden untersuchen und damit eine hohe ökologische Validität aufweisen, konnten bestätigen, dass negativer Affekt (in der Regel gemessen über Items wie „traurig“, „unsicher“, „ängstlich“, „einsam“) einem Anstieg in der Symptomausprägung vorausgeht (Ben-Zeev, Ellington, Swendsen, & Granholm, 2011; Hartley, Haddock, Sa, Emsley, & Barrowclough, 2014; Kramer et al., 2014; Krkovic, Clamor, Schlier, & Lincoln, 2019; Thewissen, Bentall, Oorschot, à Campo, et al., 2011). Während einige Studien einen unidirektionalen Zusammenhang zwischen negativem Affekt und Wahn berichten (Fowler et al.,

2012; Krkovic, Schlier, & Lincoln, 2018), weisen andere auf einen Teufelskreis zwischen Affekt und Symptomatik hin (Krkovic et al., 2019; Moritz & Van Quaquebeke, 2014). Letzteres unterstützt das Modell des Verfolgungswahns von Freeman et al., in welchem von negativem Affekt sowohl als einem exazerbierenden als auch aufrechterhaltenden Faktor ausgegangen wird (Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002).

Insgesamt sprechen die Befunde für einen robusten Zusammenhang zwischen negativem Affekt und Wahn. Die Ergebnisse legen die Vermutung nahe, dass Menschen mit Psychosen das Risiko tragen, dass sich negativer Affekt in wahnhafte Symptome überträgt. Diese Assoziation wird auch als affektiver Pfad zu Paranoia beschrieben (Myin-Germeys & van Os, 2007). Daraus folgt, dass ungünstige Emotionsregulationsstrategien einen wichtigen Faktor in der Entstehung und Aufrechterhaltung von Psychosen darstellen könnten. Hingegen könnte die Förderung effektiver Strategien zur Reduktion negativen Affekts möglicherweise symptom-präventiv wirken.

3.3 Emotionsregulation und Psychosen

Unter Emotionsregulation wird die Fähigkeit verstanden, Emotionen mittels bestimmter Strategien in ihrer Intensität, Qualität und ihren dynamischen sowie zeitlichen Eigenschaften derart zu regulieren, dass ein erwünschter emotionaler Zustand erreicht und damit zielgerichtetes Verhalten erleichtert wird (Thompson, 1994). Dies schließt sowohl das Abschwächen, Intensivieren als auch das Aufrechterhalten von Emotionen ein (Gross & Thompson, 2007, S. 7). Nach Gross (1998, S. 275) liegt der Prozess der Emotionsregulation auf einem Kontinuum von bewusster, Aufwendungen erfordernder und kontrollierter Regulation bis hin zu unbewusster, müheloser und automatischer Regulation. Das in der Forschung prominenteste Modell der Emotionsregulation postulierten Gross und Thompson (2007). In diesem sogenannten Prozessmodell werden verschiedene Emotionsregulationsstrategien anhand ihrer zeitlichen Verortung geordnet. Hierbei wird zwischen „antezedent-fokussierter“ Emotionsregulation, die in den Prozess der Emotionsentwicklung eingreift, und der „response-fokussierten“ Emotionsregulation, die an der bereits vollständig entwickelten Emotion ansetzt, unterschieden. Gemeinsam mit weiteren Konzeptualisierungen (z.B. Koole, 2009) wurde mit diesem Modell Forschung angeregt, welche distinkte, explizite Strategien, wie kognitives Umbewerten, Unterdrückung des emotionalen Ausdrucks (Suppression), Ablenkung (Bloch, Moran, & Kring, 2010; Webb, Miles, & Sheeran, 2012) und Rumination (Zawadzki, 2015) untersucht. Da explizite Emotionsregulation, d.h. solche die bewusst eingesetzt wird, ein

gewisses Bewusstsein der eigenen Emotionen voraussetzt, wird dies als entscheidende, vorausgehende Komponente des Prozesses der Emotionsregulation bewertet (Berking & Whitley, 2014; Van Rijn et al., 2011).

Als transdiagnostischer Faktor sind Defizite in den Emotionsregulationsfähigkeiten mit einer Bandbreite verschiedener Psychopathologien assoziiert (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Dabei wurde kognitives Umbewerten (John & Gross, 2004) und Akzeptanz (Hayes, Strosahl, & Wilson, 1999) als adaptive Strategien klassifiziert, während andere, vor allem Suppression (Campbell-Sills, Barlow, Brown, & Hofmann, 2006) und Rumination (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008), zu den maladaptiven Strategien zählen. Obwohl diese Einteilung häufig verwendet wird und auf assoziierten gesundheitlichen Outcomes basiert, wird die Sinnhaftigkeit dieser Dichotomie dennoch kontrovers diskutiert. Danach können Strategien je nach Kontext, Ziel, Zeitpunkt und Flexibilität ihres Einsatzes adaptiv oder maladaptiv sein und hängen von der Anpassung an sich stets verändernde Umweltbedingungen und -anforderungen ab (Aldao & Nolen-Hoeksema, 2012).

Verschiedene Untersuchungsaspekte kommen bei der Beforschung von Emotionsregulation in Betracht. Diese reichen von der Art und Häufigkeit, über die Effektivität bis hin zu Variabilität und Flexibilität von Emotionsregulation. Die wohl am häufigsten verwendete Methode zur Erfassung von Emotionsregulation ist die Fragebogenuntersuchung, welche meist die Art der Emotionsregulationsstrategie mit der Häufigkeit des Einsatzes in Verbindung bringt. Dabei wird in der Regel der gewohnheitsmäßige, sogenannte habituelle Gebrauch einzelner Strategien auf Trait Ebene erfasst (Gyurak et al., 2011). Beispielsweise wird im Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) kognitives Umbewerten u.a. mit dem Item „Wenn ich weniger negative Gefühle empfinden möchte, versuche ich über die Situation anders zu denken." und Suppression mit „Ich halte meine Gefühle unter Kontrolle, indem ich sie nicht nach außen zeige." anhand einer 7-stufigen Likert Skala von „stimmt überhaupt nicht" zu „stimmt vollkommen" erfragt. Eine Meta-Analyse von O'Driscoll et al. (2014), welche Befunde aus solchen querschnittlichen Fragebogenstudien aggregierte, konnte zeigen, dass Menschen mit Psychosen im Vergleich zu gesunden Kontrollprobanden habituell weniger kognitive Umbewertung und häufiger Rumination, Suppression und Ablenkung einsetzten. Einige Studien untersuchten darüber hinaus den Zusammenhang zwischen einzelnen Strategien und Positivsymptomatik. Hier zeigte sich in manchen Studien ein negativer Zusammenhang zu kognitiver Umbewertung (Grezellschak, Jansen, & Westermann, 2016; Marquez-Arrico, Benaiges, & Adan, 2015) und eine positive Assoziation zu Unterdrückung (Grezellschak et al.,

2016; Horan, Hajcak, Wynn, & Green, 2013). Zudem zeigte eine experimentelle Studie, dass Defizite in der habituellen Emotionsregulation sowohl die affektive als auch die psychophysiologische Stressreaktion vorhersagten (Lincoln, Hartmann, Köther, & Moritz, 2015). Eine weitere, bislang weniger häufig eingesetzte Methode zur Untersuchung von Emotionsregulation bei Menschen mit Psychosen zielt auf die Implementierung und Effektivität von Emotionsregulation ab. In experimentellen Paradigmen werden Probanden üblicherweise instruiert, induzierten negativen Affekt mittels vorgegebenen Strategien herunterzuregulieren (s. Meta-Analyse in nicht-klinischer Stichprobe; Webb et al., 2012). Diese zeigten bislang keine signifikanten Unterschiede bezüglich der Anwendung von kognitiver Umbewertung und Suppression bei Menschen mit Psychosen im Vergleich zu gesunden Kontrollprobanden (Grezellschak, Lincoln, & Westermann, 2015; van der Meer, Swart, Velde, & Pijnenborg, 2014; Perry, Henry, Nangle, & Grisham, 2012). Westermann, Rief und Lincoln (2014) berichteten jedoch in einer weiteren experimentellen Studie, dass ein geringerer Erfolg im Einsatz von kognitiver Umbewertung mit einem Anstieg paranoider Symptome in einer subklinischen Stichprobe assoziiert war.

Zusammenfassend legen bisherige Befunde den Schluss nahe, dass Menschen mit Psychosen Schwierigkeiten in der Emotionsregulation aufweisen, welche sich zum einen im häufigeren habituellen Einsatz maladaptiver Strategien sowie zum anderen im selteneren Gebrauch adaptiver Strategien äußern. Dass dies in der Tat einen Bereich darstellt, dem in der Behandlung von Psychosen ein Stellenwert zugeschrieben werden sollte, spiegelt sich in Ergebnissen einer Delphi Studie wider, in der Menschen mit Psychoseerfahrung zu ihrer persönlichen Definition von Genesung befragt wurden. Hier wurde von 89% der Befragten angegeben, dass eine adaptive Bewältigung psychischer sowie emotionaler Probleme essentiell sei (Law & Morrison, 2014). Eine neuere Studie zeigte zudem, dass eine adaptive Bewältigung, welche Emotionsregulation miteinschloss, ein zentraler Wirkmechanismus von kognitiver Verhaltenstherapie in der Psychosebehandlung darstellte, und zum Beispiel Verbesserungen im Misstrauen vorausging (Schlier, Ludwig, Wiesjahn, Jung, & Lincoln, 2019).

Insgesamt sprechen die Befunde für Abweichungen in der habituellen Verwendung von Emotionsregulationsstrategien bei Menschen mit Psychosen im Vergleich zu gesunden Kontrollprobanden. Diese Unterschiede sind allerdings hauptsächlich durch Fragebogenstudien belegt, welche auf einen vermehrten habituellen Gebrauch maladaptiver und einen geringeren Einsatz adaptiver Strategien hindeuten. Experimentelle Studien hingegen, in denen Probanden anhand instruierter Strategien zuvor induzierten negativen Affekt herunterregulieren, zeigten bislang weniger eindeutige Gruppenunterschiede.

3.4 Operationalisierungen effektiver Emotionsregulation

Emotionale Reaktionen können auf verschiedenen Ebenen beschrieben werden. Diese schließen physiologische Komponenten, subjektive Erfahrungen, kognitive Veränderungen sowie Handlungstendenzen mit ein (Levenson, 1994). Angesichts dieser unterschiedlichen Perspektiven ist es naheliegend, dass auch für die Untersuchung der Frage nach der Effektivität von Emotionsregulation entsprechend unterschiedliche Operationalisierungen gewählt werden können. Im weiteren Sinne wird effektive Emotionsregulation oft mit einem vermehrten Gebrauch adaptiver und einem selteneren Einsatz maladaptiver Strategien gleichgesetzt. Wenngleich die Klassifizierung in maladaptive und adaptive Strategien zumindest zum Teil auf Ergebnissen eben jener vielfältigen Untersuchungsebenen beruht, erscheint diese vereinfachte Darstellung unbefriedigend. Befunde verschiedener Studien deuten zwar an, dass mutmaßlich maladaptive, habituelle Strategien unabhängig von Psychopathologie zum Teil mit einem sogenannten „Rebound Effekt“ im negativen Affekt assoziiert sind (subjektive Ebene; Campbell-Sills, Barlow, Brown & Hofmann, 2006), mit einer niedrigeren Herzratenvariabilität einhergehen (physiologische Ebene; Clamor, Köther, Hartmann, Moritz & Lincoln, 2015; Williams et al., 2015), mit Einbußen im Gedächtnis verbunden sind (kognitive Ebene; Richards, Butler, & Gross, 2003; vgl. Aldao & Nolen-Hoeksema, 2012), und beispielsweise auch mit weniger sozialer Unterstützung verknüpft sind (Handlungsebene; Nolen-Hoeksema & Davis, 1999). Dennoch erscheint dieses Wissen für die Ableitung spezifischer Interventionen als unzureichend und zu ungenau. Interessanterweise zeigte eine Studie, welche sowohl neuronale Korrelate von Emotionsregulation als auch den subjektiven Erfolg anhand experimenteller Paradigmen untersuchte, dass sich Unterschiede in der Effektivität von Emotionsregulation zwischen Menschen mit Psychosen und Kontrollprobanden zwar auf neuronaler jedoch nicht auf subjektiver Ebene abbilden ließen (Strauss et al., 2013). Dieser Befund unterstreicht die Komplexität emotionaler Reaktionen und die Herausforderung, welche die Operationalisierung effektiver Emotionsregulation mit sich bringt.

In der vorliegenden Dissertation soll einer der verschiedenen möglichen Indikatoren effektiver Emotionsregulation näher beleuchtet werden. Hierbei soll innerhalb von wiederholten Messungen die Reduktion des selbstberichteten negativen Affekts von einem zum nächsten Messzeitpunkt prädiziert durch eine Emotionsregulationsstrategie als effektive Emotionsregulation auf subjektiver Ebene definiert werden. Das Rational für die Wahl dieser Operationalisierung liegt in den zahlreichen Ergebnissen zur prominenten Rolle von selbstberichtetem

negativen Affekt in der Wahnentstehung und -aufrechterhaltung begründet. Ob sich die spezifischen Defizite von Menschen mit Psychosen in der Tat in einem ineffektiveren Gebrauch einzelner Strategien abbilden oder ob sie sich vielmehr in einer exazerbierenden beziehungsweise abschwächenden Rolle verschiedener Strategien auf den affektiven Pfad zu Paranoia äußern, soll empirisch überprüft werden. Zwar liegt der Fokus hier auf der Regulation von negativem Affekt, doch soll auch die Untersuchung von positivem Affekt miteingeschlossen werden. Dieser wird erstens signifikant weniger im Alltag von Menschen mit Psychosen im Vergleich zu gesunden Kontrollprobanden berichtet (Cho et al., 2017), zweitens ist positiver Affekt mit weniger habitueller Suppression und mehr habituellem kognitiven Umbewerten bei Menschen mit Psychosen assoziiert (Moran, Culbreth, & Barch, 2018) und drittens wurde der zu starke Fokus auf negativen Affekt auf Kosten einer Untersuchung von positivem Affekt in der Emotionsregulationsforschung kritisiert (Heiy & Cheavens, 2014). Gründe hierfür schließen Evidenz ein, welche negative Assoziationen zwischen positivem Affekt und Psychopathologie zeigt (Carl, Soskin, Kerns, & Barlow, 2013) und die Überlegung, dass die Valenz des Affekts möglicherweise einen wichtigen Kontext darstellt, der für die (Mal)Adaptivität der jeweiligen Strategie entscheidend sein mag. Darüber hinaus schließt die Definition von Emotionsregulation, wie oben genannt, nicht nur das Herunterregulieren von negativem Affekt sondern auch die Aufrechterhaltung sowie die Hochregulierung von positivem Affekt mit ein (Thompson, 1994).

Zusammenfassend kann festgehalten werden, dass für die Beforschung von effektiver Emotionsregulation vielfältige Indikatoren in Frage kommen. Angesichts der zentralen Rolle, welche dem selbstberichteten negativen Affekt aufgrund von robusten empirischen Befunden zukommt und in kognitiven Modellen der Positivsymptomatik zugeschrieben wird, wird in der vorliegenden Dissertation effektive Regulierung im Sinne einer Herunterregulierung des selbstberichteten negativen beziehungsweise einer Hochregulierung des selbstberichteten positiven Affekts definiert.

3.5 Experience Sampling Studien zur Erfassung von Emotionsregulation

Auch wenn die traditionellen Methoden (d.h. Fragebogenstudien zum habituellen Gebrauch von Emotionsregulation und experimentelle Studien zum Einsatz instruierter Strategien) die Untersuchung von Emotionsregulation bei Psychosen stark vorangetrieben haben, weisen beide Untersuchungsarten wesentliche Limitationen auf. So sind Fragebogenstudien zum Beispiel mit dem Risiko der Erinnerungsverzerrung behaftet. Während einer der

zentralen Vorteile experimenteller Paradigmen ist, dass die Effektivität im Sinne einer Herunterregulierung von negativem Affekt direkt gemessen werden kann, liegt ihr Nachteil in der fehlenden ökologischen Validität durch ein künstliches Setting im Labor. Letzteres scheint bei der Beforschung von Emotionsregulation im Zusammenhang mit psychotischer Symptomatik jedoch besonders entscheidend zu sein, da es sich sowohl bei emotionalen Erfahrungen als auch bei Wahn um Phänomene handelt, die innerhalb der Komplexität im Alltag stark variieren (Brans, Koval, Verduyn, Lim, & Kuppens, 2013). ESM Untersuchungen stellen dabei eine ökologisch hochvalide Methode dar, welche die Erfassung von selbstberichteten Phänomenen dorthin rückt, wo sie auftreten, nämlich in den Alltag der Probanden. Damit wird zum einen das Risiko der Erinnerungsverzerrung minimiert und zum anderen werden längere Beobachtungszeiträume ermöglicht, welche das dynamische Zusammenspiel einzelner Konstrukte deutlich besser abbilden können (Ebner-Priemer & Trull, 2009; Trull & Ebner-Priemer, 2013).

Die wenigen ESM-Studien, welche im Bereich der Emotionsregulation bei Psychosen bisher durchgeführt wurden, verfolgten weitgehend unterschiedliche Fragestellungen. So untersuchten Hartley et al. (2014) beispielsweise Zusammenhänge zwischen dem situativen Einsatz einzelner Emotionsregulationsstrategien, d.h. deren Gebrauch im Alltag, und nachfolgenden Symptomausprägungen. Hier zeigte sich im Alltag der Probanden, dass Rumination und sich Sorgen machen nicht nur eine höhere Wahnausprägung und ein höheres Ausmaß an auditiven Halluzinationen vorhersagte, sondern gleichzeitig mit einer vermehrten subjektiv wahrgenommenen Belastung durch diese Symptome einherging. In einer Studie von Nittel et al. (2018) hingegen, zeigte sich aus einer Reihe untersuchter Strategien lediglich Suppression als prädiktiv für Anstiege in Paranoia, nicht aber Rumination. Visser, Estfahlani, Sayama und Strauss (2018) untersuchten Unterschiede in der Häufigkeit eingesetzter Strategien im Alltag von Menschen mit Psychosen im Vergleich zu gesunden Kontrollprobanden. Entgegen der Vermutung, dass sich hier ein ähnliches Muster wie bei habituellen Fragebogenuntersuchungen zeigt, wurde deutlich, dass die Psychosegruppe einen vergleichbaren, wenn nicht sogar erhöhten Gebrauch von Strategien – unabhängig von ihrer mutmaßlichen (Mal)Adaptivität – zeigte. Post-hoc untersuchten die Autoren, inwiefern sich ein ineffektiverer Gebrauch der Strategien in der Psychosegruppe zeigen ließe. Hierfür berechneten sie die Korrelation zwischen der Differenz von negativem Affekt zum einen (t-1) und zum nächsten Zeitpunkt (t) und dem Durchschnitt der eingesetzten Emotionsregulation (Gesamtwert über alle Strategien hinweg). Die Ergebnisse der Analyse (im Sinne einer niedrigeren Korrelation in der Psychosegruppe im Vergleich zu der gesunden Kontrollgruppe) interpretierten die Autoren als

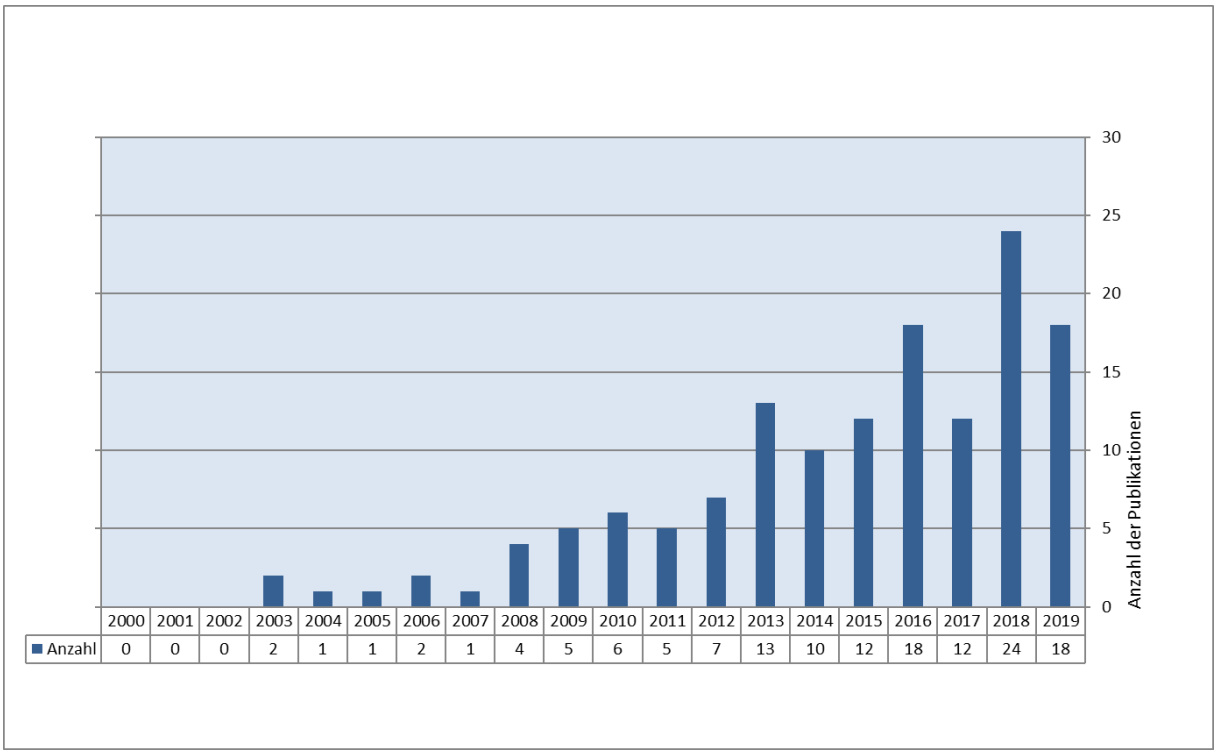
Indikator für weniger effektive Emotionsregulation bei Menschen mit Psychosen. Auch wenn dies einen interessanten und wichtigen ersten Schritt in der Untersuchung effektiver Emotionsregulation im Alltag von Menschen mit Psychosen darstellt, ist es möglich, dass die Berechnung eines Gesamtwerts von Emotionsregulation mögliche Unterschiede wie auch Gemeinsamkeiten im Gebrauch spezifischer Strategien zwischen Psychose- und Kontrollgruppe überdeckte. Eine getrennte Untersuchung der einzelnen Strategien erscheint sinnvoller, da verschiedene Befunde auf eine unabhängige Assoziation einzelner Strategien zu Psychopathologie hinwiesen (Lincoln, Sundag, Schlier, & Karow, 2017; Zawadzki, 2015). Nicht zuletzt scheinen Visser et al. (2018) in ihrer Post-hoc Analyse die hierarchische Mehrebenenstruktur der ESM-Daten nicht berücksichtigt zu haben (s. z.B. Zyzanski, Flocke, & Dickinson, 2004). Einer weiteren Fragestellung gingen Moran, Culbreth und Barch (2018) nach, indem sie untersuchten inwieweit habituelle Emotionsregulation gemessen zur Baseline das Affekterleben im Alltag von Menschen mit Psychosen vorhersagt. Habituelle Suppression zeigte dabei eine signifikante Assoziation zu höherem negativen und weniger positivem Affekt, während kognitives Umbewerten lediglich prädiktiv für höheren positiven Affekt war.

Diese wenigen Studien bestätigen vorläufig die maladaptive Rolle von Suppression in der Vorhersage von erhöhtem negativen Affekt sowie die adaptive Funktion von kognitivem Umbewerten in der Vorhersage von mehr positivem Affekterleben im Alltag. Interessanterweise deuten die Studien auch darauf hin, dass habituelle Emotionsregulation, wie sie über Fragebögen erfasst wird, möglicherweise nicht zuverlässig prädiktiv für die bloße Häufigkeit ihrer Nutzung im Alltag ist, obwohl Ergebnisse von Visser et al. (2018) vorläufig auf einen weniger effektiven Gebrauch dieser Strategien im Alltag hindeuten. Die direkte prädiktive Rolle einzelner Emotionsregulationsstrategien für Paranoia konnte bisher nicht konsistent gezeigt werden.

4. Ziele, Relevanz und Forschungsfragen

Ziel der vorliegenden Dissertation ist es, die Rolle von Emotionsregulation bei psychotischen Störungen zu beleuchten. Da Ergebnisse bisheriger Befunde auf eine wesentliche Beteiligung emotionaler Prozesse in der Wahnentstehung und -aufrechterhaltung hindeuten, erscheint es naheliegend, dass bei Menschen mit Psychosen eine reduzierte Fähigkeit, Emotionen zu regulieren, hierfür verantwortlich sein könnte. Was eine solche „reduzierte Fähigkeit" jedoch ausmacht, ist bislang unzureichend erforscht. Zwar deuten Ergebnisse aus querschnittlichen Fragebogenstudien, die den habituellen Gebrauch von Emotionsregulationsstrategien untersuchen, darauf hin, dass eine solche reduzierte Fähigkeit von einem Muster übermäßiger Nutzung mutmaßlich maladaptiver und einer weniger häufigen Nutzung adaptiver Strategien geprägt ist. Jedoch stehen diese Ergebnisse nicht im Einklang mit Befunden aus experimentellen Studien, welche bislang den vorsichtigen Schluss zuließen, dass Menschen mit Psychosen im Vergleich zu gesunden Kontrollprobanden durchaus vergleichbar effektiv in der Herunterregulierung von negativem Affekt anhand von vorgegebenen Strategien im Labor sind. Eine systematische Untersuchung von Primärstudien, welche solche Forschungsmethoden einsetzen, erscheint daher sinnvoll, um zunächst Klarheit über die Befundlage dieser gängigen Untersuchungsmethoden zu gewinnen. O'Driscoll et al. (2014) hatten hierzu bereits querschnittliche Fragebogenstudien, welche bis Mai 2014 publiziert wurden, meta-analytisch untersucht. Eine einfache Literaturrecherche der Schlagworte verdeutlicht jedoch, dass die Anzahl der Publikationen im Bereich der Emotionsregulation bei Psychosen seit dem Erscheinungsjahr (2014) rapide angestiegen ist (s. Abb. 1, S. 17). Danach sind in den Jahren zwischen 2014 und 2018 fast doppelt so viele Publikationen in dem Bereich veröffentlicht worden, wie insgesamt in allen Jahren zuvor, sodass eine neue Meta-Analyse auf Basis einer aktualisierten Literaturrecherche entsprechend sinnvoll erscheint. Des Weiteren blieben relevante Forschungsfragen bislang unbeantwortet. Zum einen wurden nicht alle relevanten Strategien berücksichtigt, wie beispielsweise Akzeptanz oder Selbst-Beschuldigung, obwohl diese in Stichproben von Probanden mit Psychosen untersucht wurden (Lincoln et al., 2015; Rowland et al., 2013). Zudem soll hier eine bisher nicht untersuchte Lücke geschlossen werden, indem der Zusammenhang zwischen einzelnen Strategien und dem Grad der Positivsymptomatik meta-analytisch untersucht wird. In Erweiterung zu O'Driscoll et al. (2014) sollen zusätzlich auch experimentelle Studien eingeschlossen werden, die Hinweise auf die Effektivität des Einsatzes vorgegebener Emotionsregulationsstrategien nach der Induktion bestimmter Emotionen liefern. Beide

traditionellen Forschungsmethoden, Einsatz von Fragebögen und experimentelle Paradigmen, weisen jedoch eine geringe ökologische Validität auf, sodass die Frage, ob sich das weit angenommene Muster vermehrter maladaptiver und weniger adaptiver Strategien auch im Alltag zeigt, von hoher Relevanz ist. Inwiefern habituelle Maße der Emotionsregulation Aussagen über das tatsächliche Affekterleben im Alltag der Probanden treffen, ist außerdem weitgehend unerforscht und die Frage bleibt offen, ob Menschen mit Psychosen Emotions-regulationsstrategien weniger effektiv im Alltag einsetzen als gesunde Kontrollprobanden.



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Anzahl	0	0	0	2	1	1	2	1	4	5	6	5	7	13	10	12	18	12	24	18

Abbildung 1 - Anzahl der Publikationen pro Erscheinungsjahr bei PsycINFO mit den Suchbegriffen Psychosis OR Schizophrenia AND Emotion regulation. (Stand 29.10.2019)

Darüber hinaus soll der Mechanismus beleuchtet werden, inwiefern die einzelnen Emotionsregulationsstrategien auf den affektiven Pfad einwirken und dabei protektiv oder exazerbierend wirken. Übergeordnetes Ziel ist dabei zum einen, das Störungsverständnis psychotischer Störungen zu bereichern und aktuelle kognitive Modelle der Positivsymptomatik empirisch zu unterfüttern. Zum anderen sollen Anhaltspunkte geliefert werden, inwiefern es sinnvoll erscheint, diese Modelle um die Komponente der Emotionsregulation zu erweitern. Die Ergebnisse sind so nicht nur von theoretischer Bedeutung, sondern auch höchst relevant, um bestehende psychotherapeutische Ansätze für Menschen mit Psychosen weiterzuentwickeln.

Zusammenfassend ist bislang also nicht abschließend geklärt, wo die konkreten emotionsregulativen Defizite bei Menschen mit Psychosen liegen, ob sich die Defizite auch in ihrem Alltag zeigen, ob diese anhand einer reduzierten Effektivität charakterisiert sind und inwiefern sie tatsächlich den Zusammenhang zwischen negativem Affekt und Wahn erklären. Da der robuste Zusammenhang zwischen negativem Affekt und Positivsymptomatik vor allem für Wahn gezeigt wurde (z.B. Thewissen et al., 2011), erscheint es vielversprechend, einen Ansatz zu wählen, in dem spezifisch auf Emotionsregulation in einer Stichprobe von Menschen mit akutem Wahn fokussiert wird.

Folgende Hauptfragestellungen werden in der vorliegenden Dissertation untersucht:

1) *Ist ein bestimmtes Muster von habituell und situativ eingesetzter Emotionsregulation charakteristisch für Menschen mit Psychosen?* Um ein spezifisches Profil herauszuarbeiten, sollen zum einen Befunde aus Fragebogenstudien meta-analytisch zusammengefasst werden, die Einblick in den habituellen Gebrauch gewähren (Studie I). Zum anderen soll das Ausmaß situativ eingesetzter Emotionsregulationsstrategien bei Menschen mit Psychosen im Vergleich zu einer gesunden Kontrollgruppe im Alltag untersucht und mit habituellen Fragebögen verglichen werden (Studie II).
2) *Ist der Einsatz von Emotionsregulationsstrategien im Alltag weniger effektiv bei Menschen mit Psychosen als bei gesunden Kontrollprobanden?* Angesichts hoher Ausprägungen im negativen Affekt bei Menschen mit Psychosen und den angenommenen Defiziten in der Emotionsregulation liegt die Vermutung nahe, dass diese weniger effektiv von Menschen mit Psychosen eingesetzt wird als von gesunden Kontrollprobanden. Um diese Annahme zu prüfen, soll im Alltag der Probanden anhand von Experience Sampling Daten der Regulierungseffekt einer Bandbreite unterschiedlicher Emotionsregulationsstrategien auf Affektebene untersucht werden (Studie II).
3) *Moderieren Emotionsregulationsstrategien den Zusammenhang zwischen negativem Affekt und nachfolgender Paranoia?* Inwiefern eine bestimmte Strategie die symptomatische Reaktion auf negativen Affekt in einer Stichprobe von Menschen mit akutem Wahn verstärkt oder abschwächt, soll in Studie III untersucht werden.

5. Zusammenfassung der Studien

5.1 Studie I: Meta-Analyse zu Emotionsregulation bei Psychosen – Fragebogenstudien und experimentelle Studien

Ludwig, L., Werner, D., & Lincoln, T. M. (2019). The relevance of cognitive emotion regulation to psychotic symptoms – A systematic review and meta-analysis. *Clinical Psychology Review*, 101746. https://doi.org/10.1016/J.CPR.2019.101746

Hintergrund und Hypothesen

Zahlreiche Studien belegen die zentrale Rolle von negativem Affekt in der Entstehung und Aufrechterhaltung von Wahn und legen damit die Relevanz von Emotionsregulationsstrategien bei Menschen mit Psychosen nahe. Bisherige Befunde deuten in der Tat darauf hin, dass diese im Vergleich zu gesunden Kontrollprobanden häufiger sogenannte maladaptive und seltener adaptive Strategien habituell einsetzen. Diese Ergebnisse stehen zwar im Einklang mit postulierten psychologischen Modellen der Positivsymptomatik, liefern jedoch bislang kein einheitliches und vollständiges Bild, um langfristig eine effektive Entwicklung psychotherapeutischer Interventionen zu ermöglichen. Die vorliegende Meta-Analyse untersucht daher Unterschiede im selbstberichteten habituellen Gebrauch verschiedener Emotionsregulationsstrategien bei Menschen mit Psychosen im Vergleich zu gesunden Kontrollprobanden. Dabei erweitern wir das Spektrum der untersuchten Strategien um solche wie Akzeptanz und Selbst-Beschuldigung, die in einer vorangegangenen Meta-Analyse von O'Driscoll et al. (2014) nicht eingeschlossen wurden. Zusätzlich sollen erstmals Effektstärken aus experimentellen Studien integriert werden, welche Aussagen über die Effektivität eingesetzter Strategien treffen können. Wir untersuchen (1) querschnittliche Unterschiede zwischen Menschen mit Psychosen und gesunden Kontrollprobanden im habituellen Gebrauch von Emotionsregulationsstrategien, (2) die Assoziation zwischen Positivsymptomatik und der Häufigkeit eingesetzter Strategien sowie (3) Unterschiede im Erfolg instruierter Strategien nach Affektinduktion in experimentellen Designs zwischen Menschen mit Psychosen und gesunden Kontrollprobanden.

Methoden

Eine systematische Literaturrecherche wurde nach den PRISMA Richtlinien (Moher et al., 2009) in den Datenbanken PubMed, PsycINFO und MEDLINE bis Januar 2018 durchgeführt. Die

Einschlusskriterien waren unter anderem erfüllt, wenn Artikel querschnittliche, korrelative oder experimentelle Daten bezüglich Emotionsregulationsstrategien bei Menschen mit einer Schizophrenie-Spektrum Diagnose im Vergleich zu gesunden Kontrollprobanden lieferten. Experimentelle Studien wurden eingeschlossen, wenn das Paradigma einen kontrollierten Vergleich einer eingesetzten versus nicht-eingesetzten Strategie in Bezug auf induzierten negativen Affekt durch emotionsevozierende Stimuli präsentierten und den Selbstbericht von negativem Affekt beinhalteten. Eine Bewertung der Qualität der Primärstudien sowie des Risikos systematischer Fehler wurden zur Einordnung der Ergebnisse vorgenommen.

(1) Effektstärken wurden in Form von standardisierten Mittelwertsunterschieden der unabhängigen Stichproben berechnet (Hedges' g). Das korrigierte Hedges' g gilt bei kleineren Stichproben als genauerer Schätzer im Vergleich zu Cohens' d. 95%-Konfidenzintervalle werden angegeben. (2) Des Weiteren wurden Korrelationskoeffizienten in die Fisher's z Skala transformiert und schließlich zur einfacheren Interpretation wieder zurück übertragen. (3) Zudem wurden standardisierte Mittelwertsveränderungen (g) berechnet. Da nicht anzunehmen ist, dass alle Studien eine gemeinsame Effektstärke teilen (z.B. aufgrund unterschiedlicher Inventare und verschiedener Patientenpopulationen), wurden Random-Effects-Modelle genutzt (Raudenbusch, 2009).

Ergebnisse

Insgesamt erfüllten 42 Studien die Einschlusskriterien und lieferten damit Daten für 2498 Probanden mit Psychosen und 3381 gesunden Kontrollprobanden. Querschnittliche Fragebogenstudien (k=39) lieferten die größten Effekte für Rumination (g=-0.67 [-0.85; -0.48]), Selbst-Beschuldigung (g=-0,56; [-0,76; -0,37]) und Ablenkung (g=0.55 [0.11; 0.98]). Suppression wurde häufiger von Menschen mit Psychosen eingesetzt (g=-0.36 [-0.56; -0.16]) und kognitives Umbewerten seltener (g=0.41 [0.28; 0.55]), jedoch bei hoher Heterogenität. Korrelative Daten (k=6) zeigten eine signifikante Assoziation zwischen maladaptiven Strategien und Positivsymptomatik. Experimentelle Studien zeigten keine eindeutigen Unterschiede in beiden Gruppen an.

Diskussion

Die Befunde lassen auf ausgeprägte Schwierigkeiten in der Emotionsregulation bei Menschen mit Psychosen schließen, welche sich überwiegend in einem verstärkten habituellen

Gebrauch maladaptiver Strategien (Rumination, Selbst-Beschuldigung und Suppression) und einem weniger häufigen Gebrauch von kognitivem Umbewerten äußern. Die aufgezeigte Assoziation zwischen Positivsymptomatik und maladaptiven Strategien bestätigt dies weitgehend. Um jedoch klinische Implikationen ableiten zu können und Emotionsregulationstrainings besser an die spezifischen Bedürfnisse von Menschen mit Psychosen anzupassen, sind multi-methodische Studien mit unterschiedlichen klinischen Kontrollgruppen nötig. Wertvolle Bestrebungen zukünftiger Forschung umfassen die Erweiterung des Wissens um zugrundeliegende Mechanismen und Risikofaktoren sowie das Identifizieren solcher Strategien, welche innerhalb von Behandlungen fokussiert werden sollten.

5.2 Studie II: Effektivität von Emotionsregulationsstrategien im Alltag

Ludwig, L., Mehl, S., Krkovic, K., Lincoln, T.M., (2020). Effectiveness of emotion regulation in daily life in individuals with psychosis and non-clinical controls – an experience sampling study. *Journal of Abnormal Psychology*. (in press)

Hintergrund und Hypothesen

Bisherige Forschung zu Emotionsregulation bei Menschen mit Psychosen ist vor allem durch den Einsatz habitueller Fragebögen geprägt. Die Befundlage deutet dabei auf einen vermehrten Gebrauch maladaptiver und einen verringerten Gebrauch adaptiver Strategien hin. Inwiefern die Erfassung habitueller Emotionsregulation jedoch Aussage über das tatsächliche Erleben von Affekt im Alltag treffen kann, ist weitgehend unklar. Erste Befunde zeigten hier, dass habituelle Suppression einen erhöhten negativen Affekt und einen verringerten positiven Affekt prädizierte, während kognitives Umbewerten einen erhöhten positiven Affekt im Alltag vorhersagte (Moran et al., 2018). Inwiefern Psychosen nicht nur mit einem bestimmten Muster von vermehrtem versus vermindertem Gebrauch von Emotionsregulationsstrategien assoziiert sind, sondern deren Gebrauch auch weniger effektiv ist, konnte in experimentellen Paradigmen bislang nicht einheitlich gezeigt werden (z.B. Perry et al., 2012; Van der Meer, et al., 2014). Die hohe intraindividuelle Variabilität, welcher Affekterleben im Alltag jedoch unterliegt (Brans et al., 2013; Thewissen et al., 2011), und die Frage, inwiefern Affektinduktionen durch Stimuli im experimentellen Setting tatsächlich persönlich relevant genug sind, um Emotionsregulation und Affekt realistisch abzubilden, rücken Methoden höherer ökologischer Validität in den Fokus. ESM-Studien ermöglichen dabei den Einblick in dynamische Zusammenhänge zwischen

Strategieeinsatz und Affekt. Visser et al. (2018) berichteten, dass entgegen der Erwartungen aufgrund der Befunde aus habituellen Fragebogenstudien Menschen mit Psychosen im Alltag vergleichbar viele, wenn nicht sogar mehr Strategien einsetzten, unabhängig davon, ob sie traditionellerweise als adaptiv oder maladaptiv klassifiziert werden. Explorativ zeigten sie, dass der Einsatz jedoch im Vergleich zu Gesunden weniger effektiv war. Da innerhalb dieser Analyse jedoch zum einen ein Gesamtwert über alle Strategien hinweg gebildet und zum anderen die Mehrebenenstruktur der ESM-Daten nicht berücksichtigt wurde, lassen diese Befunde allenfalls vorsichtige Schlüsse zu und sollten dringend überprüft werden.

In der vorliegenden Studie fokussieren wir demnach auf (1) Unterschiede im Gebrauch von Emotionsregulationsstrategien im Alltag von Menschen mit Psychosen im Vergleich zu gesunden Kontrollprobanden, (2) auf die Untersuchung des prädiktiven Werts habitueller Emotionsregulationsstrategien für negativen und positiven Affekt im Alltag sowie auf (3) die Effektivität einzelner Emotionsregulationsstrategien sowie der bewussten Wahrnehmung von Emotionen im Alltag[2] im Hinblick auf eine Reduktion von negativen und einem Anstieg im positiven Affekt.

Methoden

Die Daten wurden konsekutiv im Rahmen einer multizentrischen randomisiert-kontrollierten Therapiestudie zur Effektivität einer emotionsfokussierten Variante der kognitiven Verhaltenstherapie (CBTd-E) erhoben (clinicaltrials.gov, NCT02787135). Vorliegend wurden Daten der Baselineerhebung, d.h. vor Beginn der Therapiestudie und damit vor Randomisierung in die jeweilige Bedingung, analysiert. Die klinische Stichprobe (PSY) bestand aus Patienten, welche u.a. das Einschlusskriterium eines akuten Wahns erfüllten. Gesunde Kontrollprobanden (KG) unterschieden sich nicht signifikant von der Psychosegruppe im Hinblick auf Alter, Geschlecht und Bildungsgrad. Zur Erfassung der habituellen Emotionsregulation wurde der Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) eingesetzt. Um eine Bandbreite adaptiver Strategien zu untersuchen, wurde zudem der Fragebogen zur Selbsteinschätzung emotionaler Kompetenzen gewählt (SEK-27, Berking & Znoj, 2008). Ein ESM Design wurde zur Untersuchung der Forschungsfragen im Alltag der Probanden angewendet. Hierfür wurden

[2] Für Studie II und Studie III wurden das bewusste Wahrnehmen von Emotionen als wichtige Komponente von Emotionsregulation sowie sechs verschiedene Emotionsregulationsstrategien untersucht. In der vorliegenden Dissertation wird zuweilen auf eine sprachliche Ausdifferenzierung der Variable „bewusstes Wahrnehmen“ versus Emotionsregulationsstrategien zugunsten eines besseren Leseflusses an Stellen, bei denen eine Unterscheidung nicht unbedingt inhaltlich relevant erscheint, verzichtet.

Smartphones über einen Gesamtzeitraum von sechs Tagen eingesetzt, welche in einem Abstand von durchschnittlich ca. 70 min, mindestens jedoch 30 min, zu zehn zufälligen Messzeitpunkten den aktuellen Affekt und die eingesetzten Emotionsregulationsstrategien erfassten. Diese umfassten kognitives Umbewerten, Rumination, sozialen Austausch, Suppression, Ablenkung, Akzeptanz sowie eine weitere Komponente des Emotionsregulationsprozesses, bewusstes Wahrnehmen von Emotionen.

Effektive Emotionsregulation wurde anhand von sukzessiven Differenzen zwischen zwei konsekutiven Zeitpunkten (t und t-1) als ein positiver Wert für positiven Affekt und ein negativer Wert für negativen Affekt operationalisiert[3]. Hierarchische lineare Modelle mit random intercept und fixed slope wurden durchgeführt.

Ergebnisse

PSY (n=71) zeigten durchschnittlich über alle sechs Tage hinweg eine erhöhte Ausprägung im negativen Affekt (M=2.66, SD=1.26) im Vergleich zu KG (n=42, M=1.41, SD=0.68, t(110)=6.84, p<.0001). PSY setzten im Vergleich zur KG entweder vergleichbar häufig (sozialer Austausch, Akzeptanz und bewusstes Wahrnehmen) oder vermehrt Strategien (kognitives Umbewerten, Ablenkung, Rumination, Suppression) im Alltag ein. Habituelles Umbewerten und weitere adaptive Emotionsregulationsstrategien prädizierten sowohl verringerten negativen als auch vermehrten positiven Affekt im Alltag. Suppression war prädiktiv für verringerten positiven nicht aber für negativen Affekt im Alltag. Diese Effekte wurden nicht durch die Gruppe moderiert. Kognitives Umbewerten, Suppression und Rumination im Alltag waren signifikante Prädiktoren für sukzessive Differenzen sowohl im negativen als auch im positiven Affekt (s. Abb. 2, S. 24). Je mehr ein Proband eine der Strategien einsetzte (t-1), desto mehr verringerte sich der negative bzw. verstärkte sich der positive Affekt zwischen t-1 und t (oder desto mehr wurde der negative Affekt von einem Anstieg oder der positive Affekt von einem Rückgang zurückgehalten). Suppression war nur in PSY effektiv (signifikanter Moderatoreffekt). Bewusstes Wahrnehmen prädizierte sukzessive Differenzen im negativen Affekt in beiden Gruppen, für positiven Affekt jedoch nur in der KG. Akzeptanz zeigte einen Effekt in die entgegengesetzte Richtung und prädizierte einen Rückgang im positiven Affekt (bzw. verhinderte dessen Anstieg).

[3] Um den Lesefluss zu erhöhen, werden im Folgenden effektive Emotionsregulationsstrategien definiert, welche mit einem negativen Vorzeichen sukzessive Differenzen im negativen Affekt, beziehungsweise mit einem positiven Vorzeichen sukzessive Differenzen im positiven Affekt vorhersagen (für eine weitere Erläuterung s. Abbildung 2, S. 24.

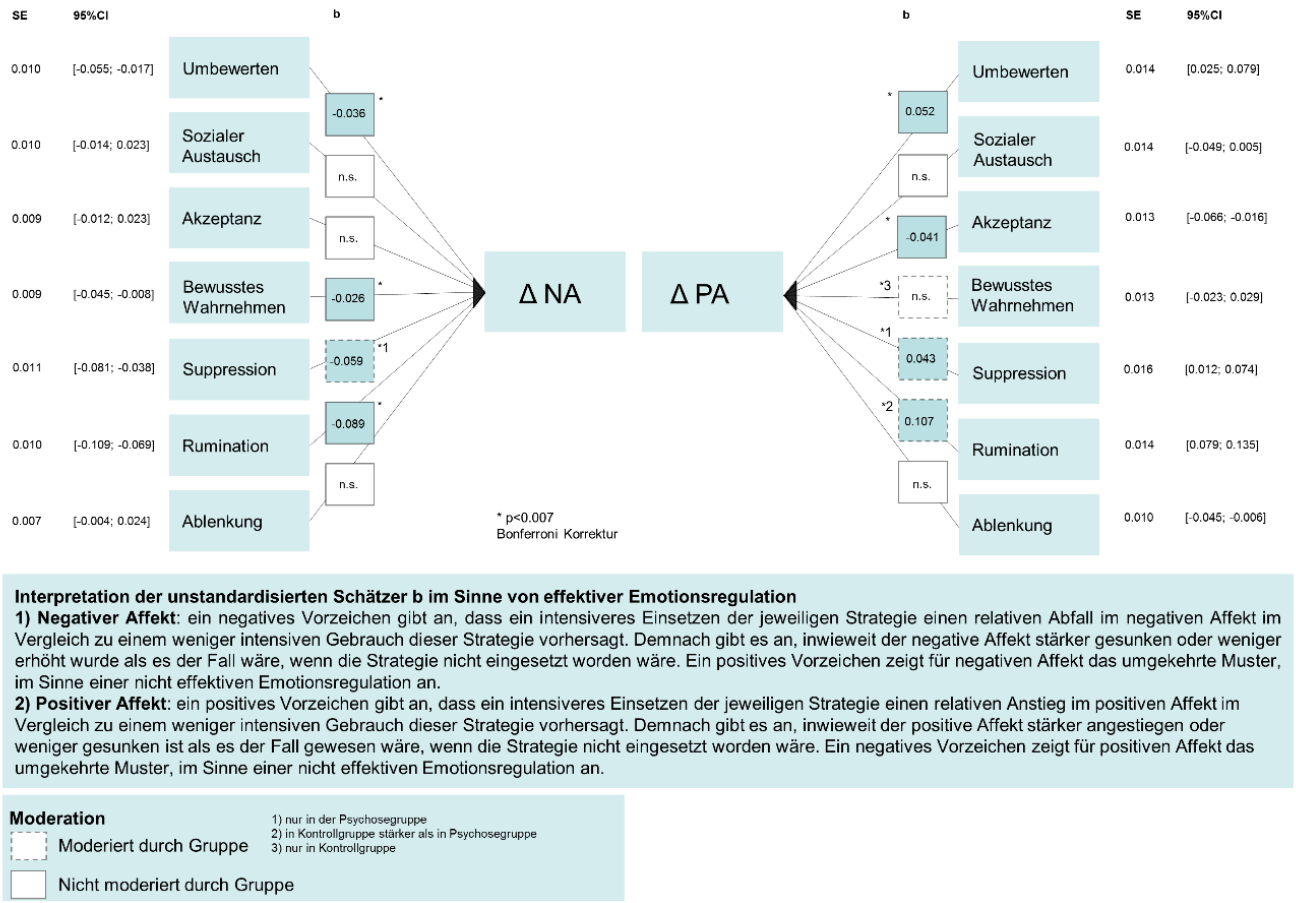


Abbildung 2 – Situative Emotionsregulationsstrategien als Prädiktoren von sukzessiven Differenzen zwischen t-1 und t im negativen Affekt (NA) und im positiven Affekt (PA), moderiert durch Gruppe.

Diskussion

Habituelle Fragebögen bestätigten die weitläufige Annahme eines vermehrten Gebrauchs einer sogenannten maladaptiven Strategie (Suppression) und einer verminderten Nutzung adaptiver Strategien in PSY im Vergleich zur KG. Wird der Fokus allerdings in den Alltag der Probanden gerichtet, ergibt sich ein abweichendes Muster: PSY nutzen nicht nur eine ganze Bandbreite an unterschiedlichen Strategien, sie verwenden sie zum Teil sogar in höherem Maße als die KG (z.B. kognitives Umbewerten). Dieser Befund deckt sich mit den Ergebnissen von Visser et al. (2018). Die plausible Annahme, dass der hohen Ausprägung an negativem und der niedrigen Ausprägung an positivem Affekt eine weniger effektive Regulierung zugrunde liegt, konnte in den Daten nicht bestätigt werden. Solche Strategien, welche in der KG effektiv in der Regulation waren, zeigten sich auch in PSY als erfolgreich. Angesichts der höheren Ausprägung im negativen Affekt in PSY erscheint dieses Ergebnis zunächst überraschend. Erklärungen für die Befunde reichen von der Diskussion, dass die vorliegenden Ergebnisse ausschließlich kurzfristiger Natur sind, über den hier gesetzten Fokus auf explizite nicht aber implizite

Emotionsregulation bis hin zu der Tatsache, dass das affektive System in PSY stärker gefordert ist (Van Os, Kenis, & Rutten, 2010).

5.3 Studie III: Emotionsregulationsstrategien als Moderatoren des Pfads von negativem Affekt zu Paranoia

Ludwig, L., Mehl, S., Schlier, B., Krkovic, K., & Lincoln, T. M. (2019). Awareness and rumination moderate the affective pathway to paranoia in daily life. *Schizophrenia Research*. https://doi.org/10.1016/J.SCHRES.2019.12.007

Hintergrund und Hypothesen

Der affektive Pfad zu Paranoia ist durch vielfältige Untersuchungsmethoden gut belegt (Ben-Zeev et al., 2011; Lincoln et al., 2009). Darauf aufbauend ist die Untersuchung von Emotionsregulationsstrategien als Moderatoren auf dem Weg von negativem Affekt zu Paranoia naheliegend. Dem liegt die Annahme zugrunde, dass bei ungünstig reguliertem Affekt die erhöhte oder andauernde emotionale Intensität in Symptomen münden kann. Nur wenige Studien haben bisher die Moderationshypothese getestet. In zwei experimentellen Studien konnte gezeigt werden, dass habituelle Emotionsregulation zur Baseline den Anstieg von Paranoia in Reaktion auf einen Stressor in einer klinischen Hochrisikogruppe (Lincoln et al., 2017) und in einer klinischen Stichprobe (Lincoln et al., 2015) moderierte. Da die Essenz psychiatrischer Symptome ist, dass sie als natürliche Erfahrungen im gewöhnlichen Alltag auftreten (Myin-Germeys et al., 2018), bietet sich für die Untersuchung des dynamischen Zusammenspiels von Affekt, Emotionsregulation und Paranoia der ESM Ansatz an. In einer Stichprobe aus der Allgemeinbevölkerung mit erhöhter Vulnerabilität wurde anhand von ESM bereits gezeigt, dass maladaptive Emotionsregulation die Assoziation zwischen negativem Affekt und Paranoia moderierte (Krkovic, Krink, & Lincoln, 2018). Diese Studie bietet einen vielversprechenden Ansatz, um die Fragestellung zum einen in einer Stichprobe von Probanden mit akutem Wahn zu untersuchen und um zum anderen einen detailgenauen Einblick zu gewinnen, welche spezifischen Emotionsregulationsstrategien den Weg zu Paranoia abschwächen und welche ihn verstärken.

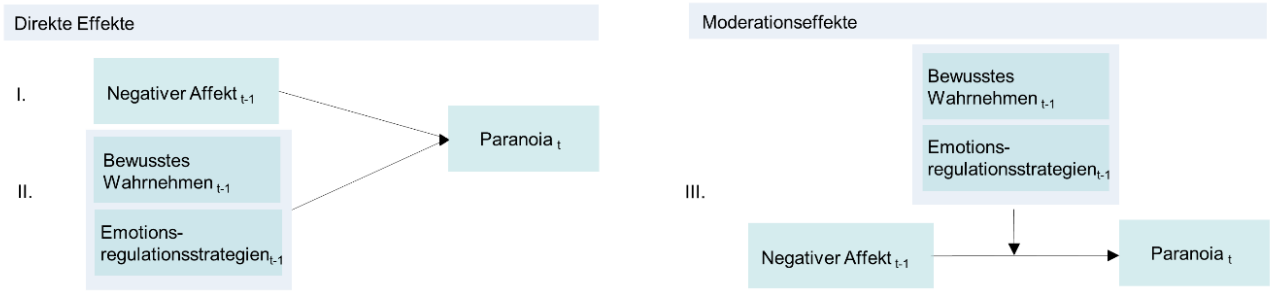


Abbildung 3 – Grafische Darstellung der Hypothesen.

Methode

Die klinische Stichprobe wurde im Rahmen der Baselineerhebung einer multizentrischen randomisiert-kontrollierten Therapiestudie zur Effektivität einer emotionsfokussierten Variante der kognitiven Verhaltenstherapie (CBTd-E) erhoben und auch für Studie II untersucht. Zur Hypothesentestung wurden Smartphones über einen Gesamtzeitraum von sechs Tagen eingesetzt, welche zu zehn zufälligen Messzeitpunkten über sechs Tage hinweg den aktuellen Affekt, die eingesetzten Emotionsregulationsstrategien sowie Paranoia erfassten. Emotionsregulationsstrategien umfassten kognitive Umstrukturierung, Rumination, sozialer Austausch, Suppression, Ablenkung, Akzeptanz sowie eine weitere Komponente des Emotionsregulationsprozesses, bewusstes Wahrnehmen. Paranoia wurde über die 3-Item Version der Paranoia Check List (Schlier, Moritz, & Lincoln, 2016) sowie über drei weitere Items (Thewissen et al., 2011) anhand einer 7-stufigen Likert-Skala erfasst. Affekt wurde über den Mittelwert sieben verschiedener Items anhand einer 7-stufigen Likert-Skala erfasst (traurig, ängstlich, schuldig, gereizt, einsam, unsicher und nervös; adaptiert nach Drees, 2008). Hierarchische lineare Modelle mit random intercept und fixed slope wurden durchgeführt.

Ergebnisse

Negativer Affekt (t-1) war ein signifikanter Prädiktor nachfolgender Paranoia (t), b=0.076, SE=0.024, p<.001, 95%CI [0.029, 0.122]. Es wurde kein direkter Effekt der einzelnen Emotions-regulationsstrategien (t-1) auf nachfolgende Paranoia (t) gefunden. Bewusstes Wahrnehmen der Emotion zu t-1 moderierte die Assoziation zwischen negativem Affekt (t-1) und Paranoia (t),

b=-0.030, *SE*=0.013, *p*=.020, 95%CI [-0.055, -0.004]. Je mehr sich die Probanden ihrer Emotionen zu t-1 bewusst waren, desto weniger stark fiel die Assoziation zwischen negativem Affekt (t-1) und Paranoia (t) aus. Im Gegensatz dazu verstärkte Rumination die Assoziation, *b*=0.032, *SE*=0.011, *p*=.004, 95%CI [0.010, 0.054].

Diskussion

Der Befund, dass negativer Affekt Paranoia zeitlich prädizierte, reiht sich in eine Vielzahl an Studien ein, die Evidenz für einen affektiven Weg zu Paranoia lieferten. Emotionsregulationsstrategien sowie das bewusste Wahrnehmen an sich waren nicht prädiktiv für Paranoia. Vielmehr zeigte sich, dass das bewusste Wahrnehmen von Emotionen und Rumination das Zusammenspiel von negativem Affekt und Paranoia modulierten. Zukünftige Studien sollten demnach die kausale Rolle dieser Komponenten auf dem affektiven Pfad zu Paranoia untersuchen. Sollte ein kausaler Zusammenhang bestätigt werden können, wie es für Rumination bereits der Fall ist (Freeman et al., 2015), erscheint es vielversprechend, Rumination und das bewusste Wahrnehmen von Emotionen als potentiellen Behandlungsfokus in psychotherapeutische Interventionen mitaufzunehmen. Dies könnte die Förderung von Fähigkeiten einschließen, die es zulassen, gegenwärtige Emotionen wahrzunehmen und sich von den kognitiven Prozessen zu lösen, welche die Emotionen aufrechterhalten.

6. Diskussion und Ausblick

Ziel der vorliegenden Dissertation war es, durch den Einsatz verschiedener Forschungsmethoden einen detailgenauen Einblick in die Rolle von Emotionsregulation in der Entstehung und Aufrechterhaltung von Wahn zu gewinnen. Die Untersuchung zugrundeliegender Mechanismen ist für die Ableitung psychosespezifischer Interventionen höchst relevant. Angesichts des robusten Zusammenhangs zwischen negativem Affekt und nachfolgendem Wahn und aufgrund von Hinweisen auf Schwierigkeiten in der Emotionsregulation bei Menschen mit Psychosen (O'Driscoll et al., 2014), erschien die Untersuchung dieses Konstrukts als potentieller Risikofaktor vielversprechend. Im Folgenden werden die drei durchgeführten Studien in Hinblick auf die Vereinbarkeit ihrer Ergebnisse, die Frage nach der Effektivität von Emotionsregulation, die Herausforderungen durch den erhöhten negativen Affekt in dieser Patientengruppe und hinsichtlich Limitationen diskutiert sowie klinische Implikationen abgewogen.

6.1 Habituelle, experimentelle und situative Untersuchungsperspektive - unterschiedliche Aspekte ein und desselben Konstrukts?

Die Ergebnisse der Dissertation, welche verschiedene Aspekte von Emotionsregulation beleuchtete, stellen die Aussagekraft einer singulären Perspektive auf Emotionsregulation in Frage. So zeigte die traditionelle Erfassung von Emotionsregulation über Fragebögen, welche in Studie I meta-analytisch zusammengefasst wurden, dass Menschen mit Psychosen im Bericht ihres habituellen Gebrauchs von Emotionsregulationsstrategien von dem der gesunden Kontrollprobanden größtenteils abwichen. Dabei war vor allem ein deutlich vermehrter Gebrauch von Rumination und Selbst-Beschuldigung in der Psychosegruppe zu verzeichnen. Etwas kleinere jedoch auch signifikante Effektstärken zeigten sich im habituellen Gebrauch von weniger kognitivem Umbewerten und vermehrter Suppression. Einige der Strategien wurden lediglich von einer kleinen Anzahl an Studien untersucht und Heterogenität war in den meisten der berechneten Random-Effects-Modellen groß, sodass hier Vorsicht bei der Interpretation geboten ist. Allgemein untermauern die Ergebnisse jedoch die Erwartungen und erhärten die Befunde einer vorangegangenen Meta-Analyse von O'Driscoll et al. (2014). Deutlich weniger Studien (k=3 für Suppression, k=2 für kognitives Umbewerten) verwendeten ein experimentelles Paradigma zur Untersuchung der Effektivität instruierter Emotionsregulationsstrategien (Studie I). Diese deuteten im Vergleich zu den Ergebnissen aus den Fragebogenstudien auf weniger

eindeutige Unterschiede in der Effektivität von Suppression und kognitivem Umbewerten zwischen beiden Gruppen hin und deuten an, dass Menschen mit Psychosen ihren negativen Affekt anhand von instruierten Strategien im Labor durchaus herunterregulieren können. Die geringe Anzahl an experimentellen Studien schränkt die Interpretierbarkeit der unterschiedlichen Ergebnisse der habituellen versus experimentellen Untersuchungsperspektive jedoch erheblich ein. Interessanterweise stehen die Ergebnisse allerdings im Einklang mit zwei neueren Studien, welche erst kürzlich bei Probanden mit psychotischen Störungen durchgeführt wurden (Opoka, Ludwig, Mehl, & Lincoln, 2020, manuscript in preparation; Opoka, Sundag, & Lincoln, 2020, manuscript submitted for publication). Zudem zeigte eine systematische Übersichtsarbeit, dass diese Diskrepanz zwischen Ergebnissen aus Fragebogenstudien und experimentellen Untersuchungen eventuell kein psychosespezifisches Phänomen ist. Störungsübergreifend wurde in 84% der untersuchten experimentellen Studien eine ebenso erfolgreiche Herunterregulierung durch kognitives Umbewerten des negativen Affekts in der klinischen Gruppe wie in der Kontrollgruppe gefunden (Zilverstand, Parvaz, & Goldstein, 2017). Ein Problem, welches der experimentellen Manipulation von Emotionsregulation anhaftet und bei der Interpretation der Ergebnisse berücksichtigt werden sollte, ist die künstliche Schaffung zweier distinkter Kategorien von Emotionsregulation (Einsetzen einer Strategie versus Nichteinsetzen) (McRae, 2013) sowie die problematische Annahme, dass lediglich eine Strategie zur Regulierung des Affekts eingesetzt wird (Aldao & Nolen-Hoeksema, 2013).

Das ESM-Design wird der Auffassung, dass es eine kontinuierliche natürliche Variation von Emotionsregulation und auch ein gleichzeitiges Einsetzen verschiedener Strategien gibt, gerechter (Studie II und Studie III). Interessanterweise zeigte sich in Studie II, dass im Alltag tatsächlich in der Regel mehrere Strategien gleichzeitig genutzt wurden (Psychosegruppe durchschnittlich um die 4, Gesunde um die 3). Dieses Ergebnis entspricht neueren Ansätzen in der Emotionsregulationsforschung, in denen postuliert wird, dass ein isoliertes Einsetzen von Strategien in der Regel nicht existiert, und vielmehr eine sogenannte Polyregulation beforscht werden sollte (Ford, Gross, & Gruber, 2019). Entgegen der durch die habituellen Fragebogenstudien geprägten Erwartungen, wie sie in Studie II durch den Einsatz von ERQ und SEK-27 auch bestätigt wurden, zeigte sich im alltäglichen Gebrauch von Emotionsregulationsstrategien ein abweichendes Muster: Menschen mit Psychosen setzten hier nicht nur vermehrt sogenannte maladaptive Strategien ein, sondern gaben auch an, die weitläufig als adaptiv beschriebene Strategie kognitives Umbewerten häufiger einzusetzen als Kontrollprobanden. Die plausible Annahme, dass es dann womöglich nicht der Einsatz per se, sondern die tatsächliche

Effektivität der Strategien ist, in der sich Menschen mit Psychosen von gesunden Kontrollprobanden unterscheiden, konnte nicht bestätigt werden. Solche Strategien, welche sich für gesunde Kontrollprobanden im Sinne einer Regulierung von negativem und positivem Affekt als effektiv erwiesen, wurden auch von der Psychosegruppe erfolgreich eingesetzt. Sogar Suppression, eine Strategie welche weitgehend als maladaptiv gilt, war nur in der Psychosegruppe, nicht aber in der Kontrollgruppe effektiv in der – zumindest kurzfristigen – Regulierung. Diese unterschiedlichen Ergebnisse werfen die Frage auf, inwiefern die verschiedenen Forschungsmethoden valide in der Erfassung von Emotionsregulation sind oder ob sie schlichtweg unterschiedliche Facetten der Emotionsregulation beleuchten.

Für die Annahme, dass habituelle und situative Designs nicht gänzlich unterschiedliche Konstrukte erfassen, sprechen Befunde, welche zeigten, dass habituelle Maße der Emotionsregulation zum Teil Aussage über das Erleben von Affekt im Alltag treffen (Moran et al., 2018). Dies konnte in Studie II weitgehend bestätigt werden. Hier erklärten habituelle Suppression und habituelles Umbewerten 11% der Varianz im negativen und 22% der Varianz im positiven Affekt im Alltag. Im Sinne der klassischen Einteilung in maladaptiv versus adaptiv waren adaptive Strategien prädiktiv für weniger negativen und mehr positiven Affekt im Alltag, während Suppression lediglich prädiktiv für weniger positiven Affekt im Alltag war. In einer explorativen Analyse, welche sich auf solche Strategien beschränkte, die sowohl habituell als auch situativ erfragt wurden, zeigte sich, dass zumindest ein Teil der Varianz im Gebrauch von situativer Suppression und von bewusstem Wahrnehmen durch die jeweilige Angabe im habituellen Fragebogen erklärt werden konnte. Situatives kognitives Umbewerten und Akzeptanz hingegen, wie über ESM erfasst, waren jedoch nicht mit ihrem habituellen Äquivalent assoziiert. Diese explorativen Ergebnisse, welche nur zum Teil auf Assoziationen zwischen beiden Erhebungsmethoden hindeuten, werfen Zweifel an der ökologischen Validität der habituellen Fragebögen auf, welche mit Erinnerungsverzerrungen verbunden sein können. Auch Verfälschungen durch globale Bewertungen in der Fragebogenuntersuchung sind denkbar (Van Os, Delespaul, Barge, & Bakker, 2014). Anderseits zeigen die habituellen Fragebögen gute psychometrische Eigenschaften (Berking & Znoj, 2008; Gross & John, 2003), während die Strategien im ESM-Design mit weniger reliablen 1-Item Skalen erfasst wurden, um die Belastung durch die Befragung im Alltag möglichst gering zu halten und den Empfehlungen für die Länge ambulatorischer Erhebungen nachzukommen (Reuschenbach & Funke, 2011, S. 550). Zwar entspricht dieser Ansatz dem üblichen Vorgehen in bisherigen ESM-Studien im Bereich der Emotionsregulation (z.B. Brans et al., 2013; Nittel et al., 2018; Visser et al., 2018), doch die

alternative Erklärung, dass die ESM-Items die entsprechenden Emotionsregulationsstrategien nicht adäquat erfasst haben, kann an dieser Stelle nicht ausgeschlossen werden.

Kritisch betrachtet ist jedoch auch denkbar, dass der selbstberichtete Gebrauch von Emotionsregulation in habituellen Maßen und die Verwendung von Emotionsregulation im Alltag distinkte Prozesse darstellen. Eine hilfreiche Einteilung könnte sein, die habituelle und situative Verwendung von Emotionsregulation auf einem Makro- und Mikrolevel zu beschreiben. Die Mikroebene stellt dabei den momentanen Gebrauch von Emotionsregulation dar, welcher möglicherweise von Kontextfaktoren beeinflusst wird (Aldao, Sheppes, & Gross, 2015), die Makroebene könnte hingegen von beständigen Faktoren geprägt sein, wie beispielsweise Selbstwirksamkeitserwartungen (Gunzenhauser et al., 2013), Kontrollüberzeugungen, inwiefern Emotionen überhaupt regulierbar sind (De Castella et al., 2013) und negativen Selbst-Schemata (Kesting & Lincoln, 2013). Ein entscheidender Faktor, der sich in einer niedrigeren Selbstwirksamkeitserwartung und einer geringeren Kontrollüberzeugung in Bezug auf Emotionsregulation in der Psychosegruppe widerspiegeln kann, stellt eventuell das nach wie vor höhere Ausmaß an negativem Affekt dar, welches sich in Studie II in der Psychosegruppe zeigte. Trotz weitgehend erfolgreicher Herunterregulierung des negativen Affekts bewegte sich die Psychosegruppe in einem konstant höheren Bereich des negativen Affekts im Vergleich zu den gesunden Kontrollprobanden. In der Tat konnte eine nicht-klinische Studie zeigen, dass implizite Theorien über die Regulierbarkeit von Emotionen mit habituellen Maßen und auch mit der Intensität des Affekts assoziiert sind. Hier zeigte sich zum einen eine positive Korrelation zwischen habituellem kognitiven Umbewerten und der Annahme, dass Emotionen veränderbar sind. Zum anderen war eben jene implizite Theorie, dass Emotionen kontrollierbar sind, negativ mit der Intensität des Affekts korreliert (Tamir, John, Srivastava, & Gross, 2007). Gleichzeitig bestätigte sich in Studie III der bereits vielfach berichtete Zusammenhang zwischen negativem Affekt und Paranoia, welcher möglicherweise hohe Ausprägungen von negativem Affekt für Menschen mit Psychosen besonders aversiv erscheinen lässt, und in Erwartungen resultiert, welche in habituellen Maßen zum Ausdruck kommen (Brudner, Denkova, Paczynski, & Jha, 2018). Niedrige Selbstwirksamkeitserwartungen sowie reduzierte Kontrollüberzeugungen durch eine erhöhte Affektinstabilität (Ergebnis der Studie II; Nittel et al., 2018) könnten so bei Menschen mit Psychosen maßgeblich an der Herausbildung einer Makroebene beteiligt sein, welche sich in den Ergebnissen der habituellen Fragebögen widerspiegelt. Bei dieser Betrachtung erscheinen auch die Ergebnisse aus den experimentellen Untersuchungen plausibel, in denen durch die Vorgabe expliziter Emotionsregulationsstrategien und die transparente Laborsituation die oben

genannten Konstrukte weniger zum Tragen kommen. Zukünftige Studien sollten demnach Emotionsregulation im Zusammenspiel mit diesen möglichen Konstrukten untersuchen und in Betracht ziehen, dass eine Ausdifferenzierung von Emotionsregulation in verschiedene Facetten für die weitere Untersuchung der Rolle von Emotionsregulation bei psychotischen Störungen essentiell erscheint.

Erste theoretische Ansätze bringen in jüngster Zeit integrative Ansätze zum Verständnis von Emotionsregulation voran und liefern Möglichkeiten, eine solche Ausdifferenzierung vorzunehmen. So postulieren Nowak et al., dass verschiedene Domänen in der Beschreibung von Emotionsregulation berücksichtigt und zu einem sogenannten Netzwerk der Emotionsregulation integriert werden müssen (Nowak, Wittkamp, Clamor, & Lincoln, 2019, manuscript submitted for publication). Hierbei werden neben der volitionalen, wie hier definiert der expliziten, Emotionsregulation, auch Emotionsbewertungen, psychophysiologische Selbstregulation und die daraus resultierende Emotionsdynamik als sich gegenseitig beeinflussende und in wechselseitigen Abhängigkeiten bestehende Elemente des Netzwerks der Emotionsregulation beschrieben. Zukünftige Forschung sollte demnach die zu kurzgreifende isolierte Betrachtung von Emotionsregulation überwinden und den postulierten integrativen Ansatz empirisch unterfüttern, um bislang konzeptuell schwer zu vereinende Ergebnisse plausibel interpretierbar zu machen.

6.2 Effektivität von Emotionsregulation

Eine singuläre Perspektive auf Emotionsregulation zu überwinden und die Ausdifferenzierung des Konstrukts weiter voranzubringen, schließt die Frage nach der Operationalisierung von Effektivität von Emotionsregulation mit ein. Eines der überraschenden Ergebnisse der Dissertation war, dass die Psychosegruppe gleichermaßen effektiv in der Herunter- bzw. Hochregulierung von negativem bzw. positivem Affekt war (Studie II). Effektivität wurde dabei anhand des Einflusses der Emotionsregulationsstrategien auf den selbstberichteten Affekt definiert. Diese Operationalisierung war zum einen im Einklang mit experimentellen Paradigmen, in denen der Rückgang von negativem Affekt durch eine zuvor eingesetzte Strategie als effektiv definiert wurde (Webb et al., 2012). Zum anderen lag das Rational für die Wahl des selbstberichteten Affekts als abhängige Variable aufgrund der gut belegten Rollen von negativem Affekt in der Wahnentstehung nahe (Myin-Germeys & van Os, 2007).

In Anbetracht der höheren Ausprägungen im negativen Affekt in der Psychosegruppe, erscheint das Ergebnis der gleichermaßen erfolgreichen Emotionsregulation zunächst kontraintuitiv. Aufgrund der berichteten signifikant höheren Ausprägungen im negativen Affekt in der Psychosegruppe, stellt sich die Frage, ob es tatsächlich möglich ist, dass diese ebenso erfolgreich in der Emotionsregulation sind wie gesunde Kontrollprobanden. Eine Erklärung ist, dass die vorliegenden Ergebnisse lediglich kurzfristige Effekte beschreiben und die Veränderungen im Affekt innerhalb von ungefähr 70-minütigen Intervallen gemessen wurden. Ob der Regulierungserfolg über einen längeren Zeitpunkt fortbesteht, bleibt unbeantwortet. Gerade bezüglich Suppression, einer Strategie, welche mit Psychopathologie (Aldao et al., 2010), mit ungünstigen langfristigen Effekten auf Gesundheitsoutcomes (Gross & John, 2003) und mit sozialen Interaktionen (Ben-Naim, Hirschberger, Ein-Dor, & Mikulincer, 2013) assoziiert ist, erscheint es intuitiv, zu erwarten, dass der Regulierungserfolg durch diese Strategie nur von kurzer Dauer ist. Gerade das Ergebnis der signifikant höheren Fluktuation im negativen Affekt in der Psychosegruppe könnte die Annahme eines nur kurzfristigen Erfolgs untermauern. Zukünftige Studien sollten kurz- versus langfristige Effekte der einzelnen Strategien untersuchen und dabei die zeitlichen, dynamischen Prozesse mitberücksichtigen, welchen die Emotionsregulation unterliegt (Kalokerinos, Résibois, Verduyn, & Kuppens, 2017).

Eine weitere Erklärung zielt auf die Auswahl der untersuchten Strategien ab. Im Sinne der Konstruktdefinition wurden Strategien gewählt, welche auf den Umgang mit der Emotion selbst abzielen anstatt auf die Veränderung der zugrundeliegenden Eigenschaften bzw. Auslöser der Emotion, wie beispielsweise Problemlösen (Garnefski et al., 2001). Zwar handelte es sich hier größtenteils um häufig untersuchte und in einer Psychosestichprobe bereits geprüfte Strategien (Nittel et al., 2018), doch ist es möglich, dass diese nicht all diejenigen abdeckten, welche zur Erforschung der Frage nach der Effektivität relevant gewesen wären. Auch der Fokus auf explizite nicht aber implizite Strategien (Koole & Rothermund, 2011) mag zu einer einseitigen Perspektive auf die Effektivität von Emotionsregulation geführt haben.

Nicht zuletzt ist bekannt, dass Menschen mit Psychosen mehr sozialem Stress ausgesetzt sind (Van Os et al., 2010) und damit das affektive System möglicherweise stärker herausgefordert ist. Da die effektive Regulierung in den Gruppen auf einem größtenteils unterschiedlichen Niveau des Affekts erfolgte, kann geschlussfolgert werden, dass Menschen mit Psychosen sogar bessere Emotionsregulationsfähigkeiten benötigen als eine gesunde Vergleichsgruppe, um negativen Affekt auf das Ausgangsniveau jener Vergleichsgruppe herunterzuregulieren. Dies wiederum stellt die hier vorgenommene Operationalisierung von

effektiver Emotionsregulation im Sinne einer Reduktion im negativen bzw. einem Anstieg im positiven Affekt infrage und regt die Diskussion weiterer Methoden in der Erfassung der Effektivität an. Denkbar ist beispielsweise, dass angesichts der unterschiedlichen Ausprägungen im negativen wie auch positiven Affekt eine Schwelle definiert wird, welche das zufriedenstellende Niveau im Affekt als Referenz für erfolgreiche Regulierung darstellt. Auch das Erfragen des subjektiven Erfolgsempfinden der Probanden stellt eventuell eine Vorgehensweise dar, welche berücksichtigt, dass möglicherweise gerade das absolute Affektniveau und weniger die relativen, sukzessiven Differenzen ausschlaggebend für das Erfolgsempfinden ist. Beide Varianten gehen jedoch auch mit psychometrischen Einbußen einher, welche Erinnerungsverzerrungen und fehlende Objektivierbarkeit einschließen und abgewogen werden müssten.

6.3 Hohe Ausprägungen im negativen Affekt – methodische Herausforderungen

Ein Ergebnis der Dissertation, welches eine Reihe von post-hoc Analysen anregte, war die hohe Ausprägung im negativen Affekt in der Psychosegruppe im Vergleich zu den gesunden Kontrollprobanden (Studie II). Zum einen ist dieses Ergebnis angesichts der Belastungen, die mit einer Psychose einhergehen, nicht überraschend. Zum anderen erfordert das hohe Ausmaß an negativem Affekt im Kontext der Emotionsregulation jedoch eine genaue Betrachtung und Analyse. Denkbar ist zum Beispiel, dass der vermehrte Gebrauch von situativen Emotionsregulationsstrategien in der Psychosegruppe als Epiphänomen eine Reaktion auf den hohen negativen Affekt darstellt. In der Tat wurden fast alle Strategien, welche signifikant häufiger von der Psychosegruppe als von den Kontrollprobanden eingesetzt wurden, von vorangehendem negativen Affekt vorhergesagt. Diese nachträgliche Analyse untermauert die aus den Ergebnissen dieser Dissertation generierte Hypothese, dass der erhöhte Gebrauch, wie er auch bei Visser et al. (2018) gefunden wurde, möglicherweise einen Versuch darstellt, mit dem hohen negativen Affekt umzugehen. Zusätzlich erschwert die hohe Ausprägung im negativen Affekt die Interpretation der Ergebnisse in Studie II. Es bleibt offen, ob eine Kontrollgruppe mit vergleichbar hoch ausgeprägtem negativen Affekt die Emotionsregulationsstrategien zu einem ähnlichen, wenn nicht sogar höheren Ausmaß verwendet hätte. Eine solche Kontrollgruppe wäre jedoch schwer zu finden und höchstwahrscheinlich weniger repräsentativ in anderen Aspekten. Post-hoc konnten wir jedoch zeigen, dass in Reaktion auf höheren negativen Affekt (über dem Median des negativen Affekts der Gesamtgruppe) nach wie vor Suppression und Rumination signifikante Prädiktoren eines Rückgangs des negativen Affekts waren. Zusätzlich zu diesen

beiden Strategien war auch kognitives Umbewerten in Reaktion auf niedrigeren negativen Affekt (unter dem Median) effektiv in der Herunterregulierung. Diese Ergebnisse sprechen dafür, dass die Ergebnisse einer größtenteils erfolgreichen Regulation nicht auf einem schlichten Effekt der Regression-zur-Mitte basieren. Interessanterweise ergänzt dieser Befund bezüglich kognitivem Umbewerten Ergebnisse anderer Studien von gesunden Stichproben, welche zeigten, dass diese Strategie bei hohen Intensitäten im negativen Affekt seltener genutzt wird (Shafir, Thiruchselvam, Suri, Gross, & Sheppes, 2016; Sheppes, Scheibe, Suri, & Gross, 2011) beziehungsweise kostspieliger und ineffektiver ist als bei niedrigeren Intensitäten im negativen Affekt (Sheppes, Catran, & Meiran, 2009; Sheppes & Meiran, 2008).

Klinisch bedeuten die hohen Levels im negativen Affekt vor allem, dass möglicherweise psychotherapeutische Interventionen, welche Emotionsregulationsfähigkeiten fördern, zu kurz greifen und darüber hinaus auch die soziale Umwelt von Patienten berücksichtigt werden sollte. Soziale Stressoren führen möglicherweise zu einer dauerhaft hohen Ausprägung im negativen Affekt oder könnten zum Zurückschnellen des regulierten Affekts führen, wie in den hohen Fluktuationen in der Psychosegruppe sichtbar war. In Anbetracht dessen stellen psychosoziale Interventionen, welche die Beteiligung unterschiedlicher Professionen in multidisziplinären Teams einschließen, eine vielversprechende und nachhaltige Behandlung psychotischer Störungen dar (DGPPN e.V. (Hrsg.) für die Leitliniengruppe, 2019, S. 225).

6.4 Implikationen für Störungsmodell

Die Aufnahme von Emotionsregulationsdefiziten in spezifische Störungsmodelle der Psychose, wie von anderen Autoren angeregt (Nittel et al., 2018), wird von den vorliegenden Ergebnissen nicht unterstützt. Vielmehr deuten die Befunde darauf hin, dass die Rolle von negativem Affekt innerhalb der Störungsmodelle weiter gestärkt werden sollte. Im Zusammenwirken mit zum einem dem Bewusstsein über eben jenen Affekt und zum anderen mit Rumination entfaltet dieser seine Auswirkung auf Paranoia, wie in Studie III gezeigt wurde. Unsere Ergebnisse deuteten so auf keinen direkten Zusammenhang zwischen Emotionsregulationsstrategien und Paranoia hin. Vielmehr scheint es das Zusammenspiel von negativem Affekt und spezifischen Komponenten der Emotionsregulation zu sein (Bewusstsein und Rumination), welches die symptomatische Reaktion auf den negativen Affekt abschwächt bzw. verstärkt. Dieser mögliche Mechanismus wurde bereits in einem Ergebnis bei Visser et al. (2018) angedeutet, welches zeigte, dass das Ausmaß an eingesetzter Emotionsregulation im Alltag 25%

der Varianz in der Positivsymptomatik zur Baseline erklärte. Wurde die Intensität von negativem Affekt jedoch hinzugefügt, so erhöhte sich die erklärte Varianz auf 37%. Da das Ergebnis aus Studie III korrelativ ist, müssten separate Studien die kausale Rolle beider Komponenten (bewusstes Wahrnehmen und Rumination) untersuchen, bevor beiden eine solch prominente Rolle auf dem affektiven Pfad zu Paranoia zugeschrieben werden kann. Um Kausalität annehmen zu können, muss der mutmaßliche kausale Mechanismus (Emotionsregulation) nicht nur mit der Outcomevariable (Paranoia) assoziiert sein, es sollte auch gezeigt werden, dass Emotionsregulation Paranoia vorangeht und inwiefern eine Änderung in der Emotionsregulation auch Änderungen in Paranoia bewirkt (Schwartz & Susser, 2006). Sollte ein kausaler Zusammenhang genauso für bewusstes Wahrnehmen gezeigt werden können, wie es für Rumination bereits in einer Therapiestudie der Fall ist (Freeman et al., 2015), erscheint es als ein vielversprechender Ansatz, Rumination und Bewusstsein von Emotionen als potentielle Ansatzpunkte in der Therapie für Menschen mit Psychosen aufzunehmen. Dritte Welle Verfahren, in denen die Vermeidung unangenehmer Erfahrungen, wie beispielsweise Emotionen, Gedanken und Symptomen, als ursächlich für Leidensdruck und psychischen Stress angesehen werden, stellen bereits neue Entwicklungen zur Arbeit mit Wahngedanken dar. Die Interventionen zielen darauf ab, die Patienten in einer wertfreien und akzeptierenden Haltung gegenüber diesen unangenehmen Erfahrungen zu unterstützen (Chadwick, 2014). Kontrollierte Therapiestudien solcher akzeptanz- und achtsamkeitsbasierten Ansätze zeigten bisher signifikante kleine bis moderate Effekte auf psychotische Symptomatik (Cramer, Lauche, Haller, Langhorst, & Dobos, 2016; Louise, Fitzpatrick, Strauss, Rossell, & Thomas, 2018), einen moderaten Effekt auf komorbide depressive Symptomatik (Louise et al., 2018) sowie eine reduzierte Hospitalisierungsrate (Cramer et al., 2016). Zugunsten der Annahme, dass solche Interventionen die Emotionsregulation verbessern, zeigte eine kontrollierte klinische Studie günstige Effekte von Akzeptanz- und Commitmenttherapie auf Emotionsregulationsfähigkeiten (Spidel, Lecomte, Kealy, & Daigneault, 2018).

6.5 Klinische Implikationen

Die vorliegenden Ergebnisse lassen den vorsichtigen Schluss zu, dass sich die Förderung bestimmter Emotionsregulationsfähigkeiten günstig auf die Wahnsymptomatik auswirken kann. Über den puren Zusammenhang zwischen habitueller Emotionsregulation und Positivsymptomatik hinaus (Studie I), lieferte Studie III Evidenz für die wahnbegünstigende Wirkung von Rumination sowie die protektive Rolle des Bewusstseins von Emotionen auf dem

affektiven Pfad zu Paranoia. Bewusstes Wahrnehmen als Resilienzfaktor zu betrachten, untermauert die Annahme, dass diese Fähigkeit eine entscheidende Voraussetzung für Emotionsregulation (Van Rijn et al., 2011) und die Grundlage für deren erfolgreichen Einsatz ist (Berking & Whitley, 2014). Unser Ergebnis reiht sich dabei in eine Vielzahl von Befunden ein, welche auf Schwierigkeiten in der Emotionswahrnehmung (Lincoln, Hartmann, Köther, & Moritz, 2015) bzw. auf die Assoziation mit dem beträchtlich breiter gefassten, verwandten Konstrukt der Alexithymie hindeuten (O'Driscoll et al., 2014). Dabei beschreibt Alexithymie neben kognitiv-affektiven Störungen in der Identifikation und Beschreibung von Emotionen auch die Schwierigkeit, Gefühle von emotionaler Erregung zu unterscheiden (Taylor, Michael Bagby, & Parker, 1991). In einer Studie zu Emotionsgranularität, dem Grad der Präzision, zwischen verschiedenen emotionalen Zuständen differenzieren zu können, zeigten Menschen mit Psychosen beispielsweise mehr Schwierigkeiten als gesunde Vergleichsprobanden (Kimhy et al., 2014). Die Fähigkeit, Emotionen zu identifizieren und zu beschreiben, war zudem mit dem sozialen Funktionsniveau bei Menschen mit Psychosen korreliert (Kimhy et al., 2012). Demnach könnte die Förderung der bewussten Emotionswahrnehmung nicht nur Paranoia verbessern, sondern auch das soziale Funktionsniveau erhöhen, welches möglicherweise in einem positiven, sich selbst aufrechterhaltenden Kreislauf münden könnte. Klinisch erscheint es daher sinnvoll, die bewusste Emotionswahrnehmung bei Menschen mit Psychosen als integralen meta-kognitiven Aspekt (Damasio, 1994) zu fördern. Dabei kann die Integration emotionaler Informationen in Prozesse des Schlussfolgerns begünstigt werden, um Abstand zu den Gefühlen zu gewinnen, um so in der Folge gezieltes proaktives Problemlösen oder Akzeptanz zu ermöglichen.

Im Kontrast dazu steht Rumination, welche in unseren Daten den affektiven Pfad zu Paranoia verstärkte. Wenn ein Mensch mit Psychosen in Kombination mit negativem Affekt grübelt, sich also „(...) gedanklich immer wieder mit nur einem Thema (...)" beschäftigt und den Eindruck hat, „(...) festzustecken, ohne zu einer Lösung zu kommen (...)" (Barnow, 2015, S. 71), werden nachfolgend paranoide Denkinhalte wahrscheinlicher. Rumination kann dabei als das Flüchten vor einem aversiven Selbstfokus beschrieben werden, indem negative Gefühle und Gedanken kognitiv unterdrückt werden oder Verhalten gezeigt wird, welches eine bewusste Selbstwahrnehmung verhindert (Nolen-Hoeksema et al., 2008, S. 410). Höchstwahrscheinlich ist ein solch maladaptiver, repetitiver Denkstil kein spezifischer Risikofaktor für Psychose, sondern vielmehr ein genereller Risikofaktor, welcher die für die Person üblichen dysfunktionalen Denkmuster aktiviert. Es ist naheliegend, dass ein solches vorherrschende Denkmuster bei

Menschen mit Psychosen mit wahnhaften Interpretationen einhergeht. Zudem kann eine dem Ruminieren oft inhärente Selbstabwertung möglicherweise zu langfristigem unerträglichem negativen Affekt führen. Dieser kann wiederum die Wahrscheinlichkeit für das Auftreten von Gedanken, die kongruent mit dem Gefühl sind erhöhen (z.B. Bedrohungsgedanken; Freeman, Garety, & Kuipers, 2001). Alternativ könnte Rumination, wie in der oben genannten Definition nach Nolen-Hoeksema et al. (2008), eine Vermeidung des andernfalls nicht auszuhaltenden negativen Affekts sein oder die Vermeidung, sich mit dessen Ursachen auseinanderzusetzen. Möglicherweise stellen Rumination und bewusste Emotionswahrnehmung zwei Seiten einer Medaille dar, welche in den diametral entgegengesetzten Moderatoreffekten in Studie III widergespiegelt werden. Klinische Implikationen schließen so die Förderung des Benennens und Identifizierens von Gefühlen mit ein (Kashdan, Barrett, & McKnight, 2015), beispielsweise mit visuellen Hilfsmitteln wie dem Gefühlsstern, welcher häufig im Rahmen von Psychoedukation über Emotionen in psychotherapeutischen Sitzungen genutzt wird (Stavemann, 2014, S. 300). Die Überwindung von Zuständen des Ruminierens durch ein Innehalten und einem Verständnis dessen, was genau gefühlt wird, ohne unmittelbar die Ursachen des Gefühls verstehen zu müssen, erscheint somit als ein sinnvoller Behandlungsfokus in der psychotherapeutischen Arbeit am Wahn. Damit reiht sich der Ansatz nicht nur in die aktuelleren Bestrebungen ein, innerhalb derer psychotherapeutische Interventionen vermehrt an den auslösenden und aufrechterhaltenden Faktoren von Psychosen ansetzen (für einen Überblick s. Lincoln & Peters, 2019), sondern auch in störungsunabhängige Empfehlungen zur Förderung von Emotionsregulation (Barnow, 2015, S. 11).

Zudem sollten aufgrund der prominenten Rolle des negativen Affekts auch andere Arten der Interventionen in Betracht gezogen werden, welche über die Förderung der Emotionsregulationsfähigkeiten hinausgehen und weitere Möglichkeiten der Affektregulierung darstellen. Dies kann Empfehlungen zur körperlichen Aktivität, eine Verbesserung der Schlafhygiene, die Unterstützung in sozialer Eingebundenheit, die Förderung der Selbstfürsorge sowie die Etablierung einer Tagesstruktur mit regelmäßigen Mahlzeiten miteinschließen (vgl. Manual zur emotionsfokussierten kognitiven Verhaltenstherapie für Psychosen, clinicaltrials.gov, NCT02787135).

6.6 Limitationen

Neben einigen bereits genannten Aspekten muss eine Reihe von Limitationen bei der Interpretation der Ergebnisse dieser Dissertation berücksichtigt werden. Als Meta-Analyse ist die Aussagekraft von Studie I zwangsläufig von der methodischen Qualität sowie der Anzahl der geeigneten Primärstudien abhängig. Die Qualität der Studien variierte beträchtlich mit dem Matching der Kontrollprobanden als eine Hauptschwäche. Auch wurde deutlich, dass einige Strategien mit einer Vielzahl an verschiedenen Inventaren gemessen wurden, was sich unmittelbar in einer potentiellen Varianz des gemessenen Konstrukts niederschlagen kann. Trotz der Bemühungen um eine präzise Konstruktdefinition, einem konservativen Prüfen auf Itemebene sowie der transparenten Darstellung der Inventare und deren Definitionen, kann eine mögliche Konfundierung durch die primären Erhebungsinstrumente nicht ausgeschlossen werden. Darüber hinaus wurden einige Strategien von nur einer spärlichen Anzahl an Primärstudien untersucht. Übereinstimmend mit Aldao et al. (2010) sollten die Ergebnisse daher nur als eine Approximation interpretiert werden.

Studie II und Studie III hingegen stellen empirische Studien dar, welche beide auf derselben Patientenstichprobe beruhen, während in Studie II zusätzlich eine gesunde Kontrollstichprobe herangezogen wurde. Diese Patientenstichprobe wurde im Rahmen einer multi-zentrischen randomisiert kontrollierten Therapiestudie zur Untersuchung der Effektivität einer emotionsfokussierten Variante der kognitiven Verhaltenstherapie rekrutiert. Eine solche Stichprobe, welche sich größtenteils selbstständig in den Hochschulambulanzen in Hamburg und Marburg vorstellten und bereit waren, eine Psychotherapie mit Fokus auf Emotionen zu beginnen, zeichnet sich möglicherweise durch eine erhöhte Motivation sowie Introspektionsfähigkeit aus. So zeigte die Stichprobe eventuell eine bereits höhere Selbstwahrnehmung als eine zufällig gezogene Patientenstichprobe oder sogar besserer Emotionsregulationsfähigkeiten als andere Patienten. Die Erfassung der Emotionsregulationsstrategien war zudem auf selbstberichtete explizite, also bewusst zugängliche, Strategien beschränkt. Zukünftige Studien sollten neben expliziter Emotionsregulation noch weitere Indikatoren von Emotionen nutzen (wie beispielsweise physiologische Indikatoren von emotionaler Erregung), da nicht auszuschließen ist, dass der negativen Selbstsicht von Menschen mit Psychosen (Kesting & Lincoln, 2013) die Wahrnehmung einer hohen Ausprägung in negativem Affekt inhärent ist und Menschen mit Psychosen somit eventuell dazu tendieren, die Ausprägung im negativen Affekt zu überschätzen (Studie II). Außerdem zielte das

Studiendesign beider Studien auf die Messung von situativer Emotionsregulation im Alltag der Probanden ab. Hierzu wurden 1-Item Skalen genutzt, die bereits in einer Psychosestichprobe eingesetzt wurden (Nittel et al., 2018). Dieses Vorgehen entspricht der bislang gängigen Praxis in der ESM-Forschung zu Emotionsregulation (Brans et al., 2013; Visser et al., 2018), um die Antwortzeit pro Befragungsmesszeitpunkt möglichst gering zu halten. Dennoch kann dies zu einer weniger validen Erfassung von Emotionsregulation geführt haben. Zwar zeigte Studie II zum Teil Zusammenhänge zwischen gut validierten habituellen Fragebögen und der ESM-Erfassung, doch zukünftige Forschung ist notwendig, um eine reliable und valide Messung von situativer Emotionsregulation zu gewährleisten. Zudem wurden Probanden über den Einsatz von Emotionsregulationsstrategien kurz vor dem Prompt zur ESM-Befragung gefragt, statt etwa die hervorstechendste emotionale Episode seit der letzten ESM-Befragung und deren Regulation zu erfassen. Unser Vorgehen hat den Vorteil von reduzierter Erinnerungsverzerrung und liefert damit ein realistischeres Bild von Emotionsregulation im Alltag. Dennoch ist es wichtig zu beachten, dass durch unsere Erhebungsmethode die Erfassung von intensiveren Emotionen möglicherweise versäumt wurde. Mit ausgiebigen wiederholten Messungen kann jedoch davon ausgegangen werden, dass diese potentielle Verzerrung möglichst reduziert wurde. Gerade aufgrund der prominenten Rolle von bewusster Wahrnehmung in den Ergebnissen der Studie III ist es essentiell zu hinterfragen, inwiefern die Erfassung der selbstberichteten Emotions-wahrnehmung überhaupt valide ist, erscheint dies auf den ersten Blick doch paradox. Demnach sollten zukünftige Studien eben jene Validität prüfen. Erste Hinweise zeigten jedoch auf habitueller Ebene, dass ein Selbstbericht der bewussten Wahrnehmung möglich ist (Lischetzke & Eid, 2003). Nicht zuletzt kann, obwohl wir nach der Regulierung und Wahrnehmung des Affekts kurz vor dem ESM-Prompt fragten, nicht ausgeschlossen werden, dass die Erfassung von sowohl positivem als auch negativem Affekt den Bericht von bewusster Emotionswahrnehmung erhöhte.

6.7 Ausblick

Um das Konstrukt der Emotionsregulation und seine verschiedenen Facetten in zukünftiger Forschung weiter auszudifferenzieren und psychoserelevante Aspekte zu beleuchten, erscheint es vielversprechend, an die innerhalb dieser Dissertation diskutierten und aufgeworfenen Forschungsfragen weiter anzuknüpfen. So deuteten die Befunde aus den Fragebogenuntersuchungen (Studie I und Studie II) gerade im Kontrast zu den Ergebnissen aus der ESM-Studie (Studie II) auf potentielle konfundierende Konstrukte hin, welche sich in den

habituellen Maßen möglicherweise widerspiegelten. Selbstwirksamkeitserwartungen bezüglich Emotionsregulation, Kontrollüberzeugungen bezüglich der Regulierbarkeit von Emotionen, und auch negative Selbstschemata erscheinen damit wertvolle Ansatzpunkte nachfolgender Studien. Aus Studie I ergibt sich zudem vor allem der Bedarf an weiteren experimentellen Designs in Stichproben mit Menschen mit Psychosen, um die bislang nur vorsichtig formulierte Aussage, dass im Labor keine Gruppenunterschiede zu verzeichnen sind, prüfen zu können. Gleichzeitig sollte jedoch auch die ökologische Validität solcher experimenteller Paradigmen erhöht werden, indem auch spontane Emotionsregulation untersucht wird, wie es in anderen Stichproben bereits angestrebt wurde (z.B. bei Probanden mit remittierter Depression, s. Ehring, Tuschen-Caffier, Schnülle, Fischer, & Gross, 2010). Über die vorgegebenen Instruktionen zum Strategieeinsatz hinaus, erscheint es außerdem essentiell, selbstgenerierte Regulationsansätze experimentell zu prüfen.

Die Untersuchung der Effektivität situativ eingesetzter Emotionsregulationsstrategien in Studie II war ein konzeptuelles und methodisches Novum. Insbesondere hier ist weitere Evidenz nötig, die den Befund gleichermaßen effektiver Emotionsregulation in Psychose- versus Kontrollstichproben bestätigt. Letztendlich sollte auch die Annahme, dass sich eine erfolgreiche Emotionsregulation stets in einer Affektreduktion äußert, weiter kritisch geprüft werden. Möglicherweise lohnt sich somit ein Schritt zurück in die Grundlagenforschung, um zu prüfen, welche dynamischen Eigenschaften einer effektiven Emotionsregulation zugrunde liegen. Zentral steht hier die Frage, ob die kurzfristige Herunterregulierung entscheidend ist oder ob vielmehr mittel- und langfristige Effekte (z.B. auch in Form von funktionellem Verhalten im Angesicht gleichbleibender affektiver Reaktion) ausschlaggebend für eine effektive Emotionsregulation sind. Denkbar ist auch, dass eventuell die individuelle Zielerreichung (Thompson, 1994) oder die Erfüllung individueller Bedürfnisse nach Emotionen (Maio & Esses, 2001) zentral für die Operationalisierung effektiver Emotionsregulation sind. Letztlich ist der vorherrschende Konsens, der sich über die Zeit herauskristallisiert hat, dass eine adaptive Anpassung durch flexibel gewählte Emotionsregulation an sich dynamisch verändernde Umwelten charakterisiert ist (Sheppes, 2014). Klug konzipierte multi-methodische Studien, die diese genannten Aspekte näher beleuchten und auch das dynamische Zusammenspiel verschiedener Strategien untersuchen (Ford et al., 2019), werden daher benötigt, um das Erschließen weitergehender und notwendiger Dimensionen der Emotionsregulation bei psychotischen Störungen weiter voranzubringen.

Studie I zeigte zudem, dass nur wenige Fragebogenstudien einen Vergleich mit weiteren klinischen Stichproben enthielten. Direkte Vergleiche mit anderen Störungsbildern werden nicht nur bezüglich der Untersuchung der habituellen Facette von Emotionsregulation, sondern auch in experimentellen sowie ESM-Studien benötigt, um zu prüfen, ob ein transdiagnostischer psychopathologischer Mechanismus oder vielmehr ein spezifischer Risikofaktor vorliegt.

Die empirischen Daten aus Studie II und III sind Teil der Baselineerhebung einer multizentrischen Therapiestudie zur Evaluation einer emotionsfokussierten Variante der kognitiven Verhaltenstherapie (KVT) für Patienten mit akutem Wahn (clinicaltrials.gov, NCT02787135). Ein wichtiger Fokus des Therapiemanuals liegt auf der Förderung von Emotionsregulationsstrategien. Die noch ausstehenden Auswertungen dieses randomisiert-kontrollierten Vergleichs zwischen Therapie- und Wartegruppe werden einen wertvollen Einblick in die Wirkmechanismen der KVT ermöglichen. Im Speziellen werden Aussagen über die Frage nach den Möglichkeiten, inwieweit Emotionsregulationsfähigkeiten im Kontext akuten Wahns psychotherapeutisch gefördert werden können, getroffen, sowie darüber, inwiefern diese den Therapieerfolg, beispielsweise im Sinne einer Wahnreduktion, moderieren. Die Analyse der über den Verlauf der 6-monatigen Therapie- bzw. Wartezeit parallel erfassten Fragebogen-, Experience Sampling sowie experimentellen Daten wird zudem die hier angeregte Ausdifferenzierung des Konstrukts der Emotionsregulation empirisch unterfüttern und in Zusammenhang mit klinischen Maßen bringen.

7. Literatur

Aldao, A., & Nolen-Hoeksema, S. (2012). The influence of context on the implementation of adaptive emotion regulation strategies. *Behaviour Research and Therapy*, *50*(7–8), 493–501. http://doi.org/10.1016/j.brat.2012.04.004

Aldao, A., & Nolen-Hoeksema, S. (2013). One versus many: Capturing the use of multiple emotion regulation strategies in response to an emotion-eliciting stimulus. *Cognition and Emotion*, *27*(4), 753–760. http://doi.org/10.1080/02699931.2012.739998

Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, *30*(2), 217–237. http://doi.org/10.1016/j.cpr.2009.11.004

Aldao, A., Sheppes, G., & Gross, J. J. (2015). Emotion Regulation Flexibility. *Cognitive Therapy and Research*, *39*(3), 263–278. http://doi.org/10.1007/s10608-014-9662-4

American Psychiatric Association. (2015). Diagnostisches und statistisches Manual psychischer Störungen DSM-5®, Deutsche Ausgabe, Hrsg. Falkai P. Hogrefe.

Arbeitskreis für Methodik und Dokumentation in der Psychiatrie (AMDP). *Das AMDP-System: Manual zur Dokumentation psychiatrischer Befunde*. (2016). Hogrefe.

Appelbaum, P. S., Robbins, P. C., & Roth, L. H. (1999). Dimensional approach to delusions: comparison across types and diagnoses. *American Journal of Psychiatry*, *156*(12), 1938–1943.

Barnow, S. (2015). *Gefühle im Griff* (2.). Berlin, Heidelberg: Springer.

Ben-Naim, S., Hirschberger, G., Ein-Dor, T., & Mikulincer, M. (2013). An experimental study of emotion regulation during relationship conflict interactions: The moderating role of attachment orientations. *Emotion*, *13*(3), 506–519. http://doi.org/10.1037/a0031473

Ben-Zeev, D., Ellington, K., Swendsen, J., & Granholm, E. (2011). Examining a cognitive model of persecutory ideation in the daily life of people with schizophrenia: A computerized experience sampling study. *Schizophrenia Bulletin*, *37*(6), 1248–1256. http://doi.org/10.1093/schbul/sbq041

Berking, M., & Whitley, B. (2014). The Adaptive Coping with Emotions Model (ACE Model). In *Affect Regulation Training* (pp. 19–29). New York, NY: Springer New York. http://doi.org/10.1007/978-1-4939-1022-9_3

Berking, M., & Znoj, H. (2008). Entwicklung und Validierung eines Fragebogens zur standardisierten Selbsteinschätzung emotionaler Kompetenzen (SEK-27), *56*(2), 141–153. http://doi.org/10.1024/1661-4747.56.2.141

Bloch, L., Moran, E. K., & Kring, A. M. (2010). On the need for conceptual and definitional clarity in emotion regulation research on psychopathology. *Emotion Regulation and Psychopathology: A Transdiagnostic Approach to Etiology and Treatment*.

Braga, R. J., Reynolds, G. P., & Siris, S. G. (2013). Anxiety comorbidity in schizophrenia. *Psychiatry Research*, *210*(1), 1–7. http://doi.org/10.1016/j.psychres.2013.07.030

Brans, K., Koval, P., Verduyn, P., Lim, Y. L., & Kuppens, P. (2013). The Regulation of Negative and Positive Affect in Daily Life. *Emotion (Washington, D.C.)*, *June*. http://doi.org/10.1037/a0032400

Breier, A., & Berg, P. H. (1999). The psychosis of schizophrenia: Prevalence, response to atypical antipsychotics, and prediction of outcome. *Biological Psychiatry*, *46*(3), 361–364. http://doi.org/10.1016/S0006-3223(99)00040-2

Brudner, E. G., Denkova, E., Paczynski, M., & Jha, A. P. (2018). The Role of Expectations and Habitual Emotion Regulation in Emotional Processing : An ERP Investigation, *18*(2), 171–180.

Buckley, P. F., Miller, B. J., Lehrer, D. S., & Castle, D. J. (2009). Psychiatric comorbidities and schizophrenia. *Schizophrenia Bulletin*, *35*(2), 383–402. http://doi.org/10.1093/schbul/sbn135

Campbell-Sills, L., Barlow, D. H., Brown, T. A., & Hofmann, S. G. (2006). Effects of suppression and acceptance on emotional responses of individuals with anxiety and mood disorders. *Behaviour Research and Therapy*, *44*(9), 1251–1263. http://doi.org/10.1016/j.brat.2005.10.001

Cannon, T. D., & Keller, M. C. (2006). Endophenotypes in the Genetic Analyses of Mental Disorders. *Annual Review of Clinical Psychology*, *2*(1), 267–290. http://doi.org/10.1146/annurev.clinpsy.2.022305.095232

Carl, J. R., Soskin, D. P., Kerns, C., & Barlow, D. H. (2013). Positive emotion regulation in emotional disorders: A theoretical review. *Clinical Psychology Review*, *33*(3), 343–360. http://doi.org/10.1016/j.cpr.2013.01.003

Chadwick, P. (2014). Mindfulness for psychosis. *British Journal of Psychiatry*, *204*(05), 333–334. http://doi.org/10.1192/bjp.bp.113.136044

Cho, H., Gonzalez, R., Lavaysse, L. M., Pence, S., Fulford, D., & Gard, D. E. (2017). Do people with schizophrenia experience more negative emotion and less positive emotion in their daily lives? A meta-analysis of experience sampling studies. *Schizophrenia Research*, *183*, 49–55. http://doi.org/10.1016/j.schres.2016.11.016

Clamor, A., Schlier, B., Köther, U., Hartmann, M. M., Moritz, S., & Lincoln, T. M. (2015). Bridging psychophysiological and phenomenological characteristics of psychosis - Preliminary evidence for the relevance of emotion regulation. *Schizophrenia Research*, *169*(1–3), 346–

350. http://doi.org/10.1016/j.schres.2015.10.035

Cohen, A. S., Callaway, D. A., Najolia, G. M., Larsen, J. T., & Strauss, G. P. (2012). On "risk" and reward: Investigating state anhedonia in psychometrically defined schizotypy and schizophrenia. *Journal of Abnormal Psychology*, *121*(2), 407–415. http://doi.org/10.1037/a0026155

Cramer, H., Lauche, R., Haller, H., Langhorst, J., & Dobos, G. (2016). Mindfulness- and Acceptance-based Interventions for Psychosis: A Systematic Review and Meta-analysis. *Global Advances in Health and Medicine*, *5*(1), 30–43. http://doi.org/10.7453/gahmj.2015.083

Damasio, A. R. (1994). *Descartes' error : emotion, reason and the human brain*.

De Castella, K., Goldin, P., Jazaieri, H., Ziv, M., Dweck, C. S., & Gross, J. J. (2013). Beliefs About Emotion: Links to Emotion Regulation, Well-Being, and Psychological Distress. *Basic and Applied Social Psychology*, *35*(6), 497–505. http://doi.org/10.1080/01973533.2013.840632

DGPPN e.V. (Hrsg.) für die Leitliniengruppe. (2019). S3-Leitlinie Schizophrenie, *Version 1.*(verfügbar unter: https://www.awmf.org/leitlinien/detail/ll/038-009.html).

Drees, J. (2008). *Associating daily life stress with the intensity of psychotic symptoms in the prodromal phase of schizophrenia*. Unpublished thesis. University of Maastricht, Netherlands

Ebner-Priemer, U. W., & Trull, T. J. (2009). Ecological Momentary Assessment of Mood Disorders and Mood Dysregulation. *Psychological Assessment*, *21*(4), 463–475. http://doi.org/10.1037/a0017075

Ehring, T., Tuschen-Caffier, B., Schnülle, J., Fischer, S., & Gross, J. J. (2010). Emotion regulation and vulnerability to depression: Spontaneous versus instructed use of emotion suppression and reappraisal. *Emotion*, *10*(4), 563–572. http://doi.org/10.1037/a0019010

Evensen, S., Wisløff, T., Lystad, J. U., Bull, H., Ueland, T., & Falkum, E. (2016). Prevalence, Employment Rate, and Cost of Schizophrenia in a High-Income Welfare Society: A Population-Based Study Using Comprehensive Health and Welfare Registers. *Schizophrenia Bulletin*, *42*(2), 476–483. http://doi.org/10.1093/schbul/sbv141

Ford, B. Q., Gross, J. J., & Gruber, J. (2019). Broadening Our Field of View: The Role of Emotion Polyregulation. *Emotion Review*, *11*(3), 197–208. http://doi.org/10.1177/1754073919850314

Fowler, D., Hodgekins, J., Garety, P., Freeman, D., Kuipers, E., Dunn, G., ... Bebbington, P. E. (2012). Negative cognition, depressed mood, and paranoia: A longitudinal pathway analysis using structural equation modeling. *Schizophrenia Bulletin*, *38*(5), 1063–1073. http://doi.org/10.1093/schbul/sbr019

Freeman, D., Dunn, G., Startup, H., Pugh, K., Cordwell, J., Mander, H., ... Kingdon, D. (2015). Effects of cognitive behaviour therapy for worry on persecutory delusions in patients with psychosis (WIT): A parallel, single-blind, randomised controlled trial with a mediation analysis. *The Lancet Psychiatry*, *2*(4), 305–313. http://doi.org/10.1016/S2215-0366(15)00039-5

Freeman, D., & Garety, P. (2014). Advances in understanding and treating persecutory delusions : a review, 1179–1189. http://doi.org/10.1007/s00127-014-0928-7

Freeman, D., Garety, P. A., & Kuipers, E. (2001). Persecutory delusions: developing the understanding of belief maintenance and emotional distress. *Psychological Medicine*, *31*(7), 1293–306.

Freeman, D., Garety, P. A., Kuipers, E., Fowler, D., & Bebbington, P. E. (2002). A cognitive model of persecutory delusions. *British Journal of Clinical Psychology*, *41*(4), 331–347. http://doi.org/10.1348/014466502760387461

Freeman, D., Stahl, D., McManus, S., Meltzer, H., Brugha, T., Wiles, N., & Bebbington, P. (2012). Insomnia, worry, anxiety and depression as predictors of the occurrence and persistence of paranoid thinking. *Social Psychiatry and Psychiatric Epidemiology*, *47*(8), 1195–203. http://doi.org/10.1007/s00127-011-0433-1

Freeman, D., Startup, H., Dunn, G., Wingham, G., Černis, E., Evans, N., ... Kingdon, D. (2014). Persecutory delusions and psychological well-being. *Social Psychiatry and Psychiatric Epidemiology*, *49*(7), 1045–1050.

Freeman, D., Waite, F., Startup, H., Myers, E., Lister, R., McInerney, J., ... Yu, L. M. (2015). Efficacy of cognitive behavioural therapy for sleep improvement in patients with persistent delusions and hallucinations (BEST): A prospective, assessor-blind, randomised controlled pilot trial. *The Lancet Psychiatry*, *2*(11), 975–983. http://doi.org/10.1016/S2215-0366(15)00314-4

Garety, P. A., Bebbington, P., Fowler, D., Freeman, D., & Kuipers, E. (2007). Implications for neurobiological research of cognitive models of psychosis: a theoretical paper. *Psychological Medicine*, *37*(10), 1377–1391. http://doi.org/10.1017/S003329170700013X

Garety, P. A., Kuipers, E., Fowler, D., Freeman, D., & Bebbington, P. E. (2001). A cognitive model of the positive symptoms of psychosis. *Psychological Medicine*, *31*(2), 189–195. http://doi.org/10.1017/S0033291701003312

Garnefski, N., Garnefski, N., Kraaij, V., Kraaij, V., Spinhoven, P., & Spinhoven, P. (2001). Negative life events, cognitive emotion regulation and emotional problems. *Personality and Individual Differences*, *30*, 1311–1327. http://doi.org/10.1016/S0191-8869(00)00113-6

Grezellschak, S., Jansen, A., & Westermann, S. (2016). Emotion regulation in patients with psychosis: A link between insomnia and paranoid ideation? *Journal of Behavior Therapy and Experimental Psychiatry*, 8–13. http://doi.org/10.1016/j.jbtep.2016.08.001

Grezellschak, S., Lincoln, T. M., & Westermann, S. (2015). Cognitive emotion regulation in patients with schizophrenia: Evidence for effective reappraisal and distraction. *Psychiatry Research*, *229*(1–2), 434–439. http://doi.org/10.1016/j.psychres.2015.05.103

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, *2*(3), 271–299. http://doi.org/10.1037/1089-2680.2.3.271

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, *85*(2), 348–362. http://doi.org/10.1037/0022-3514.85.2.348

Gross, J. J., & Thompson, R. A. (2007). Emotion Regulation: Conceptual Foundations. In J. J. Gross (Ed.), *Handbook of Emotion Regulation* (pp. 3–24). New York: Guilford Press.

Gunzenhauser, C., Heikamp, T., Gerbino, M., Alessandri, G., Van Suchodoletz, A., Di Giunta, L., ... Trommsdorff, G. (2013). Self-efficacy in regulating positive and negative emotions: A validation study in Germany. *European Journal of Psychological Assessment*, *29*(3), 197–204. http://doi.org/10.1027/1015-5759/a000151

Gyurak, A., Gross, J. J., Etkin, A., Gyurak, A., Gross, J. J., & Etkin, A. (2011). Explicit and implicit emotion regulation : A dual- process framework Explicit and implicit emotion regulation : A dual-process framework, *9931*. http://doi.org/10.1080/02699931.2010.544160

Hanssen, M., Krabbendam, L., de Graaf, R., & Vollebergh, W. (2005). Role of distress in delusion formation. *The British Journal of Psychiatry*, *187*(48), s55–s58.

Hartley, S., Barrowclough, C., & Anxiety, H. G. (2013). Anxiety and depression in psychosis: a systematic review of associations with positive psychotic symptoms, 327–346. http://doi.org/10.1111/acps.12080

Hartley, S., Haddock, G., Sa, D. V., Emsley, R., & Barrowclough, C. (2014). An experience sampling study of worry and rumination in psychosis, 1605–1614. http://doi.org/10.1017/S0033291713002080

Hasan, A., Wobrock, T., & Falkai, P. (2012). Somatische Komorbidität bei Schizophrenie: Unentdeckt und unbehandelt? *Die Psychiatrie*, *09*(03), 152–158. http://doi.org/10.1055/s-0038-1671716

Hayes, S. C., Strosahl, K., & Wilson, K. G. (1999). *Acceptance and commitment therapy : an experiential approach to behavior change*. Guilford Press.

Heiy, J. E., & Cheavens, J. S. (2014). Back to Basics : A Naturalistic Assessment of the Experience and Regulation of Emotion, *14*(5), 878–891.

Ho-wai So, S., Tang, V., & Leung, P. W. (2015). Dimensions of delusions and attribution biases along the continuum of psychosis. *PloS One*, *10*(12), e0144558.

Hor, K., & Taylor, M. (2010). Suicide and schizophrenia: a systematic review of rates and risk factors. *Journal of Psychopharmacology (Oxford, England)*, *24*(4 Suppl), 81–90. http://doi.org/10.1177/1359786810385490

Horan, W. P., Hajcak, G., Wynn, J. K., & Green, M. F. (2013). Impaired emotion regulation in schizophrenia: evidence from event-related potentials. *Psychological Medicine*, *43*(11), 2377–2391. http://doi.org/10.1017/S0033291713000019

Howes, O. D., & Murray, R. M. (2014). Schizophrenia: An integrated sociodevelopmental-cognitive model. *The Lancet*. Lancet Publishing Group. http://doi.org/10.1016/S0140-6736(13)62036-X

John, O. P., & Gross, J. J. (2004). Healthy and Unhealthy Emotion Regulation: Personality Processes, Individual Differences, and Life Span Development. *Journal of Personality*, *72*(6), 1301–1334. http://doi.org/10.1111/j.1467-6494.2004.00298.x

Kalokerinos, E. K., Résibois, M., Verduyn, P., & Kuppens, P. (2017). The temporal deployment of emotion regulation strategies during negative emotional episodes. *Emotion*, *17*(3), 450–458. http://doi.org/10.1037/emo0000248

Kashdan, T. B., Barrett, L. F., & McKnight, P. E. (2015). Unpacking Emotion Differentiation. *Current Directions in Psychological Science*, *24*(1), 10–16. http://doi.org/10.1177/0963721414550708

Kendler, K. S., & Campbell, J. (2009). Interventionist causal models in psychiatry: repositioning the mind–body problem. *Psychological Medicine*, *39*(06), 881–887.

Kesting, M.-L., & Lincoln, T. M. (2013). The relevance of self-esteem and self-schemas to persecutory delusions: A systematic review. *Comprehensive Psychiatry*, *54*(7), 766–789. http://doi.org/10.1016/j.comppsych.2013.03.002

Kimhy, D., Vakhrusheva, J., Jobson-ahmed, L., Tarrier, N., Malaspina, D., & Gross, J. J. (2012). Emotion awareness and regulation in individuals with schizophrenia : Implications for social functioning. *Psychiatry Research*, *200*(2–3), 193–201. http://doi.org/10.1016/j.psychres.2012.05.029

Kimhy, D., Vakhrusheva, J., Khan, S., Chang, R. W., Hansen, M. C., Ballon, J. S., ... Gross, J. J. (2014). Emotional granularity and social functioning in individuals with schizophrenia: An experience sampling study. *Journal of Psychiatric Research*, *53*(1), 141–148.

http://doi.org/10.1016/j.jpsychires.2014.01.020

Koole, S. L. (2009). The psychology of emotion regulation: An integrative review. *Cognition & Emotion*, *23*(1), 4–41. http://doi.org/10.1080/02699930802619031

Koole, S. L., & Rothermund, K. (2011). "I feel better but I don't know why": The psychology of implicit emotion regulation. *Cognition & Emotion*, *25*(3), 389–399. http://doi.org/10.1080/02699931.2010.550505

Kramer, I., Simons, C. J. P., Wigman, J. T. W., Collip, D., Jacobs, N., Derom, C., ... Wichers, M. (2014). Time-lagged moment-to-moment interplay between negative affect and paranoia: New insights in the affective pathway to psychosis. *Schizophrenia Bulletin*, *40*(2), 278–286. http://doi.org/10.1093/schbul/sbs194

Krkovic, K., Clamor, A., Schlier, B., & Lincoln, T. M. (2019). Emotions and persecutory ideation in daily life: On the trail of the "chicken and egg" problem. *Journal of Abnormal Psychology*. http://doi.org/10.1037/abn0000495

Krkovic, K., Krink, S., & Lincoln, T. M. (2018). Emotion regulation as a moderator of the interplay between self-reported and physiological stress and paranoia. *European Psychiatry*, *49*, 43–49. http://doi.org/10.1016/j.eurpsy.2017.12.002

Krkovic, K., Schlier, B., & Lincoln, T. (2018). An experience sampling study on the nature of the interaction between traumatic experiences, negative affect in everyday life, and threat beliefs. *Schizophrenia Research*, *201*, 381–387. http://doi.org/10.1016/j.schres.2018.05.030

Kuipers, E., Garety, P., Fowler, D., Freeman, D., Dunn, G., & Bebbington, P. (2006). Cognitive, emotional, and social processes in psychosis: Refining cognitive behavioral therapy for persistent positive symptoms. *Schizophrenia Bulletin*, *32*(SUPPL.1), 24–31. http://doi.org/10.1093/schbul/sbl014

Law, H., & Morrison, A. P. (2014). Recovery in Psychosis: A Delphi Study With Experts by Experience. *Schizophrenia Bulletin*, *40*(6), 1347–1355. http://doi.org/10.1093/schbul/sbu047

Levenson, R. W. (1994). Human emotions: A functional view In: Ekman P, Davidson RJ, eds. The nature of emotion: Fundamental questions. New York: Oxford University Press.

Lincoln, T. M. (2007). Relevant dimensions of delusions: continuing the continuum versus category debate. *Schizophrenia Research*, *93*(1), 211–220.

Lincoln, T. M., Hartmann, M., Köther, U., & Moritz, S. (2015). Dealing with feeling: Specific emotion regulation skills predict responses to stress in psychosis. *Psychiatry Research*, *228*(2), 216–222. http://doi.org/10.1016/j.psychres.2015.04.003

Lincoln, T. M., Hartmann, M., Köther, U., & Moritz, S. (2015). Do People With Psychosis Have

Specific Difficulties Regulating Emotions? *Clinical Psychology & Psychotherapy*, *22*(6), 637–646. http://doi.org/10.1002/cpp.1923

Lincoln, T. M., Peter, N., Schäfer, M., & Moritz, S. (2009). Impact of stress on paranoia: an experimental investigation of moderators and mediators. *Psychological Medicine*, *39*(7), 1129–1139. http://doi.org/10.1017/S0033291708004613

Lincoln, T. M., & Peters, E. (2018). A systematic review and discussion of symptom specific cognitive behavioural approaches to delusions and hallucinations. *Schizophrenia Research*. http://doi.org/10.1016/j.schres.2017.12.014

Lincoln, T. M., Sundag, J., Schlier, B., & Karow, A. (2017). The Relevance of Emotion Regulation in Explaining Why Social Exclusion Triggers Paranoia in Individuals at Clinical High Risk of Psychosis. *Schizophrenia Bulletin*, (October), 1–11. http://doi.org/10.1093/schbul/sbx135

Lischetzke, T., & Eid, M. (2003). Is Attention to Feelings Beneficial or Detrimental to Affective Well-Being? Mood Regulation as a Moderator Variable. *Emotion*, *3*(4), 361–377. http://doi.org/10.1037/1528-3542.3.4.361

Louise, S., Fitzpatrick, M., Strauss, C., Rossell, S. L., & Thomas, N. (2018). Mindfulness- and acceptance-based interventions for psychosis: Our current understanding and a meta-analysis. *Schizophrenia Research*, *192*, 57–63. http://doi.org/10.1016/J.SCHRES.2017.05.023

Maio, G. R., & Esses, V. M. (2001). The Need for Affect: Individual Differences in the Motivation to Approach or Avoid Emotions. *Journal of Personality*, *69*(4), 583–614. http://doi.org/10.1111/1467-6494.694156

Marquez-Arrico, J. E., Benaiges, I., & Adan, A. (2015). Strategies to cope with treatment in substance use disorder male patients with and without schizophrenia. *Psychiatry Research*, *228*(3), 752–759. http://doi.org/10.1016/j.psychres.2015.05.028

McGrath, J., Saha, S., Chant, D., & Welham, J. (2008). Schizophrenia: A concise overview of incidence, prevalence, and mortality. *Epidemiologic Reviews*, *30*(1), 67–76. http://doi.org/10.1093/epirev/mxn001

McRae, K. (2013). Emotion Regulation Frequency and Success: Separating Constructs from Methods and Time Scale. *Social and Personality Psychology Compass*, *7*(5), 289–302. http://doi.org/10.1111/spc3.12027

Mestdagh, A., & Hansen, B. (2014). Stigma in patients with schizophrenia receiving community mental health care: a review of qualitative studies. *Social Psychiatry and Psychiatric Epidemiology*, *49*(1), 79–87. http://doi.org/10.1007/s00127-013-0729-4

Millier, A., Schmidt, U., Angermeyer, M. C., Chauhan, D., Murthy, V., Toumi, M., & Cadi-Soussi, N.

(2014). Humanistic burden in schizophrenia: A literature review. *Journal of Psychiatric Research*, *54*, 85–93. http://doi.org/10.1016/J.JPSYCHIRES.2014.03.021

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., Altman, D., Antes, G., ... Tugwell, P. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, *6*(7). http://doi.org/10.1371/journal.pmed.1000097

Moran, E. K., Culbreth, A. J., & Barch, D. M. (2018). Emotion Regulation Predicts Everyday Emotion Experience and Social Function in Schizophrenia. *Clinical Psychological Science*, *6*(2), 271–279. http://doi.org/10.1177/2167702617738827

Moritz, S., & Van Quaquebeke, N. (2014). Are you sure? Delusion conviction moderates the behavioural and emotional consequences of paranoid ideas. *Cognitive Neuropsychiatry*, *19*(2), 164–180. http://doi.org/10.1080/13546805.2013.819781

Myin-Germeys, I., Kasanova, Z., Vaessen, T., Vachon, H., Kirtley, O., Viechtbauer, W., & Reininghaus, U. (2018). Experience sampling methodology in mental health research: new insights and technical developments. *World Psychiatry*, *17*(May), 123–132. http://doi.org/10.1002/wps.20513

Myin-Germeys, I., & van Os, J. (2007). Stress-reactivity in psychosis: Evidence for an affective pathway to psychosis. *Clinical Psychology Review*, *27*(4), 409–424. http://doi.org/10.1016/j.cpr.2006.09.005

Naeem, F., Khoury, B., Munshi, T., Ayub, M., Lecomte, T., Kingdon, D., & Farooq, S. (2016). Brief cognitive behavioral therapy for psychosis (CBTp) for schizophrenia: Literature review and meta-analysis. *International Journal of Cognitive Therapy*, *9*(1), 73–86. http://doi.org/10.1521/ijct_2016_09_04

Nittel, C. M., Lincoln, T. M., Lamster, F., Leube, D., Rief, W., Kircher, T., & Mehl, S. (2018). Expressive suppression is associated with state paranoia in psychosis: An experience sampling study on the association between adaptive and maladaptive emotion regulation strategies and paranoia. *British Journal of Clinical Psychology*. http://doi.org/10.1111/bjc.12174

Nolen-Hoeksema, S., & Davis, C. G. (1999). "Thanks for sharing that": Ruminators and their social support networks. *Journal of Personality and Social Psychology*, *77*(4), 801–814. http://doi.org/10.1037/0022-3514.77.4.801

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking Rumination. *Perspectives on Psychological Science*, *3*(5), 400–424. http://doi.org/10.1111/j.1745-6924.2008.00088.x

Nowak, U., Wittkamp, M. F., Clamor, A., & Lincoln, T. M. (2019). Using the Ball-in-Bowl Metaphor to Integrate the Concepts of Emotion Regulation, Emotion Appraisals, Psychophysiological

Self-Regulation, and Emotion Dynamics. *Manuscript Submitted for Publication*.

O'Driscoll, C., Laing, J., & Mason, O. (2014). Cognitive emotion regulation strategies, alexithymia and dissociation in schizophrenia, a review and meta-analysis. *Clinical Psychology Review*, *34*(6), 482–495. http://doi.org/10.1016/j.cpr.2014.07.002

Opoka, S. M., Ludwig, L., Mehl, S., & Lincoln, T. M. (2020). An experimental study on emotion regulation effectiveness in patients with acute delusions. *Manuscript in Preparation*.

Opoka, S. M., Sundag, J., & Lincoln, T. M. (2020). Emotion-regulation in psychosis: patients with psychotic disorders apply reappraisal successfully. *Manuscript Submitted for Publication*.

Perry, Y., Henry, J. D., Nangle, M. R., & Grisham, J. R. (2012). Regulation of negative affect in schizophrenia: The effectiveness of acceptance versus reappraisal and suppression. *Journal of Clinical and Experimental Neuropsychology*, *34*(5), 497–508. http://doi.org/10.1080/13803395.2012.661405

Preti, A., & Cella, M. (2010). Paranoid thinking as a heuristic. *Early Intervention in Psychiatry*, *4*(3), 263–266. http://doi.org/10.1111/j.1751-7893.2010.00190.x

Reeve, S., Sheaves, B., & Freeman, D. (2015). The role of sleep dysfunction in the occurrence of delusions and hallucinations: A systematic review. *Clinical Psychology Review*, *42*, 96–115. http://doi.org/10.1016/j.cpr.2015.09.001

Reuschenbach, B., & Funke, J. (2011). Themenbereich B: Methodologie und Methoden / Psychologische Diagnostik / Leistungs-, Intelligenz- und Verhaltensdiagnostik. In L. F. Hornke, M. Amelang, M. Kersting, N. Birbaumer, D. Frey, J. Kuhl, ... R. Schwarzer (Eds.), . Hogrefe Verlag.

Richards, J. M., Butler, E. A., & Gross, J. J. (2003). Emotion Regulation in Romantic Relationships: The Cognitive Consequences of Concealing Feelings. *Journal of Social and Personal Relationships*, *20*(5), 599–620. http://doi.org/10.1177/02654075030205002

Rowland, J. E., Hamilton, M. K., Lino, B. J., Ly, P., Denny, K., Hwang, E. J., ... Green, M. J. (2013). Cognitive regulation of negative affect in schizophrenia and bipolar disorder. *Psychiatry Research*, *208*(1), 21–28. http://doi.org/10.1016/j.psychres.2013.02.021

Sarin, F., Wallin, L., & Widerlöv, B. (2011). Cognitive behavior therapy for schizophrenia: A meta-analytical review of randomized controlled trials. *Nordic Journal of Psychiatry*, *65*(3), 162–174. http://doi.org/10.3109/08039488.2011.577188

Schlier, B., Ludwig, L., Wiesjahn, M., Jung, E., & Lincoln, T. M. (2019). Fostering coping as a mechanism of symptom change in cognitive behavioural therapy for psychosis. *Schizophrenia Research*. http://doi.org/10.1016/J.SCHRES.2019.07.047

Schlier, B., Moritz, S., & Lincoln, T. M. (2016). Measuring fluctuations in paranoia: Validity and psychometric properties of brief state versions of the Paranoia Checklist. *Psychiatry Research*, *241*, 323–332. http://doi.org/10.1016/j.psychres.2016.05.002

Schwartz, S. ., & Susser, E. (2006). What is a cause? In E. Susser, S. Schwartz, A. Morabia, & E. J. Bromet (Eds.), *Psychiatric Epidemiology: Searching for the Causes of Mental Disorder* (Oxford Uni). New York, NY.

Shafir, R., Thiruchselvam, R., Suri, G., Gross, J. J., & Sheppes, G. (2016). Neural processing of emotional-intensity predicts emotion regulation choice. *Social Cognitive and Affective Neuroscience*, *11*(12), 1863–1871. http://doi.org/10.1093/scan/nsw114

Sheppes, G. (2014). Emotion regulation choice: Theory and findings. In *Handbook of emotion regulation, 2nd ed.* (pp. 126–139). New York, NY, US: Guilford Press.

Sheppes, G., Catran, E., & Meiran, N. (2009). Reappraisal (but not distraction) is going to make you sweat: Physiological evidence for self-control effort. *International Journal of Psychophysiology*, *71*(2), 91–96. http://doi.org/10.1016/j.ijpsycho.2008.06.006

Sheppes, G., & Meiran, N. (2008). Divergent Cognitive Costs for Online Forms of Reappraisal and Distraction. *Emotion*, *8*(6), 870–874. http://doi.org/10.1037/a0013711

Sheppes, G., Scheibe, S., Suri, G., & Gross, J. J. (2011). Emotion-regulation choice. *Psychological Science*, *22*(11), 1391–1396. http://doi.org/10.1177/0956797611418350

Spidel, A., Lecomte, T., Kealy, D., & Daigneault, I. (2018). Acceptance and commitment therapy for psychosis and trauma: Improvement in psychiatric symptoms, emotion regulation, and treatment compliance following a brief group intervention. *Psychology and Psychotherapy: Theory, Research and Practice*, *91*(2), 248–261. http://doi.org/10.1111/papt.12159

Stavemann, H. (2014). *Einführung in die KVT: Die Therapie emotionaler Turbulenzen* (5.). Weinheim, Basel: Beltz Psychologie.

Strauss, G. P., Kappenman, E. S., Culbreth, A. J., Catalano, L. T., Lee, B. G., & Gold, J. M. (2013). Emotion regulation abnormalities in schizophrenia: Cognitive change strategies fail to decrease the neural response to unpleasant stimuli. *Schizophrenia Bulletin*, *39*(4), 872–883. http://doi.org/10.1093/schbul/sbs186

Tamir, M., John, O. P., Srivastava, S., & Gross, J. J. (2007). Implicit Theories of Emotion: Affective and Social Outcomes Across a Major Life Transition. *Journal of Personality and Social Psychology*, *92*(4), 731–744. http://doi.org/10.1037/0022-3514.92.4.731

Taylor, G. J., Michael Bagby, R., & Parker, J. D. A. (1991). The Alexithymia Construct: A Potential Paradigm for Psychosomatic Medicine. *Psychosomatics*, *32*(2), 153–164.

http://doi.org/10.1016/S0033-3182(91)72086-0

Thewissen, V., Bentall, R. P., Oorschot, M., à Campo, J., van Lierop, T., van Os, J., & Myin-Germeys, I. (2011). Emotions, self-esteem, and paranoid episodes: An experience sampling study. *British Journal of Clinical Psychology*, *50*(2), 178–195. http://doi.org/10.1348/014466510X508677

Thompson, R. A. (1994). Emotion regulation: a theme in search of definition. *Monographs of the Society for Research in Child Development*, *59*(2–3), 25–52.

Thornicroft, G., Brohan, E., Rose, D., Sartorius, N., Leese, M., & INDIGO Study Group. (2009). Global pattern of experienced and anticipated discrimination against people with schizophrenia: a cross-sectional survey. *The Lancet*, *373*(9661), 408–415. http://doi.org/10.1016/S0140-6736(08)61817-6

Trull, T. J., & Ebner-Priemer, U. (2013). Ambulatory assessment. *Annual Review of Clinical Psychology*, *9*, 151–76. http://doi.org/10.1146/annurev-clinpsy-050212-185510

Turner, D. T., van der Gaag, M., Karyotaki, E., & Cuijpers, P. (2014). Psychological Interventions for Psychosis: A Meta-Analysis of Comparative Outcome Studies. *American Journal of Psychiatry*, *171*(5), 523–538. http://doi.org/10.1176/appi.ajp.2013.13081159

Van der Gaag, M., Valmaggia, L. R., & Smit, F. (2014). The effects of individually tailored formulation-based cognitive behavioural therapy in auditory hallucinations and delusions: A meta-analysis. *Schizophrenia Research*, *156*(1), 30–37. http://doi.org/10.1016/j.schres.2014.03.016

Van Der Meer, L., Swart, M., Velde, J. Van Der, & Pijnenborg, G. (2014). Neural Correlates of Emotion Regulation in Patients with Schizophrenia and Non-Affected Siblings, *9*(6). http://doi.org/10.1371/journal.pone.0099667

Van Os, J., Delespaul, P., Barge, D., & Bakker, R. P. (2014). Testing an mhealth momentary assessment routine outcome monitoring application: A focus on restoration of daily life positive mood states. *PLoS ONE*, *9*(12), 1–19. http://doi.org/10.1371/journal.pone.0115254

van Os, J., & Kapur, S. (2009). Schizophrenia. *Lancet (London, England)*, *374*(9690), 635–45. http://doi.org/10.1016/S0140-6736(09)60995-8

Van Os, J., Kenis, G., & Rutten, B. P. F. (2010). The environment and schizophrenia. *Nature*, *468*(7321), 203–212. http://doi.org/10.1038/nature09563

Van Rijn, S., Schothorst, P., Wout, M. V., Sprong, M., Ziermans, T., van Engeland, H., ... Swaab, H. (2011). Affective dysfunctions in adolescents at risk for psychosis: Emotion awareness and social functioning. *Psychiatry Research*, *187*(1–2), 100–105.

http://doi.org/10.1016/j.psychres.2010.10.007

Veling, W., Pot-Kolder, R., Counotte, J., Van Os, J., & Van Der Gaag, M. (2016). Environmental Social Stress, Paranoia and Psychosis Liability: A Virtual Reality Study. *Schizophrenia Bulletin*, *42*(6), 1363–1371. http://doi.org/10.1093/schbul/sbw031

Visser, K. F., Esfahlani, F. Z., Sayama, H., & Strauss, G. P. (2018). An ecological momentary assessment evaluation of emotion regulation abnormalities in schizophrenia. *Psychological Medicine*, 1–9. http://doi.org/10.1017/S0033291717003865

Webb, T. L., Miles, E., & Sheeran, P. (2012). Dealing with feeling: A meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. *Psychological Bulletin*, *138*(4), 775–808. http://doi.org/10.1037/a0027600

Westermann, S., Rief, W., & Lincoln, T. M. (2014). Emotion regulation in delusion-proneness: Deficits in cognitive reappraisal, but not in expressive suppression. *Psychology and Psychotherapy: Theory, Research and Practice*, *87*(1), 1–14. http://doi.org/10.1111/papt.12000

Williams, D. W. P., Cash, C., Rankin, C., Bernardi, A., Koenig, J., & Thayer, J. F. (2015). Resting heart rate variability predicts self-reported difficulties in emotion regulation: A focus on different facets of emotion regulation. *Frontiers in Psychology*, *6*(MAR), 1–8. http://doi.org/10.3389/fpsyg.2015.00261

Zawadzki, M. J. (2015). Rumination is independently associated with poor psychological health: Comparing emotion regulation strategies. *Psychology and Health*, *30*(10), 1146–1163. http://doi.org/10.1080/08870446.2015.1026904

Zilverstand, A., Parvaz, M. A., & Goldstein, R. Z. (2017). Neuroimaging cognitive reappraisal in clinical populations to define neural targets for enhancing emotion regulation. A systematic review. *NeuroImage*, *151*(December 2015), 105–116. http://doi.org/10.1016/j.neuroimage.2016.06.009

Zubin, J., & Spring, B. (1977). Vulnerability--a new view of schizophrenia. *Journal of Abnormal Psychology*, *86*(2), 103–26. http://doi.org/10.1037//0021-843x.86.2.103

Zyzanski, S. J., Flocke, S. A., & Dickinson, L. M. (2004). On the Nature and Analysis of Clustered Data, 199–200. http://doi.org/10.1370/afm.197.tudies

8. Anhang A: Studie I

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Review

The relevance of cognitive emotion regulation to psychotic symptoms – A systematic review and meta-analysis

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HIGHLIGHTS

- Emotion regulation (ER) is markedly impaired in patients with psychotic disorders.
- Maladaptive ER is more frequently and adaptive ER less frequently used.
- Maladaptive but not adaptive ER strategies are associated with severity of positive symptoms.
- No differences are evident in experimental studies, in which patients were instructed to use ER strategies.

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Schizophrenia

ABSTRACT

Numerous studies emphasise the pivotal role of negative affect in the formation and maintenance of positive symptoms, which moves emotion regulation (ER) as a contributing factor into focus. We systematically reviewed and meta-analysed case-control studies reporting cross-sectional, correlative and experimental data of ER strategies in patients with psychotic disorders. In total, 42 studies were eligible, providing data for 2498 subjects and 3381 healthy controls. Questionnaire-based cross-sectional data (k = 39) indicated strongest effects for rumination (g = -0,67 [-0,85 to -0,48]), self-blaming (g = -0,56; [-0,76 to -0,37]) and distraction (g = 0,55 [0,11 to 0,98]). Suppression was more frequently (g = -0,36 [-0,56 to -0,16]) and cognitive reappraisal less frequently used (g = 0,41 [0,28 to 0,55]), but heterogeneity was high. Correlative data (k = 6) supported the assumption of an association between maladaptive strategies and positive symptoms (r = 0,34 [0,22 to 0,44]). Less evidence of group differences was found in the experimental studies (k = 3). The findings support the notion that ER is markedly impaired in patients with psychotic disorders. However, future research will need to further clarify the extent to which difficulties continue to exist after controlling for context and emotion intensity. The large effects for rumination and self-blaming point to promising treatment targets but also raise questions concerning the specifity of findings.

1. Introduction

Current psychological conceptualisations of psychosis emphasise the relevance of negative affect, an umbrella term used for affective states and discrete emotions such as fear, shame, guilt and anger, to delusion formation and maintenance (Garety, Kuipers, Fowler, Freeman, & Bebbington, 2001; Kuipers et al., 2006; Preti & Cella, 2010). For example, within the cognitive model of positive symptoms, Garety et al. (2001) assume negative affect along with cognitive biases to contribute to a delusional interpretation of anomalous or ambiguous experiences. Similarly, in Preti and Cella's heuristical approach, negative affect is ascribed a key role in emphasising the threatening value of neutral stimuli and thus increasing the likelihood of paranoid interpretations (Preti & Cella, 2010).

Numerous studies using a variety of research designs corroborate the relevance of negative affect in the formation, maintenance and exacerbation of delusions: Epidemiological studies point to high comorbidity rates with affective and anxiety disorders (50% for anxiety and 38% for depression) (Braga, Reynolds, & Siris, 2013; Buckley, Miller, Lehrer, & Castle, 2009). Longitudinal studies confirm negative affect, and particularly anxiety (Garety et al., 2005), to be a predecessor of subsequent delusions (Fowler et al., 2012; Freeman et al., 2012;

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Kramer et al., 2014; Lincoln, Marin, & Jaya, 2017). Experimental studies find anxiety to mediate the impact of stress on paranoia (Lincoln, Peter, Schäfer, & Moritz, 2009). Finally, the suggested prediction of psychotic symptoms through negative affect is also confirmed by studies applying the experience sampling method (ESM) (Ben-Zeev, Ellington, Swendsen, & Granholm, 2011; Delespaul, deVries, & van Os, 2002; Hartley, Haddock, Sa, Emsley, & Barrowclough, 2014; Thewissen et al., 2011).

Given the crucial role of negative affect for symptom formation, it is intuitive to presume that patients with psychosis show particular difficulties in regulating negative affect. Emotion regulation (ER) is defined as *"extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goals"* (Thompson, 1994). Gross and Thompson's (2007) process model constitutes one of the most widely used frameworks, in which the various strategies are allocated in terms of their primary impact on the emotion-generative process (Gross, 1998; Gross & Thompson, 2007). Together with other frameworks (e.g. Koole, 2009), this model has guided the research in the field that has focused on investigating the distinct strategies proposed by Gross, including reappraisal, suppression and distraction (Bloch, Moran, & Kring, 2010; Webb, Miles, & Sheeran, 2012). Over time, researchers have postulated additional strategies. For example, Berking's model of adaptive ER, which describes ER as the interplay of nine different skills, includes the ability to accept one's emotions (Berking & Whitley, 2014), whereas other researchers have proposed a more fine-grained range of cognitive strategies, including those frequently found in clinical disorders, such as rumination and self-blaming (Garnefski, Kraaij, & Spinhoven, 2001). Thus, investigating ER involves taking into account the wide range of different strategies assumed to be relevant.

Cross-sectional research of ER strategies based on self-report data in patients with psychosis was aggregated by O'Driscoll, Laing, and Mason (2014). Their comprehensive meta-analysis covered the research conducted by May 2014 and included case-control studies, focusing on ER strategies as well as on broad constructs of emotional processes, such as alexithymia and dissociation. In line with the expectation that psychosis is associated with problems in ER, they found that less adaptive strategies, such as suppression, distraction and rumination are more frequently employed by patients with psychosis than by healthy controls, whereas the more adaptive strategy cognitive reappraisal is less frequently used. However, a basic literature research of the relevant search terms reveals an exponential growth, with a major increase of publications particularly in the last three years (e.g. more studies have been published in this realm between 2014 and 2017 than in all years before). Also, despite the thorough approach taken in this previous meta-analysis, several questions remain unanswered. For one, not all the relevant strategies included in recent conceptualisations of ER were covered. For example, the analysis did not include studies investigating acceptance and self-blaming, although these have been studied in psychosis in several recent studies (Lincoln, Hartmann, Köther, & Moritz, 2015a; Rowland et al., 2013a; Rowland et al., 2013). Furthermore, the available literature at that point was not sufficient to analyse the association between positive symptoms and the deployment of ER strategies. Additionally, the focus on self-report questionnaires is inevitably restricted to the analysis of how frequently people think they use certain ER strategies or as how effective they perceive the strategies to be, whereas in experimental designs participants are typically asked to either down- or up-regulate induced negative emotions, which provides insight into the actual success of using certain strategies. An updated review and meta-analysis of the constantly growing body of research in this field that also addresses these remaining research questions is likely to advance our understanding of which aspects of ER are associated with psychosis.

Whilst setting the rationale of this review, we were cognisant of the substantive definitional ambiguity of ER which is also reflected by the variety of measures employed (Bloch et al., 2010). The lacking consensus primarily concerns the distinction of *emotion regulation* and *coping*. The considerable overlap between these constructs becomes apparent by comparing the definition of ER by Thompson (1994, pp. 27-28)*"… processes responsible for monitoring, evaluating, and modifying emotional reactions… to accomplish one's goals"* (Thompson, 1994) to a prototypical definition of coping by Lazarus and Folkman (1984, p. 141) that defines coping as the "*…constantly changing cognitive and behavioural efforts to manage specific external and/or internal demands that are appraised as taxing.*" (Lazarus & Folkman, 1984). Moreover, Folkman et al. (1986, p. 993) describe "*two widely recognized major functions [of coping]: regulating stressful emotions… and altering the troubled person-environment relation causing the distress*" (Folkman et al., 1986). Gross' attempts to solve this definitional problem by confining coping to negative emotions and longer periods (e.g. bereavement) (Gross & Thompson, 2007). Another possible solution is to distinguish between regulating the emotion itself (ER) versus regulating the underlying features, such as the situation which triggered the emotion (coping) (Thompson & Calkins, 1996). Garnefski et al. (2001, p. 1313), narrow the concept down even further by focusing on the cognitive component of ER and defining cognitive ER as *"the cognitive way of managing the intake of emotionally arousing information"* rather than the emotion-eliciting situation (Garnefski et al., 2001). We used this conceptualisation as a framework of our meta-analysis as it is (1) viable and broad enough to provide a representative overview of the existing literature within the field of psychosis research but (2) narrow enough to allow for a substantive interpretation of the data.

This review aims to meta-analyse and evaluate the existing literature in regard to (1) cross-sectional differences between patients with psychosis and healthy controls in the habitual deployment of cognitive ER strategies, expanding the existing meta-analysis by further strategies, such as acceptance, (2) the association between the extent of positive symptoms and the frequency of the various ER strategies, and (3) the differences in the success of various ER strategies after affect induction within experimental designs in patients with psychosis versus healthy controls.

2. Method

2.1. Search method for inclusion of studies

The analysis was conducted in line with the PRISMA guidelines (Moher et al., 2009). Relevant studies were identified by searching the databases PubMed, PsycINFO and MEDLINE, covering the time period until January 2018. Search terms were selected as in O'Driscoll et al., 2014 by compiling keywords into 1) psychosis related terms (psychosis [Title] OR delusion[Title] OR schizophrenia[Title]), 2) ER and related terms and 3) ER and coping scales (see supplementary data). Reference lists from related meta-analyses and primary studies were reviewed to complete the literature research. We did not seek unpublished data.

2.2. Selection of studies

Articles were considered relevant if they were (1) published in English and described (2) cross-sectional, correlational or experimental data of (3) ER strategies in (4) patients diagnosed with schizophrenia spectrum disorders compared to (5) healthy controls (studies that used pre-existing normative data as a control group were excluded) and (6) provided sufficient data for calculating effect sizes. Data from experimental research designs was included in the analyses if the study a) involved a controlled comparison of strategy versus non-strategy use in response to the induction of negative affect through emotion eliciting stimuli, and b) had included a self-report measure of negative affect following these manipulations. Thus, studies investigating only the neural (e.g. event-related potentials) or behavioural correlates (e.g. eye-movement) of ER were not included. Studies were reviewed for eligibility by the first author and checked by a second rater. In case of

multiple publications from the same study, we selected the one with the fullest description given. If different aspects and analyses based on the same data set were presented, we treated these as coming from one primary study. Any questions and discrepancies among the raters concerning the eligibility of a study were resolved in consensus between the first and the third author. A flow diagram of the systematic review outlining frequencies of reasons for exclusion can be found in the Appendix (A).

2.3. Quality appraisal

Methodological quality was assessed using an adaptation of the Newcastle-Ottawa Quality Assessment Scale for case-control studies (Wells et al., 2011) (supplementary data). Data was extracted and evaluated for quality independently by two raters.

2.4. Assessment of risk of bias

We assessed low, high or unclear risk of bias regarding selection bias, confounders and measurement bias following the classification scheme used by O'Driscoll et al. (2014), which is based on the Cochrane Collaboration's tool for assessing risk of bias (Higgins et al., 2011) (supplementary data). Two raters coded the risk of bias independently and any disagreements were resolved by another author. Funnel plots were produced and checked for asymmetry.

2.5. Analysis of questionnaire-based data

Self-reported questionnaire-based data from relevant subscales on ER was extracted and compiled into the following ER strategies: *cognitive reappraisal, acceptance, awareness, managing emotions, suppression, rumination, distraction* and *self-blaming.*Table 1 provides a description of the inventories considered and indicates the specific subscale used. Group contrasts were presented throughout in the primary studies. Means and standard deviations were extracted to calculate standardised mean differences (SMD; Hedges' *g*). As an approximate guide we interpreted effect sizes as small (0,2), moderate (0,5) and large (0,8) (Cohen, 1992). We used a random-effect model since studies differ in various ways (e.g. patient population) and we did not assume them to share a common effect size. We estimated the between-study variance with DerSimonian-Laird (DL) method and reported a 95% confidence interval to address the uncertainty in the estimate. Additionally, we calculated the I^2 statistic to estimate the percentage of observed variation in effect size due to variation in true effects and interpreted the I^2 statistic in terms of low (25%), moderate (50%) and high (75%) inconsistency (Higgins, Thompson, Deeks, & Altman, 2003). In order to combine correlational data between ER strategies and positive symptoms, we used the Fisher's Z-transformation and then back transformed the Fisher's Z coefficients to raw correlation coefficients (Borenstein, Hedges, Higgins, & Rothstein, 2009). Because the low number of primary studies for this question prevented the effect integration for the individual strategies, we compiled the strategies into adaptive and maladaptive strategies following a commonly used distinction made on the basis of their associated immediate behavioural, affective and cognitive effects (for an overview see Aldao & Nolen-Hoeksema, 2012). To avoid violation of the assumption of independence in those cases, in which multiple effect sizes from one study were available for the adaptive or maladaptive category (e.g. a study reporting on rumination as well as suppression, which were both classified as maladaptive strategies), we formed the composite effect size by averaging the dependent effect sizes.

2.6. Analysis of data extracted from experimental study designs

For each study providing self-report data from experimental studies, we described the design and the ER strategies with which participants were asked to down-regulate these emotions. Where available we also described the neurophysiological indicators (e.g. EEG, fMRT) of ER (Appendix B). In line with the primary studies, we operationalised success of ER as a reduction of self-reported negative affect after the use of an instructed strategy compared to the control condition. We computed the difference in standardised mean change for pretest-posttest control group designs (Morris, 2008). Mean change scores were calculated for each group by dividing the difference in self-reported negative affect between the control (viewing) and experimental condition by the standard deviation of the control condition. We then calculated the difference in mean change between patient and healthy control groups. This type of effect size for experimental data indicates how much larger (or smaller) the reduction of negative affect in the patient group was when compared to the healthy control group. In keeping with the procedure chosen for self-report data, we integrated effect sizes in cases where more than one study reported on the same instructed ER strategy applied to the same valence of emotion-eliciting stimuli.

Statistical analyses were carried out in R (Version 3.4.3) using the meta-analysis package metafor (Version 2.0-0).

3. Results

In total, 42 studies (of which 22 were not included in the meta-analysis by O'Driscoll et al., 2014) fulfilled the inclusion criteria, providing data for 2498 subjects (mean age 39,40; range 20-62 years) and 3381 healthy controls (mean age 40,34; range 22-63 years). Thirty-nine studies investigated habitual ER, using a range of different self-report questionnaires in a cross-sectional design. Eight of those studies provided additional correlative data on the association between the extent of positive symptoms and the frequency of ER strategies in the patient sample. In the remaining three studies, experimental paradigms were used. Among those, two studies additionally used standardised self-report questionnaires investigating habitual ER. Individual study characteristics are listed in the main table (Appendix B).

3.1. Quality and risk of bias

The quality of the studies ranged from 4-10 on the adapted Newcastle-Ottawa Quality Assessment Scale (with possible maximum score of 10) (supplementary data). The median score was 8 (IQR 7-9). As can be seen in Fig. 1, the criteria receiving the lowest ratings were the matching of subjects and controls as well as the definition of controls. Assessment of risk of bias indicated low levels of potential bias overall (Fig. 1). Individual quality and risk of bias scores are listed in the study characteristics (Appendix B). We visually inspected funnel plots. Overall, publication bias was not evident (supplementary data).

3.2. Measuring instruments

Table 1 depicts the measures and the subscales considered for the effect integration and their associated psychometric properties, as well as a description of the construct assessed by the respective measure. The Emotion Regulation Questionnaire (ERQ (Gross & John, 2003)), a measure of reappraisal and suppression, and the Mayer-Salovey-Caruso Emotion Intelligence Test (MSCEIT (Mayer, Salovey, & Caruso, 2002)), a measure of Emotional Intelligence, were the most frequently used inventories (Table 1). Although emotional intelligence is a different construct, we included studies using the MSCEIT, because it is found to be closely related to ER and leading researchers in the field thus advocate an integration of both constructs (Peña-Sarrionandia, Mikolajczak, & Gross, 2015). Only the subscale *managing emotions* from the MSCEIT was considered for the effect integration. It constitutes one of four components of emotional processing and is measured on the basis of vignettes describing various situations with possible ways of dealing with the depicted emotions.

Table 1
Psychometric properties of measures used in the meta-analysis.

Inventory	Authors	Construct being assessed	Description	Subscales	Subscales considered within meta-analysis	Psychometric properties	Studies from review
CERQ (cognitive emotion regulation questionnaire)	(Garnefski et al., 2001)	Cognitive ER strategies	9 subscales, 36 items in total, 5-point Likert scale	Self-blame, acceptance, rumination, positive refocusing, refocus on planning, positive reappraisal, putting into perspective, catastrophizing, blaming others	Self-blame (=self-blaming), acceptance, rumination, positive reappraisal (=cognitive reappraisal)	Cronbach's alpha ranged from α = .66-.81, test-retest-reliability (5-month) ranging between r_{tt} = 0.41-0.63 factor analysis supported the 9-factor structure[a]	(Rowland, Hamilton, Lino, et al., 2013; Rowland, Hamilton, Vella, et al., 2013)
CISS (coping inventory for stressful situations)	(Endler & Parker, 1990)	Reactions to difficult, stressful, or upsetting situations	3 subscales, 48 items, 5-point Likert scale	Task-focused coping, avoidance-focused coping, emotion-focused coping	Task-focused coping (=cognitive reappraisal)	Cronbach's alpha ranging from α = .82-.90 factor analysis supported the 3-factor structure (Cosway, Endler, Sadler, & Deary, 2000)	(Allott et al., 2015; Ponizovsky, Grinshpoon, Sasson, & Levav, 2004; Ponizovsky, 2013; Ritsner et al., 2006)
CRI (coping response inventory)	(Moos, 1993)	Approach and avoidance coping responses	8 subscales, 48 items, 4-point Likert scale	Logical analysis, positive reappraisal, seeking guidance and support, problem solving, cognitive avoidance, acceptance or resignation, seeking alternative rewards, emotional discharge	Positive reappraisal (=cognitive reappraisal)	Cronbach's alpha ranging from α = 0.58-0.74[b]	(Ventura, Nuechterlein, Subotnik, Green, & Gitlin, 2004)
CSI (coping strategies inventory)	(Tobin, Holroyd, Reynolds, & Wigal, 1989)	Subjects are asked to describe a specific stressful event; indication of the extent to which they used specific coping strategies	8 subscales, 72 items[c], 5-point Likert scale	Problem solving, cognitive restructuring, social support, express emotions, problem avoidance, wishful thinking, social withdrawal, self-criticism	Cognitive restructuring (=cognitive reappraisal), self-criticism (=self-blaming)	Cronbach's alpha ranging from α = 0.71-.94, Test-retest reliability ranging from r_{tt} = .67-.83	(Marquez-Arrico, Benaiges, & Adan, 2015)
CSQ (coping style questionnaire)	(Wang, Wang, & Ma, 1999)	Coping styles	6 subscales, 62 items	Problem solving, self-blame, help seeking, fantasy, avoidance, rationalization	Self-blame (=self-blaming), Avoidance (=suppression)	Test-retest reliability ranging from r_{tt} = 0.63-0.73[b]	(Xu et al., 2013)
ECQ2 (emotional control questionnaire)	(Roger & Najarian, 1989)	Responses to emotional arousal	4 subscales, 56 items, dichotomous format (true/false)	Labeled rehearsal, emotional inhibition, aggression control, and benign control	Labeled rehearsal (=rumination), emotional inhibition (=suppression)	Kuder-Richardson reliability ranging from r_{tt} = 0.77-.86, Test-retest reliability (7-week) ranging from r_{tt} = 0.73-0.92, factor analysis supported the 4-factor structure	(Suslow, Roestel, Ohrmann, & Arolt, 2003)
ERQ (emotion regulation questionnaire)	(Gross & John, 2003)	Habitual use of reappraisal and suppression	2 subscales, 10 items, 7-point Likert scale	Reappraisal, suppression	Reappraisal (=cognitive reappraisal), suppression	Cronbach's alpha for reappraisal ranging from α =.75-.82; for suppression ranging from α =.68-.76 Test-retest reliability r_{tt} =.69 for both scales; factor analysis supported the 2-factor structure	(Badcock, Paulik, & Maybery, 2011; Grezellschak et al., 2016, 2015; Henry, Rendell, Green, McDonald, & O'Donnell, 2008; Horan, Hajcak, Wynn, & Green, 2013; Kimhy et al., 2012; Kimhy et al., 2016; Livingstone et al., 2009; Perry, Henry, & Grisham, 2011; Van der Meer et al., 2014; Van der Meer & Aleman, 2009; Zou, Y. min, Ni, K., Yang, Z. ya, Li, Y., Cai, X. lu, Xie, D. jie, … Chan, R. C. K., 2017)
ERSQ-ES (emotion-specific emotion regulation skill questionnaire)	(Ebert, Christ, & Berking, 2013)	Adaptive ER skills separately for specific emotions	27 items, 5-point Likert scale	Awareness, clarity, sensations, understanding, acceptance, tolerance, self-support, readiness to confront distressing situations, modification	Acceptance, awareness	Cronbach's alpha ranging between α = .70-.97[d] test-retest reliability r_{tt} = .41-.70	(Lincoln et al., 2015a; Lincoln et al., 2015b)

(*continued on next page*)

Table 1 (*continued*)

Inventory	Authors	Construct being assessed	Description	Subscales	Subscales considered within meta-analysis	Psychometric properties	Studies from review
MAX (maladaptive and adaptive coping style questionnaire)	(Moritz et al., 2016)	Maladaptive and adaptive coping styles	3 dimensional structure, 21 items, 4-point Likert scale	Adaptive coping, maladaptive coping, avoidance coping	Suppression[e]	Cronbach's alpha for adaptive coping subscale α = .87, maladaptive subscale α =.85, avoidance subscale α = .65; test-retest reliability ranging from r_{tt} = .59-.75, factor analysis supported 3-dimensional structure	(Moritz et al., 2016)
MSCEIT (mayer-salovey-caruso emotional intelligence test)	(Mayer, Salovey, Caruso, & Sitarenios, 2003)	Emotional intelligence, assessed via vignettes describing possible ways of dealing with depicted emotions	4 branches; each with 2 subtasks, in total 141 items	Perceiving emotions, using emotions to facilitate thoughts, understanding emotions, managing emotions (a. emotion management = actions characters may engage in to change their emotional states; b. emotional relations = actions characters may engage in to change others emotional states)	Managing emotions	Full-test split-half reliability r = .93, the four branch scores range between r = .76-.91, factor analysis supported the 4-factor structure	(Cicero, Klaunig, Trask, & Neis, 2016; Dawson, Kettler, Burton, & Galletly, 2012; Fan et al., 2013; Frajo-Apor, Pardeller, Kemmler, Welte, & Hofer, 2016; Green et al., 2012; Kee et al., 2009; Kern et al., 2011; Kimhy et al., 2012; Lee et al., 2013; Pietrzak et al., 2009; Rajji et al., 2013; Tso, Grove, & Taylor, 2010)
RRS (ruminative response scale)	(Treynor, Gonzalez, & Nolen-Hoeksema, 2003)	Rumination	2 subscales, 10 items, 4-point scale	Reflection, brooding	Total score (=rumination)	Cronbach's alpha for reflection subscale α = .72, brooding subscale α = .77, test-retest reliability for reflection subscale r_{tt} = .60, brooding subscale r_{tt} = .62	(Badcock et al., 2011; Vorontsova, Garety, & Freeman, 2013)
RSQ (response style questionnaire)	(Nolen-Hoeksema & Morrow, 1991)	Responses to negative moods	2 subscales, 71 items, 4-point scale	Distraction subscale, rumination subscale	Rumination subscale	Cronbach's alpha for rumination subscale α =.89, distraction subscale α = .80	(Siegle, Condray, Thase, Keshavan, & Steinhauer, 2010)
STAXI (state-trait-anger expression inventory)	(Spielberger, 1988)	Trait anger and anger expression	4 subscales, 4-point scale	Trait anger, anger-in, anger-out, anger-control	Anger-in (=suppression)	Cronbach's α = .90[b]	(Ille et al., 2010)
TCQ (thought control questionnaire)	(Wells & Davies, 1994)	Strategies used to control unpleasant or unwanted thoughts	5 subscales, 30 items, 4-point Likert scale	Distraction, social control, worry, punishment, reappraisal	Punishment (=self-blaming), reappraisal (=cognitive reappraisal), distraction	Cronbach's alpha ranging from α = 0.64-0.79, Test-retest reliability, total score r_{tt} = 0.83	(Morrison & Wells, 2000)
TMMS (trait meta-mood scale)	(Salovey, Mayer, Goldman, Turvey, & Palfai, 1995)	Perceived emotional intelligence	3 subscales, 30 items, 5-point Likert scale	Attention, clarity, mood repair	Mood repair (=cognitive reappraisal)	Cronbach's alpha ranging from α = 0.82-.87, factor analysis supported the 3-factor structure	(Tabak et al., 2015)

[a] If not otherwise specified, psychometric properties have been derived from original study cited in the column "authors".
[b] Psychometric properties have been derived from the reviewed article cited in the column "studies from review".
[c] Spanish version used by Marquez-Arrico et al. (2015) contains 41 items.
[d] Clinical sample.
[e] Unpublished data retrieved from the authors of the study for the subscale "suppression" – consisting of three items (cognitive as well as expressive suppression).

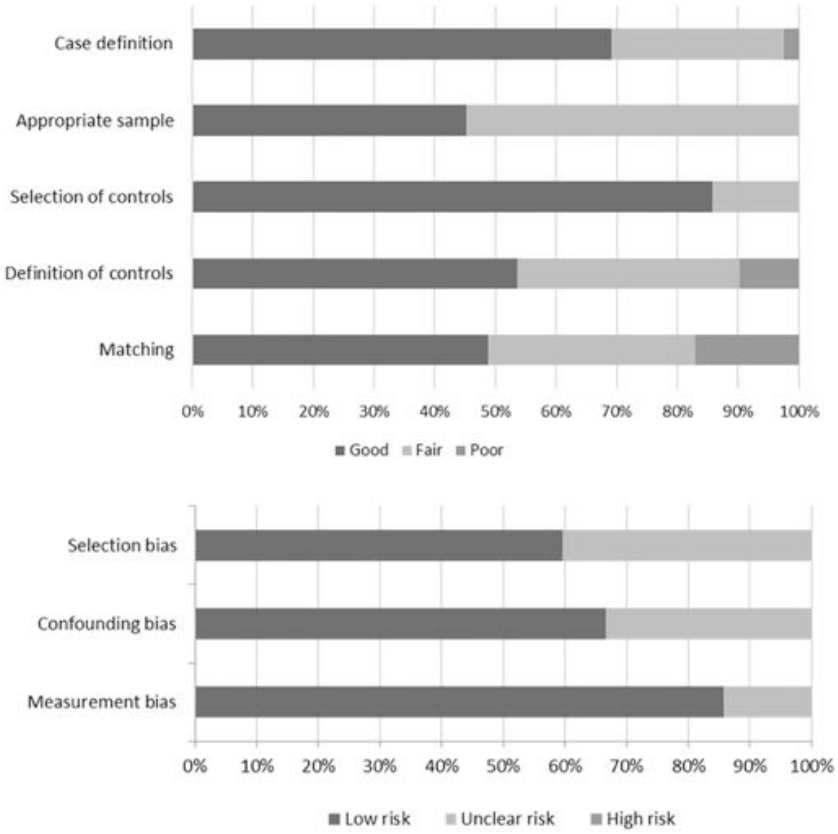

Fig. 1. Quality appraisal by modified Newcastle-Ottawa Quality Assessment Scale and Risk of bias based on Cochrane Collaboration's tool for assessing risk of bias, author's rating of each quality item across all included studies.

3.3. Questionnaire-based cross-sectional data

The 39 studies reporting on habitual ER provided data for six common ER strategies which were reported on in at least two different primary studies (suppression, rumination, self-blaming, distraction, cognitive reappraisal and acceptance), and for managing emotions as measured by the MSCEIT. The mean effect sizes for the comparison between patients with psychosis and healthy controls were significant for all but one strategy (acceptance).

3.3.1. Suppression

The mean effect size for suppression was small to moderate with g = -0,36 (95% CI; -0,56 to -0,16, k = 16), indicating that patients with psychosis report to habitually use suppression to a larger extent than healthy controls (Fig. 2). There was high heterogeneity (I^2 = 72,25%).

3.3.2. Rumination

The mean effect size for rumination was moderate to large with g = -0,67 (95% CI; -0,85 to -0,48, k = 6), indicating that patients with psychosis habitually used rumination to a larger extent than healthy controls (Fig. 2).

3.3.3. Self-blaming

The mean effect size for self-blaming was moderate with g = -0,56 (95% CI; -0,76 to -0,37, k = 4), indicating that patients with psychosis habitually used self-blaming to a larger extent than healthy controls (Fig. 2).

3.3.4. Distraction

The mean effect size for distraction was moderate with g = 0,55 (95% CI; 0,11 to 0,98, k = 2), indicating that patients with psychosis habitually used distraction to a lesser extent than healthy controls (Fig. 3).

3.3.5. Cognitive reappraisal

The mean effect size for cognitive reappraisal was small to moderate with g = 0,41 (95% CI; 0,28 to 0,55, k = 22), indicating that participants with psychosis habitually used cognitive reappraisal to a lesser extent than healthy controls (Fig. 3). There was moderate to high heterogeneity (I^2 = 58,74%).

3.3.6. Acceptance

The mean effect size for acceptance was non-significant with g = 0,30 (95% CI; -0,54 to 1,14, k = 3) (Fig. 3). There was high heterogeneity (I^2 = 91,48%), with inconsistent directions of the effect sizes in the original studies in this subgroup analysis.

3.3.7. Managing emotions

The mean effect size for managing emotions was large with g = 0,93 (95% CI; 0,75 to 1,11, k = 12), indicating that participants with psychosis described more difficulties in managing emotions than healthy controls (Fig. 3). There was moderate heterogeneity (I^2 = 56,32%).

3.4. Questionnaire-based correlational data

Six studies reported on the association between the extent of positive symptoms and the frequency of adaptive ER strategies (including cognitive reappraisal, acceptance and awareness) within the psychosis samples. Overall, these yielded a non-significant mean effect size of r = -0,16 (95% CI; -0,37 to 0,06, k = 6) (Fig. 4). There was moderate to high heterogeneity (I^2 = 62,98%). Whilst the majority of studies provided data on positive symptoms in general, Grezellschak, Jansen, and Westermann (2016) reported on the association with paranoia as one

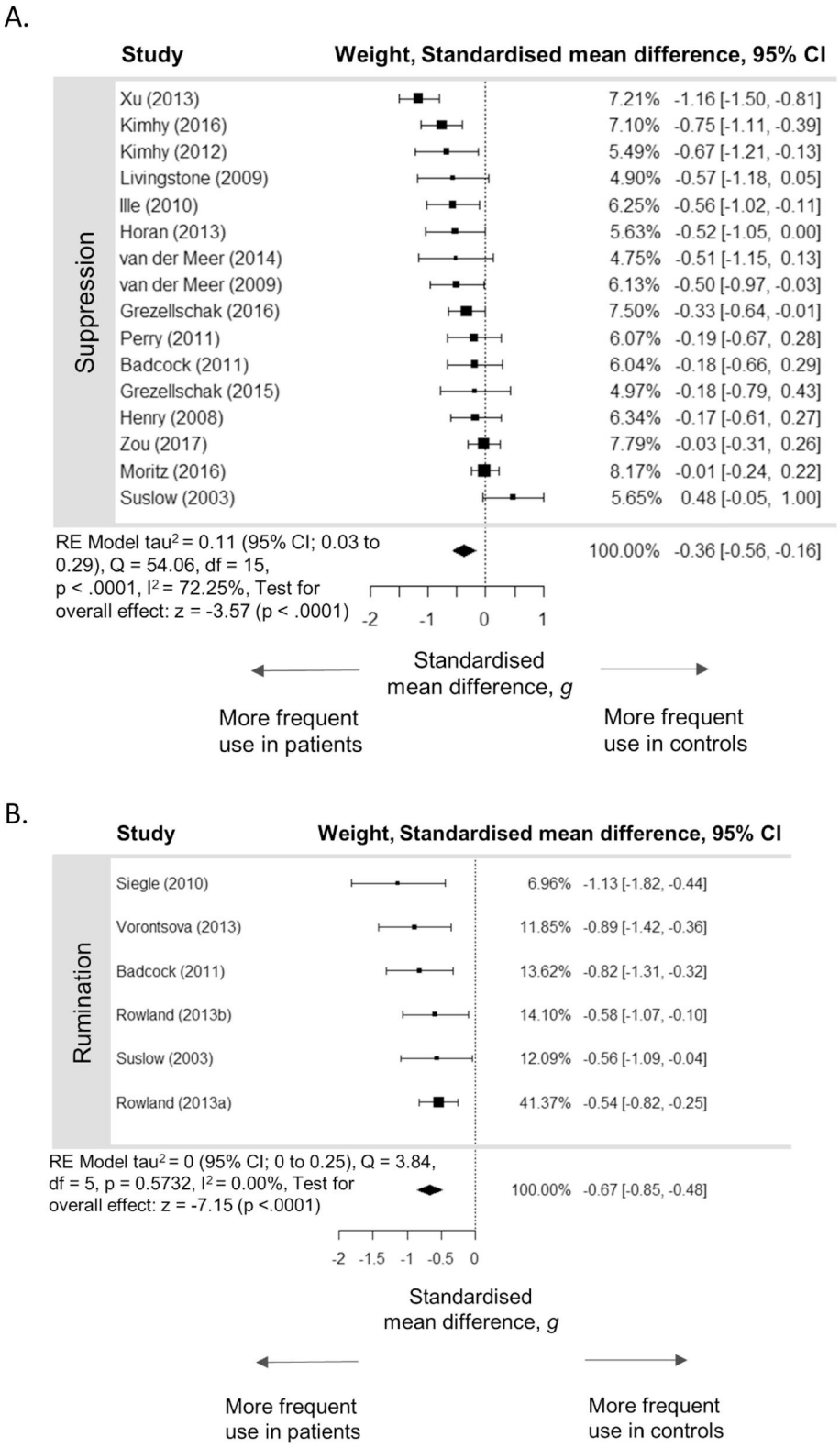

Fig. 2. Forest plots for analyses of habitual use of emotion regulation strategies. (A) Forest plot for comparison of suppression between patients with psychosis and healthy controls. (B) Forest plot for comparison of rumination between patients with psychosis and healthy controls. (C) Forest plot for comparison of self-blaming between patients with psychosis and healthy controls.

specific positive symptom (Grezellschak et al., 2016). Removal of this study resulted in a smaller, and also non-significant effect of r = - 0,11 (95% CI; -0,33 to 0,13, k = 5), with similar heterogeneity (I^2 = 60,47%). Six studies reported on the association between positive symptoms and the frequency of maladaptive ER strategies (including self-blaming, suppression, rumination and maladaptive coping) (Fig. 4). These yielded a significant mean effect of small to moderate size, with r = 0,34 (95% CI; 0,22 to 0,44), indicating a positive association of maladaptive ER and positive symptoms. Again, the removal of Grezellschak et al. (2016) resulted in a smaller effect of r = 0,30 (95%

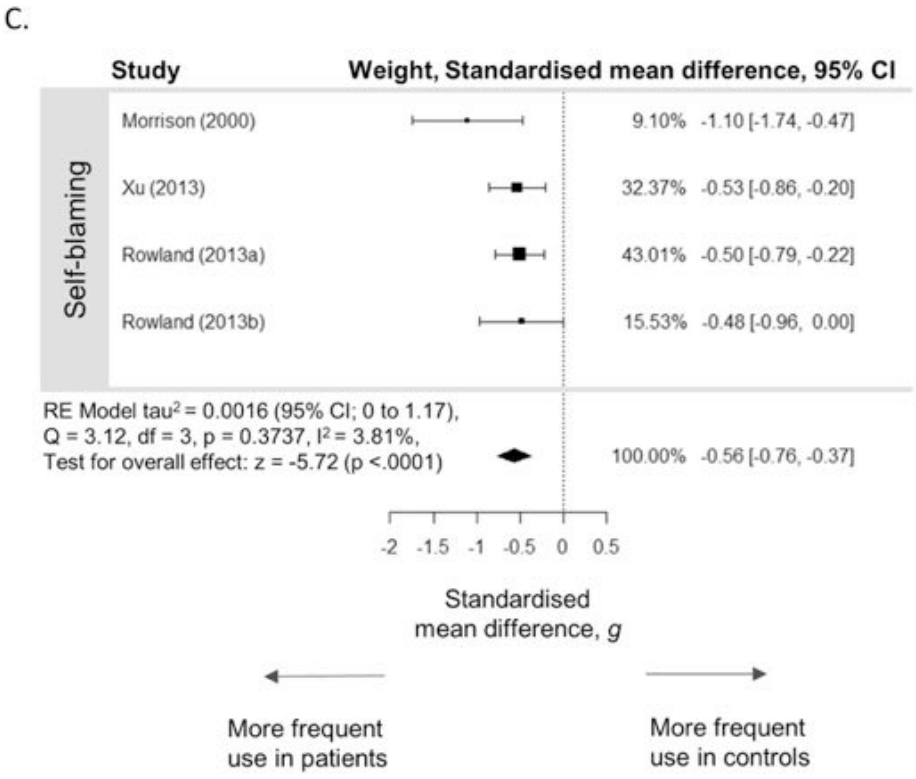

Fig. 2. (*continued*)

CI; 0,17 to 0,42, k = 5).

3.5. Experimental self-report data

Two studies used an experimental 2 (group) x 3 (condition) (Grezellschak, Lincoln, & Westermann, 2015; Perry, Henry, Nangle, & Grisham, 2012), and one study used a 3 x 3 (Van der Meer et al., 2014) within-participant paradigm in which participants with psychosis versus healthy controls were instructed to deploy certain ER strategies versus to deploy no strategy (control condition) after the induction of negative affect (Grezellschak et al., 2015; Perry et al., 2012; Van der Meer et al., 2014) (Fig. 4). To induce negative affect these studies either used pictures from the International Affective Pictures System (IAPS) (Grezellschak et al., 2015; Van der Meer et al., 2014) or film clips (Perry et al., 2012). For cognitive reappraisal (k = 3) (Grezellschak et al., 2015; Perry et al., 2012; Van der Meer et al., 2014), the effect size of the difference in standardised mean change was significant with g = 0,23 (95% CI; 0,01 to 0,45; p = 0,04), in favour of a larger reduction of self-reported negative affect in controls than in patients with psychosis (Fig. 4). However, the confidence intervals of the three original studies contained zero throughout. For suppression (k = 2) (Perry et al., 2012; Van der Meer et al., 2014) the effect size of the difference in standardised mean change was non-significant with g = 0,11 (95% CI; -0,26 to 0,48) (Fig. 4). There was moderate heterogeneity (I^2 = 50,31%).

4. Discussion

The analysis of the questionnaire-based data shows that patients with psychosis differ in the way they report to habitually regulate and manage emotions. The most prominent differences were found for rumination, self-blaming and distraction, but patients with psychosis also reported to make less use of cognitive reappraisal and more use of suppression. No differences were evident in the use of acceptance. However, distraction, acceptance and self-blaming were only investigated in a small number of studies, warranting a more cautious interpretation. The correlations found between self-reported maladaptive ER and psychotic symptoms largely supported the results obtained in the group-comparisons.

The results on the habitual use of ER strategies thus corroborate our expectations and substantiate the findings reported by O'Driscoll et al. (2014). Several effect sizes were in the moderate to large range, comparable to effects found for other treatment targets, such as the jumping-to-conclusions bias (*g* = -0,53) (Dudley, Taylor, Wickham, & Hutton, 2016), indicating that ER may also be a promising target of psychological interventions. Indeed, the importance of addressing ER strategies within cognitive behaviour therapy (CBT) for patients with psychosis, for example by promoting the use of reappraisal, acceptance and mindfulness techniques, has already been stressed by several researchers (Khoury & Lecomte, 2012). In line with this, mindfulness- and acceptance-based interventions have been adapted for psychosis. These approaches attempt to equip patients with means to ease distress by responding to inner-experiences (e.g. emotions) in a non-judgemental and accepting way (Chadwick, 2014; Hayes, Strosahl, & Wilson, 1999; O'Donoghue, Morris, Oliver, & Johns, 2018; Wright et al., 2014). The adaptations of mindfulness-based interventions to psychosis involve an explicit normalising approach to positive symptoms. For example, hallucinations are given no superior attention than other sensations (Chadwick, 2014). In symptom specific approaches of acceptance and commitment therapy, the primary aim is to support the patient in disengaging attention from distressing aspects of hallucinations and in accepting the existence of symptoms whilst pursuing committed value-guided action (Thomas, Morris, Shawyer, & Farhall, 2013). The emerging evidence from controlled clinical trials of such approaches is encouraging with meta-analyses demonstrating significant small to moderate effects on overall psychotic symptoms (Cramer, Lauche, Haller, Langhorst, & Dobos, 2016; Louise, Fitzpatrick, Strauss, Rossell, & Thomas, 2018), a moderate treatment effect on depressive symptoms (Louise et al., 2018), as well as on reduced hospitalisation rates (Cramer et al., 2016). In support of the notion that these interventions focus on ER, a recent controlled clinical study also pointed to beneficial effects of

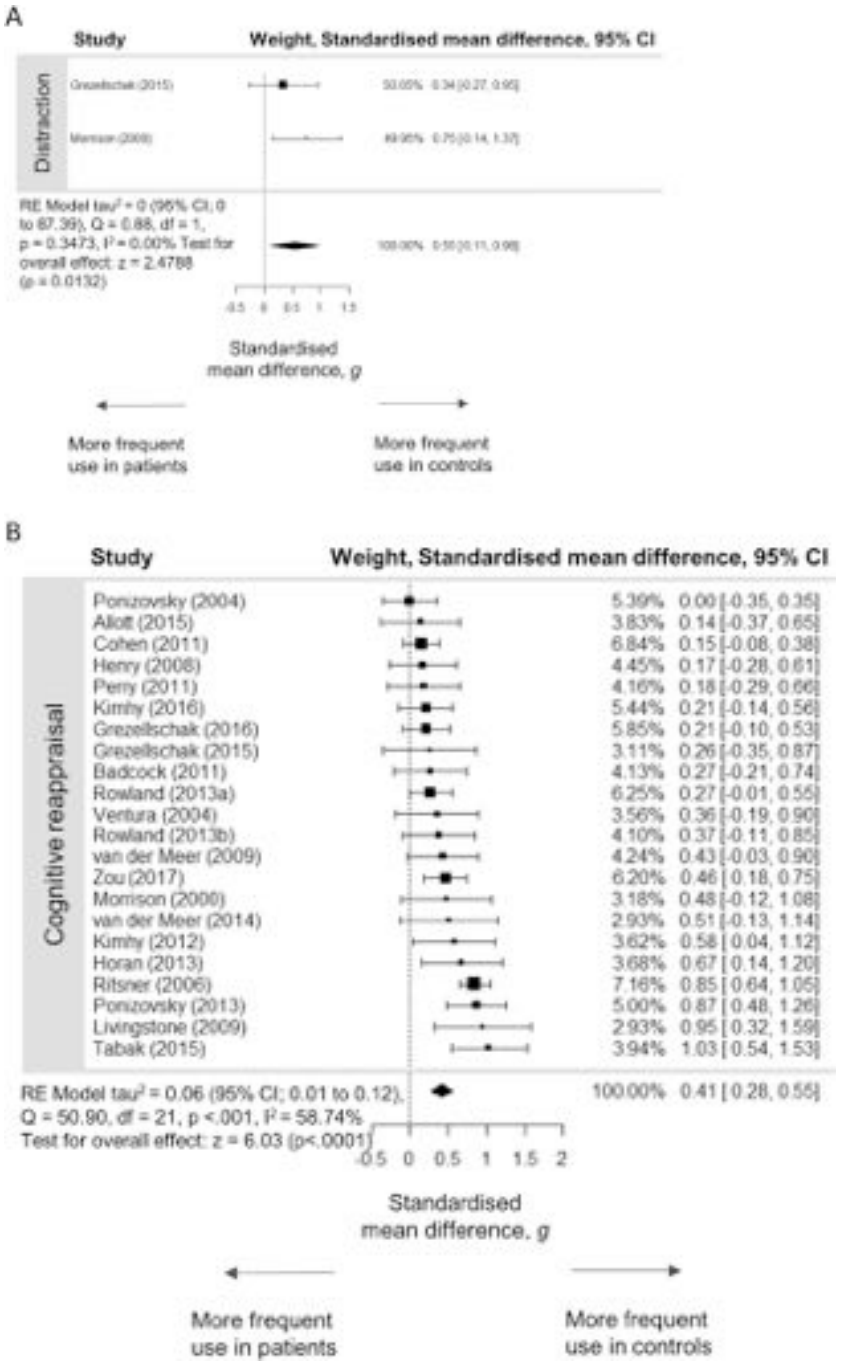

Fig. 3. Forest plots for analyses of habitual use of emotion regulation strategies. (A) Forest plot for comparison of distraction between patients with psychosis and healthy controls. (B) Forest plot for comparison of cognitive reappraisal between patients with psychosis and healthy controls. (C) Forest plot for comparison of acceptance between patients with psychosis and healthy controls. (D) Forest plot for comparison of managing emotions between patients with psychosis and healthy controls.

acceptance and commitment therapy in ER skills (Spidel, Lecomte, Kealy, & Daigneault, 2018). Several further studies also found that affect-focused interventions (e.g. brief CBT targeting worry, virtual reality CBT involving exposure therapy, and an intervention aiming at emotional processing and meta-cognitive awareness) successfully reduce negative affect and that these reductions seemed to translate into reductions of delusions (Opoka, Ludwig, & Lincoln, 2018). To sum up, these promising results from clinical studies underline that interventions promoting ER skills and those aiming at reducing negative affect show favourable effects in terms of reductions in negative affect as well as positive symptoms and also show that ER skills can be enhanced through training. Above that, the discussion of some aspects of our findings might help to continue tailoring ER trainings better to the specific needs of patients with psychosis.

As a transdiagnostic factor, ER is associated with and contributes to various psychopathologies, and has been most prominently researched in the context of depression (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Understanding whether there is a specific pattern of ER unique to delusion formation or whether difficulties are more transdiagnostic in nature, is important in order to know whether we should develop specifically tailored therapy for delusions or can encourage the use of non-disorder-specific interventions. However, only a minority of studies

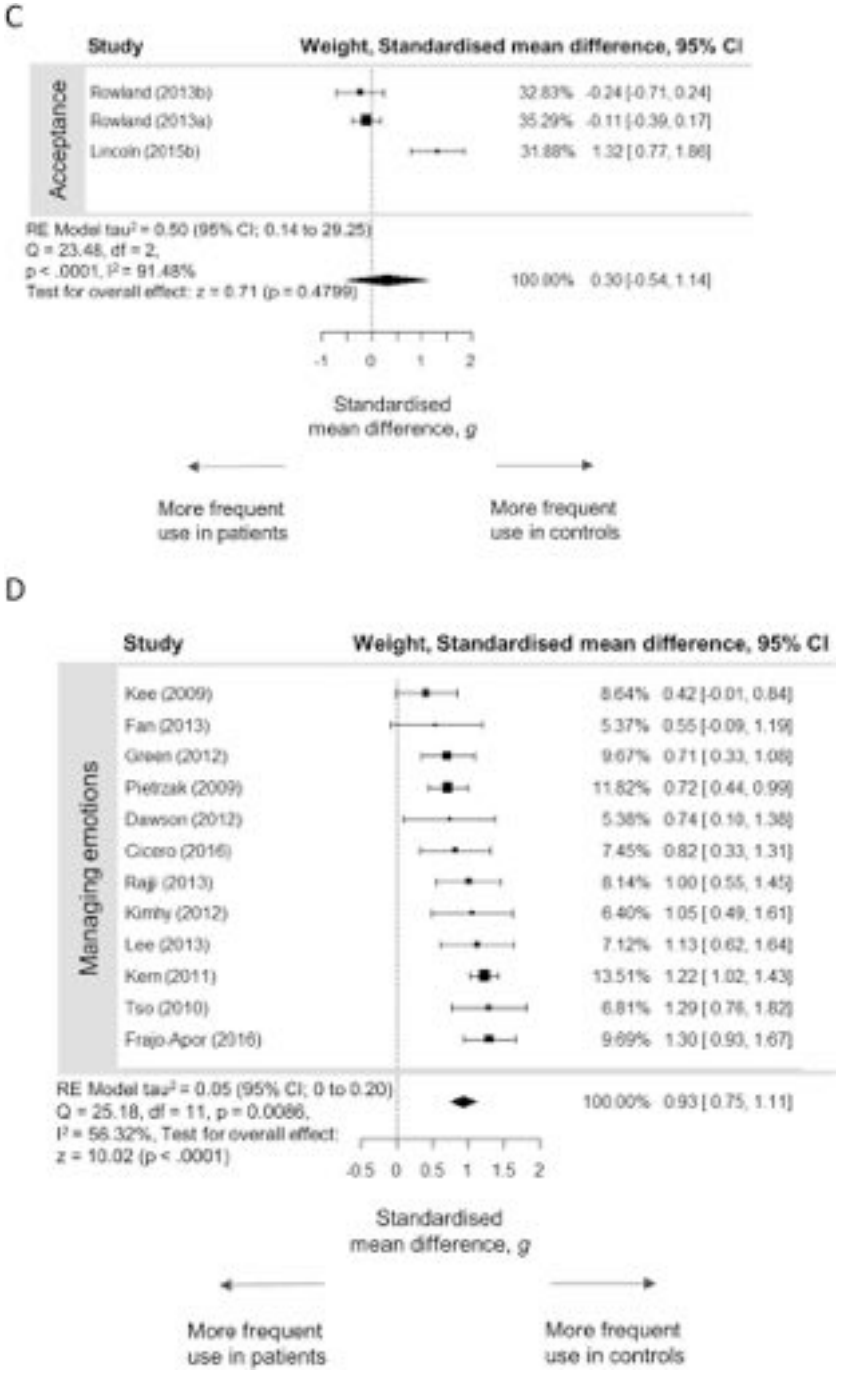

Fig. 3. (*continued*)

included in this meta-analysis explored the specifity of findings. As can be seen in Appendix B these reported heterogeneous results when comparing psychosis with depression or bipolar disorder, with some indicating no differences (acceptance and awareness (Lincoln, Hartmann, Köther, & Moritz, 2015b); reappraisal (Livingstone, Harper, & Gillanders, 2009; Tabak et al., 2015)) and others finding indication of specificity (more suppression in patients with depression (Ille, Schöny, Kapfhammer, & Schienle, 2010); more reappraisal in patients with depression (Ponizovsky, 2013), more self-blaming in patients with bipolar disorder (Rowland, Hamilton, Vella, et al., 2013)). Given the high comorbidity rates of depression in psychotic disorders (Buckley et al., 2009), the strong effects we found for rumination and self-blaming are non-surprising. Clinically, it may be most promising to focus on these strategies specifically, given that depressive thought processes can be key in the formation of psychotic experiences (Freeman & Garety, 2014). In line with this notion, interventions targeting perseverative thinking styles resulted in reductions of paranoia (Foster, Startup, Potts, & Freeman, 2010; Freeman et al., 2015). However, future research would benefit from further multi-sample approaches, in the hope at arriving at a clearer pattern of findings on the question of specificity.

Another question that our results raise relates to the findings from the three experimental studies, in which patients were required to deploy an instructed ER strategy after the induction of negative affect. In contrast to the questionnaire-based studies, the analysis of the experimental data did not point to unequivocal differences between patients and controls. The effect for suppression was non-significant and although the effect size for cognitive reappraisal was significant ($p = 0.04$), all confidence intervals of the original studies contained zero.

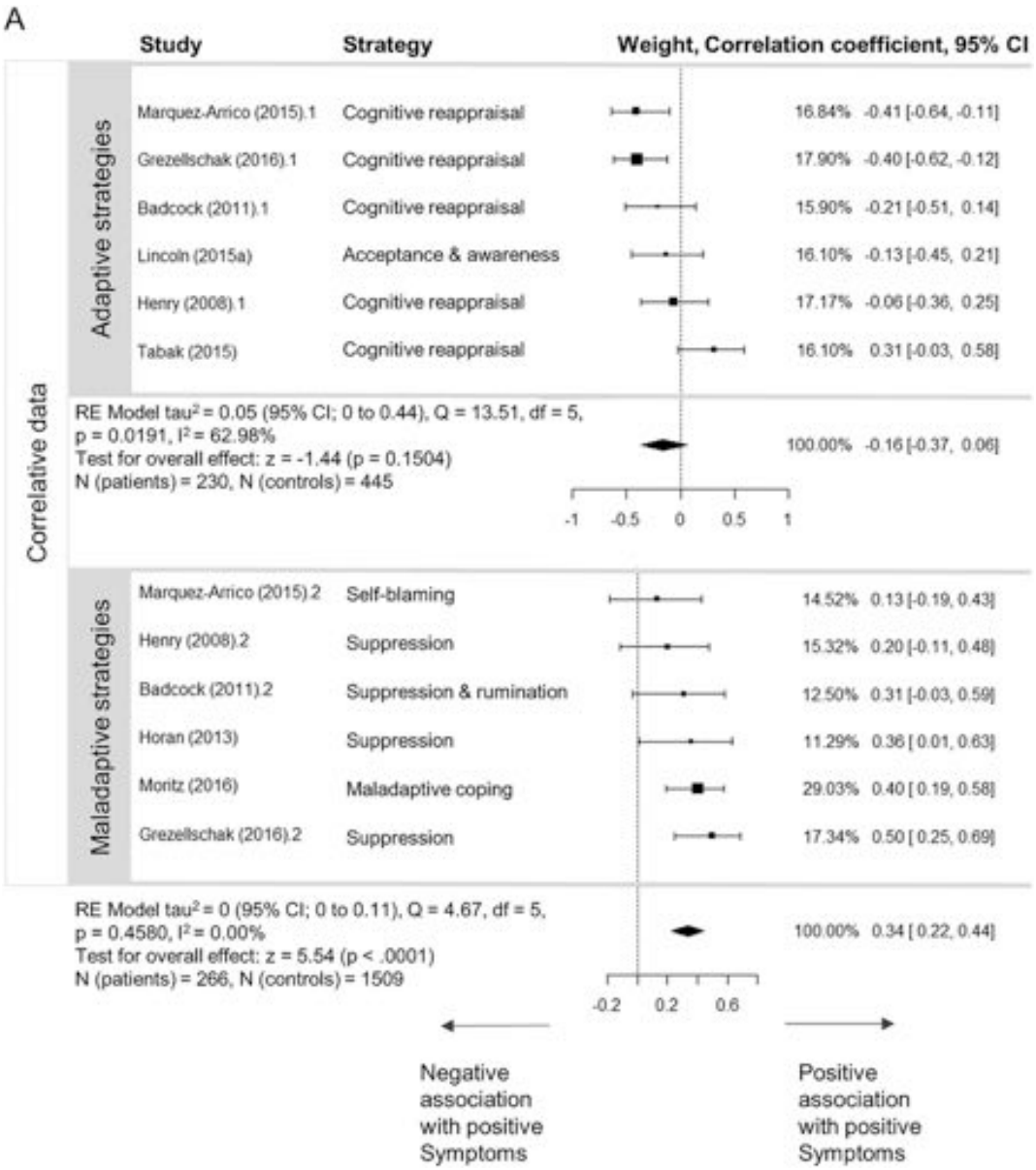

Fig. 4. (A) Forest plots for correlative data of the relationship between (mal)adaptive strategies and positive symptoms in patients with psychosis. (B) Forest plots for experimental data of cognitive reappraisal and suppression in patients with psychosis compared to healthy controls.

Thus, patients with psychosis do not seem to differ much from healthy controls in the effectiveness of their use of strategies once they have been instructed to employ them. Interestingly, indication of a discrepancy between self-reported use of cognitive reappraisal in questionnaires and self-reported success of its use in the lab was also found in a recent systematic review of numerous studies across various disorders (Zilverstand, Parvaz, & Goldstein, 2017), indicating that this "discrepancy" seems to be robust and not specific to psychosis. One possible explanation is the artificial laboratory setting: While a participant may be able to apply a strategy when confronted with IAPS pictures, the actual success of this strategy employed in everyday life, where emotions are elicited through personally relevant stimuli might require a more proficient usage of skills. Moreover, it may be easier applying a strategy following an instruction than generating it from one's own account as is necessary in every-day life settings. Furthermore, the experimental manipulation of ER strategies remains artificial as it creates two distinct conditions of either applying a certain strategy or not (McRae, 2013). The possibility that one instructed strategy facilitates the use of another in the sense of a natural continuous variation and interaction of ER, remains unexplored. Another problem is social desirability, as the typical design of these experiments is transparent and might lead participants to rate their negative affect in favour of a reduction after the deployment of the instructed strategy. This interpretation is corroborated by the interesting finding from an experimental study by Strauss et al., 2013, who reported no differences between self-reported negative affect ratings in both patients with psychosis and healthy controls, but nevertheless found differences in the late positive potential, which was interpreted as an indicator of (abnormal) ER. Similarly, the review on experimental studies of cognitive reappraisal mentioned above found a reduced activation in the ventrolateral prefrontal cortex as well as in the dorsolateral prefrontal cortex despite the absence of differences in self-reported success of strategy use (Zilverstand et al., 2017). Thus, it appears important to continue to apply multi-method approaches in accordance with the various facets of emotional responses (Joormann & Stanton, 2016).

The question of causality in the relationship between ER and psychotic symptoms also requires further consideration. In order to assume causality, the putative causal mechanism (ER) should not only be

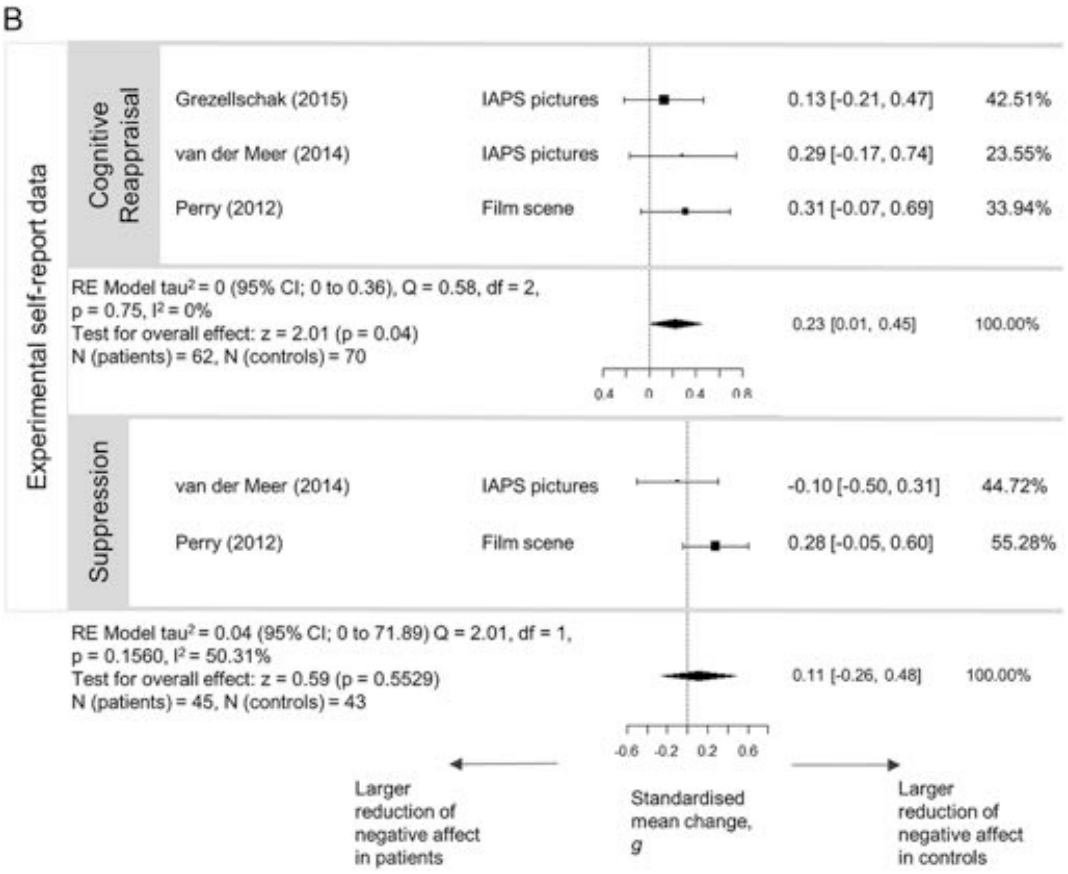

Fig. 4. (*continued*)

associated with the outcome variable (psychotic symptoms), as shown in our data, but it should also be tested whether ER precedes psychotic symptoms and whether change in ER leads to change in psychotic symptoms (see Schwartz & Susser, 2006). As the questionnaire-based studies generally did not control for baseline negative affect, which tends to be high in patients with psychosis (Braga et al., 2013; Buckley et al., 2009), we cannot exclude the possibility that the self-reported difficulties in ER are – at least in part – a consequence rather than a cause of the higher levels of negative affect. Thus, cleverly designed experience sampling and experimental studies are required to tease out the temporal order and causal relation of strategy use and symptoms. First attempts in this direction have recently been made, with one study finding that from a range of ER strategies used in daily life suppression significantly predicted subsequent paranoia (Nittel et al., 2018). Another study found that, compared to healthy controls, patients with psychosis deployed a comparable or even higher number of ER strategies, but did so less effectively (Visser, Esfahlani, Sayama, & Strauss, 2018).

If a causal role of ER strategies can be further established for psychosis, the question arises by which mechanisms these difficulties lead to psychotic symptoms. One assumption is that the failure to employ adaptive ER strategies increases or even amplifies the affective stress response, resulting in increasingly unbearable negative affect which increases the likelihood of beliefs that are congruent with the emotion (e.g. threat beliefs in the presence of extreme anxiety (Freeman, Garety, & Kuipers, 2001)). Another is that the use of maladaptive strategies triggers symptoms, for example the use of suppression could result in misinterpreting own affective states which eventually increase the likelihood of a paranoid interpretation.

This also promotes the discussion of how known indicators of vulnerability (e.g. neurocognitive or biological vulnerability) or genetic and social risk factors are linked to impaired ER. For example, executive functions, which are known to be impaired in people with psychosis (Orellana & Slachevsky, 2013), may be associated with the difficulty to deploy certain strategies, such as cognitive reappraisal (McRae, Jacobs, Ray, John, & Gross, 2012). Also, heart rate variability, which is an indicator of physical adaptability of the organism and is reduced in people with psychosis (Clamor, Lincoln, Thayer, & Koenig, 2016), has also been found to be linked to impaired ER in this group (Clamor et al., 2015). Furthermore, early adverse experiences tend to be associated with impaired ER skills (Laloyaux, Dessart, Van der Linden, Lemaire, & Larøi, 2016) and a recent study in a large community sample found ER to mediate the link between childhood trauma and psychotic experiences (Lincoln et al., 2017). Here too, however, questions related to the specificity need to be addressed.

Several limitations warrant discussion. One is that the quality of studies varied considerably, with matching of controls as a main weakness. Also, it became apparent that some strategies were measured through a myriad of inventories, leading to a potential variance in the construct being assessed. Despite efforts to precisely formulate our inclusion criteria in a first step and then transparently describe the definitions used in the questionnaires included, a potential confounding due to this variance cannot be ruled out. Moreover, some of our research questions were based on a small number of primary studies. Thus, and in line with Aldao et al., 2010, we caution that these results can only be regarded as an approximation. In order to synthesise correlative data, we grouped strategies into the categories of maladaptive and adaptive strategies. This comes with the tradeoff of reduced

precision in terms of which specific strategies are linked to specific symptoms. Furthermore, despite the common agreement on what constitutes a more or less adaptive strategy (see reviews in Gross, 1998; Nolen-Hoeksema & Watkins, 2011), whether a strategy is adaptive or maladaptive also depends on the context and the goal (Aldao & Nolen-Hoeksema, 2012) and these aspects were not controlled for or assessed in the questionnaire-based studies.

To sum up, our meta-analysis further substantiates the assumption that difficulties in ER are closely linked to psychotic symptoms, emphasising the potential relevance of ER as a treatment target. However, more studies using multi-method approaches and including different clinical control groups are needed to gain a more complete understanding of the distinct difficulties in this group of patients and the interplay of negative affect, ER strategies and subsequent positive symptoms. Advancing our understanding of underlying mechanisms and risk factors as well as identifying those strategies which are important to target in treatment will be a necessary and promising endeavour of future research.

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Contributors

LL, TL and DW contributed to the study conception and design. LL did the systematic literature research and selected studies for inclusion. LL extracted data and assessed the quality of the studies. LL and DW did statistical analyses. DW critically reviewed the methodology. LL wrote the first draft of the manuscript and TL revised the manuscript for important intellectual content. All authors critically revised the manuscript, and contributed and approved the final draft.

Declaration of Competing Interest

The authors declare no competing interests.

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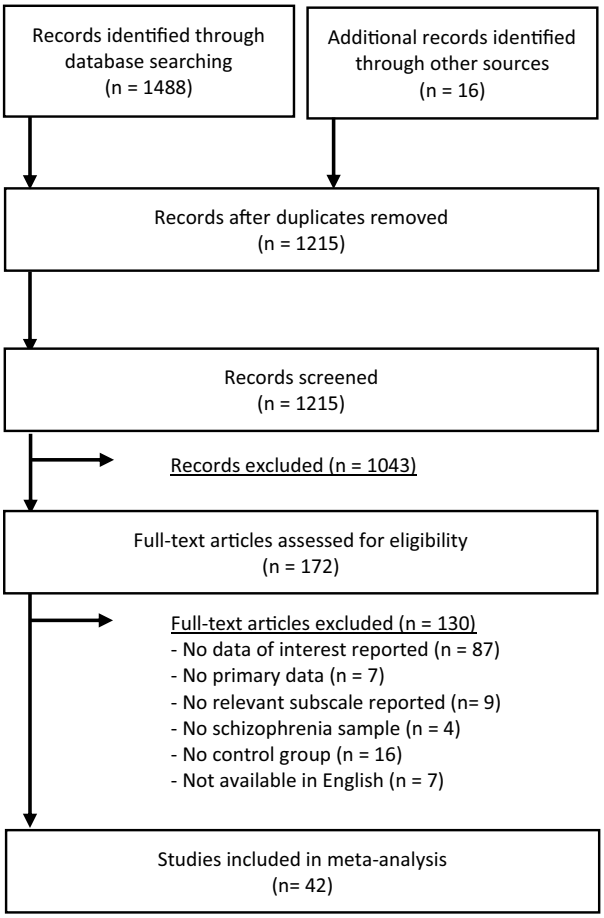
Declarations of Competing Interest

None.

Appendix A. Flow chart



Appendix B. Main Table (Individual study characteristics, individual ratings of quality)

Table 1
Cross-sectional and correlative questionnaire-based studies on habitual use of emotion regulation.

Author name	Sample details	Age M (SD)	Psychopathology measures	ER measures	Results	Quality	Risk of bias
(Allott et al., 2015)	34 individuals with first-episode psychosis (FEP); 26 healthy controls	SZ: 20.03 (2.56) HC: 21.85 (2.01)	DSM-IV (SCID) BPRS, SANS	CISS	An independent-samples t-test revealed no significant group difference regarding the use of task-oriented coping ($p = .58$). Pearson Correlation indicated a significant negative correlation between task-oriented coping and perceived stress in FEP patients ($r = -.429$, $p = .014$) but not in HC ($r = -.066$, $p = .747$)	Case definition: good Appropriate sample: fair Selection of controls: good Definition of controls: good Matching: fair	Selection bias: low Confounding bias: unclear Measurement bias: low
(Badcock et al., 2011)	34 individuals with schizophrenia and current auditory hallucinations; 34 healthy controls	SZ: 37.91 (9.40) HC: 41.35 (11.85)	DSM-IV (DIP) PSYRATS	ERQ, RRS	An independent-samples t-test revealed no significant group difference regarding the use of reappraisal ($t = 1.10$, $p = .276$) and suppression ($t = 0.77$, $p = .445$). Rumination was significantly higher in SZ ($t = 3.38$, $p = .001$) compared to HC Pearson Correlation indicated a significant positive correlation between the use of expressive suppression and severity of hallucinatory experience ($r = .405$, $p < .05$) as well as disruption to life[a] ($r = .479$, $p = .005$) in SZ Scores on the rumination scale were significantly correlated with levels of depression ($r = .398$, $p < .05$) and distress related to hallucinations ($r = .378$, $p < .05$) in SZ. When controlling for levels of depression, the correlation between suppression and severity of hallucinatory experience remained significant ($p = .022$), but the correlation between rumination and distress related to hallucinations did not remain significant ($p > .1$)	Case definition: good Appropriate sample: good Selection of controls: good Definition of controls: good Matching: fair	Selection bias: low Confounding bias: unclear Measurement bias: low
(Cicero et al., 2016)	45 individuals with schizophrenia or schizoaffective disorder; 28 healthy controls	SZ: 49.49 (10.67) HC: 44.31 (14.14)	DSM-IV (SCID) PANSS	MSCEIT	An independent-samples t-test revealed a significantly lower score on managing emotions in SZ compared to HC ($t = 2.84$, $p < .01$). Spearman Correlation indicated a significant negative correlation between positive symptoms and managing emotions ($\rho = -.51$, $p < .05$). Negative symptoms were not associated with managing emotions ($\rho = -.17$, $p > .05$).	Case definition: good Appropriate sample: fair Selection of controls: good Definition of controls: good Matching: good	Selection bias: low Confounding bias: low Measurement bias: low
(Cohen, Hassamal, & Begum, 2011)	198 individuals with schizophrenia; 113 healthy controls	SZ: 61.5 (5.6) HC: 63.0 (5.4)	DSM-IV PANSS	Own list of 22 strategies (derived from (Pearlin, Mullan, Semple, & Skaff, 1990); Cognitive Coping subscale = cognitive reappraisal	An independent-samples t-test revealed no significant difference in the use of a cognitive coping style between SZ and HC ($t = 1.24$, $p = .22$).	Case definition: good Appropriate sample: fair Selection of controls: good Definition of controls: poor Matching: poor	Selection bias: low Confounding bias: unclear Measurement bias: unclear
(Dawson et al., 2012)	20 individuals with schizophrenia; 20 healthy controls	SZ: 43.25 (9.15) HC: 38.60 (10.86)	DSM-IV-TR	MSCEIT	An independent-samples t-test showed significantly lower scores for managing emotions in SZ compared to HC ($t = -2.39$, $p = .02$, $d = 0.76$).	Case definition: fair Appropriate sample: fair Selection of controls: good Definition of controls:	Selection bias: unclear Confounding bias: unclear Measurement bias: low

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Table 1 (*continued*)

Author name	Sample details	Age M (SD)	Psychopathology measures	ER measures	Results	Quality	Risk of bias
						good Matching: good	
(Fan et al., 2013)	27 individuals with schizophrenia (inpatients); 15 healthy controls	SZ: 39.7 (7.2) HC: 41.4 (6.3)	DSM-IV-TR (SCID) PANSS	MSCEIT	An independent-samples t-test revealed no significant difference in managing emotion scores between SZ and HC ($t = 1.71$, $p = .096$).	Case definition: good Appropriate sample: fair Selection of controls: good Definition of controls: fair Matching: fair	Selection bias: low Confounding bias: low Measurement bias: low
(Frajo-Apor et al., 2016	56 individuals with schizophrenia (outpatients); 84 healthy controls	SZ: 45.3 (10.2) HC: 44.8 (9.3)	M.I.N.I PANSS	MSCEIT	A Mann-Whitney U-test showed significantly lower managing emotions scores in SZ compared to HC ($z = -6{,}225$, $p < .001$, $d = 1.31$). An analysis of covariance showed that the group difference in managing emotions remained significant after adjusting for non-social cognition and education ($F = 14.82$, $p < .001$).	Case definition: fair Appropriate sample: fair Selection of controls: good Definition of controls: good Matching: fair	Selection bias: low Confounding bias: unclear Measurement bias: low
(Green et al., 2012)	50 prodromal participants; 34 healthy controls 81 first episode schizophrenia patients[b] 46 healthy controls 53 chronic schizophrenia patients 47 healthy controls	SZ(prodr.): 18.25 (3.12) HC: 18.95 (2.91) SZ(firstep.): 22.02 (4.18) HC: 22.20 (3.51) SZ(chronic): 34.77 (7.89) HC: 33.02 (5.32)	DSM-IV (SCID) SAPS	MSCEIT	An ANOVA revealed no significant difference in the use of managing emotions between prodromal participants, first episode SZ and chronic SZ ($F = 1.41$, $p = .245$), but a significant difference in the use of managing emotions between the patient groups and HC ($F = 21.07$, $p < .001$). A Pearson correlation analysis indicated no significant correlation between MSCEIT total scores and positive symptoms in prodromal participants ($r = -.278$, $p > .05$) and first episode SZ ($r = -.120$, $p > .05$), but a significant negative correlation in chronic SZ ($r = -.295$, $p < .05$).	Case definition: good Appropriate sample: good Selection of controls: good Definition of controls: good Matching: good	Selection bias: low Confounding bias: low Measurement bias: low
(Grezellschak et al., 2016)	46 individuals with psychosis; 23 relatives of individuals with psychosis; 267 healthy controls	SZ: 36.16 (11.58) Relat.: 26.65 (9.59) HC: 28.27 (9.26)	PCL	ERQ	Independent-samples t-tests showed no significant difference regarding the use of reappraisal in SZ compared to HC ($t = 1.49$, $p = .14$), but a significantly higher use of expressive suppression in SZ compared to HC ($t = -2.05$ $p = .04$). Correlation analyses revealed a significant negative correlation between reappraisal and paranoid ideation in the total sample ($r = -.21$, $p < .01$) as well as in the SZ group only ($r = -.40$, $p < .01$). Expressive suppression was significantly correlated to paranoid ideation in the total sample ($r = .38$, $p < .01$) as well as in the SZ group only ($r = .50$, $p < .01$).	Case definition: fair Appropriate sample: good Selection of controls: good Definition of controls: fair Matching: fair	Selection bias: unclear Confounding bias: unclear Measurement bias: low
(Henry et al., 2008)	41 individuals with schizophrenia or schizoaffective Disorder; 38 healthy controls	SZ: 37.5 (10.67) HC: 36.1 (11.99)	DSM-IV SAPS	ERQ	Independent-samples t-tests showed no significant difference regarding the use of suppression ($t = 1.03$, $p = .308$, $d = 0.24$) and reappraisal ($t = 0.82$, $p = .415$, $d = 0.19$) between SZ and HC. Exploratory analyses revealed no group differences in the use of these emotion regulation strategies across three classes of emotional valence: positive ($t = 0.06$, $p = .955$), negative ($t = 0.39$, $p = .700$), or nonvalenced ($t = 0.11$, $p = .911$) emotional states. Correlation analyses revealed that there were no significant associations between the use of reappraisal and hallucinations	Case definition: fair Appropriate sample: good Selection of controls: good Definition of controls: fair Matching: good	Selection bias: unclear Confounding bias: low Measurement bias: low

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Table 1 (*continued*)

Author name	Sample details	Age M (SD)	Psychopathology measures	ER measures	Results	Quality	Risk of bias
					(r = -.10, p > .05) or delusions (r = -.06, p > .05) within SZ. No significant correlation between the use of suppression and hallucinations (r = .03, p > .05) or delusions (r = .20, p > .05) was found.		
(Horan et al., 2013)	31 individuals with schizophrenia (outpatients); 27 healthy controls	SZ: 47.8 (9.8) HC: 45.5 (6.7)	DSM-IV (SCID) BPRS	ERQ	An independent-samples t-test indicated a significantly higher use of reappraisal (t56 = -2.45, p < .05) and lower use of suppression by SZ compared to HC (t56 = 2.27, p < .05).	Case definition: good Appropriate sample: fair Selection of controls: good Definition of controls: good Matching: good	Selection bias: low Confounding bias: low Measurement bias: low
(Ille et al., 2010)	38 individuals with schizophrenia (inpatients); 40 healthy controls	SZ: 39.7 (12.9) HC: 35.5 (14.1)	ICD-10 (M.I.N.I.)	STAXI	Pairwise comparisons revealed significantly more anger suppression in SZ compared to HC (mean difference = 2.56, p = .046).	Case definition: good Appropriate sample: good Selection of controls: good Definition of controls: good Matching: fair	Selection bias: unclear Confounding bias: low Measurement bias: low
(Kee et al., 2009)	50 individuals with schizophrenia (outpatients); 39 healthy controls	SZ: 34.37(7.69) HC: 32.97 (5.17)	DSM-IV (SCID) SAPS	MSCEIT	Independent-samples t-test revealed significantly lower emotion management in the SZ compared to HC (t = -1.96, p < .05, d = 0.42). Correlation analyses showed no significant association between managing emotions scores and hallucinations (r = -.21, p > .05), delusions (r = -.03, p > .05) or the SAPS total score (r = -.23, p > .05).	Case definition: good Appropriate sample: fair Selection of controls: good Definition of controls: good Matching: good	Selection bias: low Confounding bias: low Measurement bias: low
(Kern et al., 2011)	176 persons with schizophrenia or schizoaffective disorder; 300 healthy controls	SZ: 44.0 (11.2) HC: 42.6 (11.6)	DSM-IV (SCID)	MSCEIT	A MANOVA revealed significantly lower managing emotions scores in SZ compared to HC (p < .001). Classification and regression trees showed managing emotions scores to be an important factor for discriminating SZ from HC (importance = 0.372, normalized importance = 82.6%).	Case definition: good Appropriate sample: fair Selection of controls: good Definition of controls: fair Matching: fair	Selection bias: unclear Confounding bias: unclear Measurement bias: low
(Kimhy et al., 2012)	44 individuals with schizophrenia (inpatients and outpatients); 20 healthy controls	SZ: 30.33 (8.08) HC: 24.20 (4.62)	SAPS	MSCEIT + ERQ	An ANCOVA controlling for age revealed significantly lower managing emotion scores (F = 8.29, p < .01, d = 1.06), use of reappraisal (F = 5.27, p = .02, d = 0.60) and significantly higher use of suppression (F = 5.42, p = .02, d = 0.68) in SZ compared to HC.	Case definition: good Appropriate sample: good Selection of controls: good Definition of controls: fair Matching: poor	Selection bias: unclear Confounding bias: low Measurement bias: low
(Kimhy et al., 2016)	87 individuals with schizophrenia; 54 clinical high risk for psychosis (CHR); 50 healthy controls	SZ: 33.45 (9.47) CHR: 20.18 (3.41) HC: 23.04 (4.10)	DSM-IV SAPS	ERQ	An ANCOVA controlling for age revealed significant differences in reappraisal (F = 5.57, p = .004, d = 0.73) and suppression (F = 15.42, p < .001, d = 1.10) between CHR, SZ and HC. Pairwise comparisons showed reappraisal scores to be significantly lower in SZ and CHR compared to HC and suppression scores	Case definition: good Appropriate sample: fair Selection of controls: good Definition of controls: fair	Selection bias: unclear Confounding bias: low Measurement bias: low

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Table 1 (*continued*)

Author name	Sample details	Age M (SD)	Psychopathology measures	ER measures	Results	Quality	Risk of bias
					to be significantly higher in SZ and CHR compared to HC.	Matching: poor	
(Lee et al., 2013)	38 individuals with schizophrenia (outpatients); 68 individuals with bipolar disorder (BD, outpatients); 36 healthy controls	SZ: 44.7 (9.1) BD: 43.9 (10.6) HC: 41.4 (9.9)	BPRS	DSM-IV (SCID) MSCEIT	An ANOVA revealed a significant difference in managing emotions scores in SZ, BD and HC ($F = 12.73$, $p < .001$). Pairwise comparisons revealed no difference in managing emotions between BD and HC, but significantly lower managing emotion scores in SZ patients compared to both other groups (effect size = 1.13).	Case definition: good Appropriate sample: fair Selection of controls: good Definition of controls: good Matching: good	Selection bias: low Confounding bias: low Measurement bias: low
(Lincoln et al., 2015a), (Lincoln et al., 2015b)	37 individuals with schizophrenia and schizoaffective disorder; 30 individuals with depression (D); 28 healthy controls	SZ: 40.3 (12.3) D: 41.7 (11.1) HC: 35.6 (14.5)	DSM-IV (M.I.N.I) PANSS PCL	ERSQ-ES	A MANOVA revealed significant group effects for awareness ($F = 8.54$, $p < .001$) and acceptance ($F = 17.00$, $p < .001$) of emotion, with both scores being lower in SZ and D than in HC. Awareness did not remain significantly impaired in SZ when controlling for depression ($F = 3.34$, $p = .72$, $\eta_p^2 = .05$), while acceptance did ($F = 5.84$, $p = .001$, $\eta_p^2 = .16$). Correlation analyses revealed no significant association between awareness and PANSS positive scores (-.10), acceptance and PANSS positive scores (-.17) and modification and PANSS positive scores (.03) but significant negative correlations between awareness and Paranoia Checklist scores (-.36, $p < .05$), acceptance and Paranoia Checklist scores (-.48, $p < .01$) and modification and Paranoia Checklist scores (-.35, $p < .05$) Regression analyses showed awareness, acceptance and modification of emotion to significantly predict the increase in state paranoia from no stress to noise stress condition in SZ ($\beta = -0.20$, $p < .05$; $\beta = -0.18$, $p < .05$; $\beta = -0.25$, $p < .01$, respectively)	Case definition: good Appropriate sample: good Selection of controls: good Definition of controls: good Matching: good	Selection bias: low Confounding bias: low Measurement bias: low
(Livingstone et al., 2009)	21 individuals with schizophrenia; 21 individuals with anxiety disorder (AD) or depression; 21 healthy controls	SZ: 39.26 (11.30) AD/ D: 40.52 (10.67) HC: 40.00 (11.88)	-	ERQ	An ANOVA revealed a significant main effect of group regarding the use of cognitive reappraisal ($F = 5.161$, $p < .05$). Posthoc comparisons, using between-groups t-tests, found a significant difference when comparing the two clinical groups together with HC ($t = -4.003$, $p < .025$), with no significant difference when comparing the two clinical groups with each other ($t = 0.000$, $p > .025$). An ANOVA revealed no significant main effect of group on the expressive suppression subscale ($F = 2.158$, $p > .05$)	Case definition: poor Appropriate sample: fair Selection of controls: fair Definition of controls: fair Matching: fair	Selection bias: unclear Confounding bias: unclear Measurement bias: low
(Marquez-Arrico et al., 2015)	39 male individuals with Substance Use Disorder (SUD) and SZ (SZ+) 43 male individuals with SUD	SUD: 35.35 (8.42) SZ+: 37.49 (8.18)	DSM-IV- R (SCID) PANSS;	CSI	An ANOVA indicated no significant difference in the use of cognitive restructuring between SUD and SZ+ ($F < 0.006$; $p > .939$), but SZ+ had lower scores in self-criticism than SUD ($F = 4.190$; $p = .044$; $\eta^2 = .50$). Bivariate correlations showed a significant negative correlation between cognitive restructuring and PANSS positive scores for SZ+ ($r = -.408$, $p < .01$). No significant association between self-criticism and PANSS positive scores was found ($r = .134$, $p > .05$).	Case definition: good Appropriate sample: fair Selection of controls: good Definition of controls: NA Matching: NA	Selection bias: low Confounding bias: low Measurement bias: low

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Table 1 (*continued*)

Author name	Sample details	Age M (SD)	Psychopathology measures	ER measures	Results	Quality	Risk of bias
(Moritz, Lüdtke, et al., 2016)	75 individuals with psychosis; 100 individuals with depression; 1100 healthy controls	SZ: 40.89 (9.41) D: 42,59 (10,47) HC: 41,96 (11,35)	CAPE	MAX	Group comparisons ($F = 18.39$, $p < .001$) revealed significantly more avoidance in both SZ ($p = .046$) and depression patients ($p < .001$) than in HC; comparing the two clinical groups, depression patients showed more avoidance than SZ ($p = .015$). Adaptive coping was correlated with lower ($r = -.312$), maladaptive coping with higher ($r = .402$) positive symptoms. Avoidance and suppression coping were also associated with positive symptoms ($r = .447$, $r = .459$). Suppression was significantly correlated with CAPE paranoia scores ($r = .431$, $p < .001$).[c]	Case definition: fair Appropriate sample: fair Selection of controls: good Definition of controls: fair Matching: good	Selection bias: unclear Confounding bias: low Measurement bias: low
(Morrison & Wells, 2000)	22 individuals with schizophrenia; 22 healthy controls	SZ: 44,1 (14,35) HC: 39,8 (8,81)	-	TCQ	Univariate analysis indicated a significantly higher use of punishment- ($F = 11.40$, $p = .002$) and worry ($F = 15.40$, $p = .001$) and a less frequent use of distraction in SZ compared to HC ($F = 6.42$, $p = .015$). No group difference was found regarding reappraisal ($F = 2.57$, $p = > .05$).	Case definition: fair Appropriate sample: fair Selection of controls: fair Definition of controls: poor Matching: fair	Selection bias: unclear Confounding bias: unclear Measurement bias: unclear
(Perry et al., 2011)	33 individuals with schizophrenia or schizoaffective disorder; 36 healthy controls	SZ: 43.7 (9.89) HC: 40.8 (11.49)	SAPS	ERQ	Independent-samples t-tests revealed no between-group differences in the use of suppression ($t = 0.83$, $p = .412$, $d = 0.20$) and reappraisal ($t = 0.78$, $p = .441$, $d = 0.19$). For SZ, Pearson's correlations indicated, that a greater use of suppression was associated with poorer social functioning ($r = -.40$, $p = .022$), greater use of reappraisal was related to decreased levels of depression ($r = -.40$, $p = .021$) and lower negative symptoms ($r = -.48$, $p = .005$).	Case definition: fair Appropriate sample: good Selection of controls: good Definition of controls: fair Matching: good	Selection bias: low Confounding bias: low Measurement bias: low
(Pietrzak et al., 2009)	121 individuals with schizophrenia or Schizoaffective disorder; 120 healthy controls	SZ: 40.4 (11.1) HC: 39.2 (11.0)	DSM-IV PANSS BPRS	MSCEIT	A group comparison indicated a difference in MSCEIT performance scores in favor of HC ($M = 96.2$, $SD = 9.5$) compared to SZ ($M = 87.9$, $SD = 13.1$, $p < .001$) with a moderate effect size ($d \approx -0.73$).	Case definition: good Appropriate sample: good Selection of controls: good Definition of controls: good Matching: good	Selection bias: low Confounding bias: low Measurement bias: low
(Ponizovsky et al., 2004)	70 individuals with schizophrenia; 55 healthy controls	SZ: 38.6 (9.4) HC: 40.6 (10.0)	ICD-10	CISS	An independent-samples t-test indicated no significant difference in task-oriented coping ($t = 0.006$, $p > .05$).	Case definition: fair Appropriate sample: fair Selection of controls: good Definition of controls: fair Matching: good	Selection bias: unclear Confounding bias: low Measurement bias: low
(Ponizovsky, 2013)	51 individuals with schizophrenia; 70 individuals with depression; 61 healthy controls	SZ: 33.8 (10.5) D: 37.4 (13.4) HC: 35.7 (11.3)	DSM-IV (SCID) PANSS	CISS	Task-oriented coping scores were significantly lower in SZ compared to the depression group and HC ($F = 7.45$, $p = .001$). In a regression model (coping in SZ), task- and emotion-oriented coping styles predicted PANSS general psychopathology scores, accounting for 8.8% and 7.2%, respectively, of the total variance ($R^2 = 0.45$; adjusted $R^2 = 0.34$; $F = 3.3$, $p < .001$)	Case definition: good Appropriate sample: good Selection of controls: fair Definition of controls: fair Matching: fair	Selection bias: unclear Confounding bias: unclear Measurement bias: low

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Author name	Sample details	Age M (SD)	Psychopathology measures	ER measures	Results	Quality	Risk of bias
(Rajji et al., 2013)	59 individuals with schizophrenia or schizoaffective disorder; 33 healthy controls	SZ: 63.5 (6.8) HC: 63.4 (7.7)	DSM-IV (SCID) PANSS	MSCEIT	Independent-samples t-tests revealed lower scores in managing emotions in SZ compared to HC ($t = -4.61$, $df = 90$, $p < .0001$, $d = 1.0$).	Case definition: good Appropriate sample: good Selection of controls: good Definition of controls: good Matching: fair	Selection bias: low Confounding bias: low Measurement bias: low
(Ritsner et al., 2006)	237 individuals with schizophrenia; 175 healthy controls	SZ: 37.9 (9.9) HC: 38.4 (10.0)	PANSS	CISS	A two-way ANCOVA revealed a significantly lower use of task-oriented coping in SZ compared to HC ($F = 39.6$, $p = .001$). Task-oriented coping style scores were independent from covariates tested.	Case definition: fair Appropriate sample: good Selection of controls: fair Definition of controls: good Matching: poor	Selection bias: unclear Confounding bias: low Measurement bias: low
(Rowland, Hamilton, Vella, et al., 2013)	126 individuals with schizophrenia; 97 individuals with bipolar disorder; 81 healthy controls	SZ: 45.46 (10.96) BD: 51.26 (12.10) HC: 44.65 (12.86)	DIP	CERQ	ANCOVAs, controlling for age and gender, revealed a significantly more frequent use of rumination (SZ: $F = 8.05$, $p < .0005$, $\eta_p^2 = .106$) and self-blame (SZ: $F = 5.12$, $p = .002$, $\eta_p^2 = .070$) in SZ and bipolar patients compared to HC. They showed less putting into perspective (SZ: $F = 4.65$, $p = .004$, $\eta_p^2 = .064$). No differences in positive reappraisal and acceptance. There were no significant associations between levels of positive or negative symptomatology and frequency of use of CERQ strategies in SZ	Case definition: good Appropriate sample: good Selection of controls: good Definition of controls: poor Matching: poor	Selection bias: unclear Confounding bias: low Measurement bias: unclear
(Rowland, Hamilton, Vella, et al., 2013)	32 individuals with schizophrenia; 24 individuals with bipolar I disorder; 36 healthy controls	SZ: 44.57 (10.37) BD: 40.67 (11.27) HC: 33.91 (12.24)	PANSS	CERQ	A MANOVA revealed a significantly more frequent use of rumination in SZ compared to HC ($F = 3.53$, $p = .034$, $\eta^2 = .073$). SZ scored higher in the use of self-blaming than HC ($F = 3.19$, $p = .046$, $\eta^2 = .067$), patients with bipolar scored higher than SZ. No differences were found regarding positive reappraisal and acceptance between SZ and HC.	Case definition: fair Appropriate sample: good Selection of controls: good Definition of controls: poor Matching: poor	Selection bias: unclear Confounding bias: unclear Measurement bias: unclear
(Siegle et al., 2010)	15 individuals with schizophrenia; 14 with major depression; 24 healthy controls	SZ: 41.5 (5.6) D: 43.1 (14.2) HC: 30.2 (11.4)	SCID	RSQ	Higher scores of rumination on RRS scale in SZ compared to HC.[d]	Case definition: good Appropriate sample: good Selection of controls: fair Definition of controls: fair Matching: poor	Selection bias: unclear Confounding bias: unclear Measurement bias: low
(Suslow et al., 2003)	28 individuals with schizophrenia; 30 healthy controls	SZ: 35.7 (9.4) HC: 35.5 (8.6)	SAPS	ECQ	No significant difference was found regarding suppression and rumination between SZ and HC.	Case definition: good Appropriate sample: fair Selection of controls: fair Definition of controls: fair Matching: fair	Selection bias: unclear Confounding bias: unclear Measurement bias: unclear

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Table 1 (*continued*)

Author name	Sample details	Age M (SD)	Psychopathology measures	ER measures	Results	Quality	Risk of bias
(Tabak, Horan, & Green, 2015)	35 individuals with schizophrenia (outpatients); 38 individuals with bipolar disorder (outpatients); 35 healthy controls	SZ: 47.06 (9.79) BP: 43.47 (11.38) HC: 47.17 (6.53)	DSM-IV (SCID) BPRS	TMMS	Post-hoc analysis revealed that the use of cognitive reappraisal was significantly higher in SZ than in HC ($t = 4.38$, $p < .01$, $d = 1.05$). There was no difference between SZ and patients with bipolar disorder. Correlation analysis showed no significant correlation between cognitive reappraisal and BPRS positive scores ($r = .31$, $p > .05$).	Case definition: good Appropriate sample: fair Selection of controls: good Definition of controls: good Matching: good	Selection bias: low Confounding bias: low Measurement bias: low
(Tso et al., 2010)	33 individuals with schizophrenia or schizoaffective disorder; 33 healthy controls	SZ: 38.5 (11.3) HC: 38.2 (9.6)	DSM-IV (SCID) BPRS	MSCEIT	Independent-samples t-test revealed significantly lower managing emotion scores in SZ compared to HC ($t = -5.27$, $p < .005$).	Case definition: good Appropriate sample: good Selection of controls: good Definition of controls: good Matching: good	Selection bias: low Confounding bias: low Measurement bias: low
(Van der Meer, & Aleman, 2009)	31 individuals with schizophrenia; 44 healthy controls	SZ: 32.2 (8.0) HC: 29.2 (8.6)	DSM-IV (CASH) PANSS	ERQ	Two separate ANOVAs revealed a significant effect for group for suppression ($F = 4.638$, $p = .035$) and no significant effect for group for reappraisal ($F = 3.490$, $p = .066$).	Case definition: good Appropriate sample: fair Selection of controls: good Definition of controls: good Matching: good	Selection bias: low Confounding bias: low Measurement bias: low
(Ventura et al., 2004)	29 individuals with schizophrenia (outpatients); 24 healthy controls	SZ: 25.8 (6.3) HC: 26.9 (5.9)	DSM-IV (SCID) BPRS	CRI	Independent-samples t-test indicated no significant difference between SZ and controls regarding cognitive reappraisal ($t = 1.32$, $p < .20$)	Case definition: good Appropriate sample: good Selection of controls: good Definition of controls: good Matching: good	Selection bias: low Confounding bias: low Measurement bias: low
(Vorontsova et al., 2013)	30 individuals with schizophrenia 30 individuals with depression 30 healthy controls	SZ: 40.1 (10.7) D: 42.5 (13.1) HC: 40.4 (13.1)	SCAN v2.1 PSYRATS	RRS	A group comparison revealed a higher usage of rumination in SZ compared to HC ($t = 3.286$, $p = .0017$, $d = -0.899$)	Case definition: good Appropriate sample: fair Selection of controls: good Definition of controls: fair Matching: fair	Selection bias: low Confounding bias: unclear Measurement bias: low
(Xu et al., 2013)	133 individuals with schizophrenia; 50 healthy controls	SZ: 34.6 (11.4) HC: 31.8 (11.9)	PANSS	CSQ	Independent-samples t-test revealed that self-blaming ($t = 3.3$, $p = .001$) and avoidance ($t = 7.1$, $p < .001$) were used significantly more frequently in SZ	Case definition: fair Appropriate sample: fair Selection of controls: good Definition of controls: good Matching: fair	Selection bias: low Confounding bias: low Measurement bias: unclear

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Table 1 (*continued*)

Author name	Sample details	Age M (SD)	Psychopathology measures	ER measures	Results	Quality	Risk of bias
(Zou, Y. min, Ni, K., Yang, Z. y-a, Li, Y., Cai, X. lu, Xie, D. jie, … Chan, R. C. K., 2017)	146 individuals with schizophrenia 73 healthy controls	SZ: 36,3 (10.3) HC: 35.95 (10.6)	PANSS	ERQ	Independent-samples t-test indicated that HC used significantly more often reappraisal strategies ($t = 3.248$, $p < .001$, $d = -0.5$). No significant difference in the use of suppression strategies ($d = 0.025$).	Case definition: fair Appropriate sample: fair Selection of controls: good Definition of controls: fair Matching: good	Selection bias: low Confounding bias: low Measurement bias: low

AD: Anixiety Disorder; BD: Bipolar Disorder; BPRS: Brief Psychiatric Rating Scale; CAPE: Community Assessment of Psychic Experiences; CASH: Comprehensive Assessment of Symptoms and History; CERQ: Cognitive Emotion Regulation Questionnaire; CHR: Clinical High Risk; CISS: Coping Inventory for Stressful Situations; CRI: Coping Response Inventory; CSI: Coping Strategies Inventory; CSQ: Coping Style Questionnaire; D: Depression; DIP: The Diagnostic Interview for Psychosis; DSM IV: Diagnostic and Statistical Manual of Mental Disorders 4th edition; ECQ: Emotional Control Questionnaire; ERP: Event Related Potential; ERQ: Emotion Regulation Questionnaire; ERSQ-ES: emotion specific Emotion Regulation Skill Questionnaire; FEP: First Episode Psychosis; HC: Healthy Controls; ICD- 10: International Statistical Classification of Diseases and Related Health Problems 10th edition; MAX: Maladaptive and Adaptive Coping Styles questionnaire; M.I.N.I.: Mini Mental Neuropsychiatric Interview; MSCEIT: Mayer-Salovey-Caruso Emotion Intelligence Test; PANSS: Positive and Negative Symptom Scale; PCL: Paranoia Checklist; RRS: Ruminative Response Scale; RSQ: Response Style Questionnaire; SANS: Scale for the Assessment of Negative Symptoms; SAPS: Scale for the Assessment of Positive Symptoms; SCAN v2.1: Schedules for Clinical Assessment in Neuropsychiatry version 2.1; SCID: Structured Clinical Interview for DMS Disorders; STAXI: State-Trait-Anger Expression Inventory; SZ: Schizophrenia Patients; TCQ: Thought Control Questionnaire; TMMS: Trait Meta Mood Scale.

[a] PSYRATS Item.

[b] Data from first episode participants were included in the meta-analysis.

[c] Authors were contacted in order to receive means and SDs for the suppression subscale.

[d] Authors were contacted in order to receive means and SDs on RRS scale for the meta-analysis.

Table 2
Experimental studies on emotion regulation

Author name	Sample details	Age M (SD)	Psychopathology measures	Induced Emotions	Emotion regulation strategies tested	Experimental design/ manipulation	Results	Quality	Risk of bias
(Grezellschak et al., 2015)	17 individuals with schizophrenia; 27 healthy controls	SZ: 40.41 (11.52) HC: 37.89 (10.93)	CAPE	Negative affect (anxiety)	Reappraisal, distraction	Induction of anxiety through IAPS pictures and IADS-2 sounds; all participants were instructed to down-regulate their feelings through either reappraisal or distraction. Control condition = watching the pictures without deploying a strategy. State anxiety rated on visual analogue scale	A repeated measure ANOVA revealed a significant main effect for emotion regulation ($F = 12.27$, $p < .001$, $\eta_p^2 = .23$), with simple contrasts showing a significant difference between control condition and reappraisal ($p = .001$) and between control condition and distraction ($p < .001$). No significant main effect for group ($F = 2.51$, $p = .12$) and no significant interaction between group and strategy ($F = 0.20$, $p = .82$) were found. Habitual questionnaire-based data (ERQ): No significant group difference was found regarding the use of both reappraisal and suppression.	Case definition: good Appropriate sample: good Selection of controls: good Definition of controls: good Matching: good	Selection bias: low Confounding bias: low Measurement bias: low
(Perry et al., 2012)	25 individuals with schizophrenia (16) or schizoaffective disorder (9); 24 healthy controls	SZ: 42.2 (9.53) HC: 42.8 (12.54)	SAPS	Negative affect (sadness)	Suppression, reappraisal, acceptance	Watching a film scene, inducing negative affect. Participants are asked to use emotion regulation strategies; rating of ability to implement strategies and willingness to watch	Repeated measures ANOVAs revealed no group differences in reported levels of negative affect Increased ability to deploy acceptance, relative to suppression	Case definition: good Appropriate sample: good Selection of controls: good Definition of	Selection bias: low Confounding bias: low Measurement bias: low

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Table 2 (*continued*)

Author name	Sample details	Age M (SD)	Psychopathology measures	Induced Emotions	Emotion regulation strategies tested	Experimental design/ manipulation	Results	Quality	Risk of bias
						another similar film clip; measurement of behavioral expression (surface electromyography) and subjective experience of emotion	($p = .17$), independent of group. No group or interaction effects of implementation of emotion regulation instructions SZ were less willing than HC to experience sadness again, regardless of the regulatory strategy that was implemented, ($F = 6.04$, $p = .018$, $\eta_p^2 = .12$) A mixed model ANOVA revealed lower levels of self-reported sadness for the implementation of reappraisal compared to expression ($p = .042$) or acceptance ($p = .032$) in both groups. No significant comparisons were obtained for suppression and any of the other conditions (all ps > .05)[a]	controls: good Matching: good	
(Van der Meer et al., 2014)	20 individuals with schizophrenia; 20 non-psychotic siblings; 20 healthy controls	SZ: 35.2 (10.8) HC: 35.5 (11.7)	PANSS	Negative affect	Suppression, reappraisal	fMRI scan; viewing IAPS pictures, inducing negative affect, four conditions (attend neutral, attend negative, reappraisal, suppression), rating of negative emotions	An ANOVA indicated no group difference for regulating negative affect with both reappraisal and the suppression strategy. Reappraising negative stimuli activated previously reported brain areas in all groups. SZ and siblings showed decreased activation of the left VLPFC compared to HC during reappraisal. Habitual questionnaire-based data (ERQ): An ANOVA indicated no group difference regarding the use of both reappraisal and suppression.	Case definition: good Appropriate sample: fair Selection of controls: good Definition of controls: good Matching: good	Selection bias: low Confounding bias: low Measurement bias: low

CAPE: Community Assessment of Psychic Experiences; ERQ: Emotion Regulation Questionnaire; fMRI: functional Magnetic Resonance Imaging; HC: Healthy Controls; IADS-2: International Affective Digitized Sounds System; IAPS: International Affective Pictures System; PANSS: Positive and Negative Symptom Scale; SZ: Schizophrenia Patients; SAPS: Scale for the Assessment of Positive Symptoms; VLPFC: Ventrolateral Prefrontal Cortex.

[a] Authors were contacted in order to receive data for means and SDs.

Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cpr.2019.101746.

References

Aldao, A., & Nolen-Hoeksema, S. (2012). The influence of context on the implementation of adaptive emotion regulation strategies. *Behaviour Research and Therapy, 50*(7–8), 493–501. https://doi.org/10.1016/j.brat.2012.04.004.

Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review, 30*(2), 217–237. https://doi.org/10.1016/j.cpr.2009.11.004.

Allott, K. A., Rapado-Castro, M., Proffitt, T. M., Bendall, S., Garner, B., Butselaar, F., ... Phillips, L. J. (2015). The impact of neuropsychological functioning and coping style on perceived stress in individuals with first-episode psychosis and healthy controls. *Psychiatry Research, 226*(1), 128–135. https://doi.org/10.1016/j.psychres.2014.12.032.

Badcock, J. C., Paulik, G., & Maybery, M. T. (2011). The role of emotion regulation in auditory hallucinations. *Psychiatry Research, 185*(3), 303–308. https://doi.org/10.1016/j.psychres.2010.07.011.

Ben-Zeev, D., Ellington, K., Swendsen, J., & Granholm, E. (2011). Examining a cognitive model of persecutory ideation in the daily life of people with schizophrenia: A computerized experience sampling study. *Schizophrenia Bulletin, 37*(6), 1248–1256. https://doi.org/10.1093/schbul/sbq041.

Berking, M., & Whitley, B. (2014). The adaptive coping with emotions model (ACE model). *Affect Regulation Training* (pp. 19–29). New York, NY: Springer New York. https://doi.org/10.1007/978-1-4939-1022-9_3.

Bloch, L., Moran, E. K., & Kring, A. M. (2010). *On the need for conceptual and definitional clarity in emotion regulation research on psychopathology. Emotion Regulation and Psychopathology: A Transdiagnostic Approach to Etiology and Treatment*.

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). Effect sizes

based on correlations. *Introduction to meta-analysis* (pp. 41–43). Chichester, UK: John Wiley & Sons, Ltd. https://doi.org/10.1002/9780470743386.ch6.
Braga, R. J., Reynolds, G. P., & Siris, S. G. (2013). Anxiety comorbidity in schizophrenia. *Psychiatry Research, 210*(1), 1–7. https://doi.org/10.1016/j.psychres.2013.07.030.
Buckley, P. F., Miller, B. J., Lehrer, D. S., & Castle, D. J. (2009). Psychiatric comorbidities and schizophrenia. *Schizophrenia Bulletin, 35*(2), 383–402. https://doi.org/10.1093/schbul/sbn135.
Chadwick, P. (2014). Mindfulness for psychosis. *British Journal of Psychiatry, 204*(05), 333–334. https://doi.org/10.1192/bjp.bp.113.136044.
Cicero, D. C., Klaunig, M. J., Trask, C. L., & Neis, A. M. (2016). Anomalous self-experiences and positive symptoms are independently associated with emotion processing deficits in schizophrenia. *Schizophrenia Research, 176*(2–3), 456–461. https://doi.org/10.1016/j.schres.2016.08.018.
Clamor, A., Lincoln, T. M., Thayer, J. F., & Koenig, J. (2016). Resting vagal activity in schizophrenia: Meta-analysis of heart rate variability as a potential endophenotype. *British Journal of Psychiatry, 208*(1), 9–16. https://doi.org/10.1192/bjp.bp.114.160762.
Clamor, A., Schlier, B., Köther, U., Hartmann, M. M., Moritz, S., & Lincoln, T. M. (2015). Bridging psychophysiological and phenomenological characteristics of psychosis - Preliminary evidence for the relevance of emotion regulation. *Schizophrenia Research, 169*(1–3), 346–350. https://doi.org/10.1016/j.schres.2015.10.035.
Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155.
Cohen, C. I., Hassamal, S. K., & Begum, N. (2011). General coping strategies and their impact on quality of life in older adults with schizophrenia. *Schizophr. Res. 127*, 223–228. https://doi.org/10.1016/j.schres.2010.12.023.
Cosway, R., Endler, N. S., Sadler, A. J., & Deary, I. J. (2000). The coping inventory for stressful situations: Factorial structure and associations with personality traits and psychological health. *Journal of Applied Biobehavioral Research, 5*(2), 121–143. https://doi.org/10.1111/j.1751-9861.2000.tb00069.
Cramer, H., Lauche, R., Haller, H., Langhorst, J., & Dobos, G. (2016). Mindfulness- and acceptance-based interventions for psychosis: A systematic review and meta-analysis. *Global Advances in Health and Medicine, 5*(1), 30–43. https://doi.org/10.7453/gahmj.2015.083.
Dawson, S., Kettler, L., Burton, C., & Galletly, C. (2012). Do people with schizophrenia lack emotional intelligence? *Schizophrenia Research and Treatment, 2012*(1), https://doi.org/10.1155/2012/495174 ID: 495174.
Delespaul, P., deVries, M., & van Os, J. (2002). Determinants of occurrence and recovery from hallucinations in daily life. *Social Psychiatry and Psychiatric Epidemiology, 37*(3), 97–104. https://doi.org/10.1007/s001270200000.
Dudley, R., Taylor, P., Wickham, S., & Hutton, P. (2016). Psychosis, delusions and the "Jumping to Conclusions" reasoning bias: A systematic review and meta-analysis. *Schizophrenia Bulletin, 42*(3), 652–665. https://doi.org/10.1093/schbul/sbv150.
Ebert, D. D., Christ, O., & Berking, M. (2013). Entwicklung und Validierung eines Fragebogens zur emotionsspezifischen Selbsteinschätzung emotionaler Kompetenzen (SEK-ES). *Diagnostica, 59*(1), 17–32. https://doi.org/10.1026/0012-1924/a000079.
Endler, N. S., & Parker, J. D. A. (1990). *Coping inventory for stressful situations (CISS): Manual.* Ontario, Canada: Multi-Health Systems, Inc.
Fan, F., Tan, S., Yang, F., Tan, Y., Zhao, Y., Chen, N., ... Kline, N. S. (2013). Ventral medial prefrontal functional connectivity and emotion regulation in chronic schizophrenia: A pilot study. *29*(1), 59–74. https://doi.org/10.1007/s12264-013-1300-8.
Folkman, S., Lazarus, R. S., Dunkel-Schetter, C., DeLongis, A., & Gruen, R. J. (1986). Dynamics of a stressful encounter: cognitive appraisal, coping, and encounter outcomes. *Journal of Personality and Social Psychology, 50*(5), 992–1003.
Foster, C., Startup, H., Potts, L., & Freeman, D. (2010). A randomised controlled trial of a worry intervention for individuals with persistent persecutory delusions. *Journal of Behavior Therapy and Experimental Psychiatry, 41*(1), 45–51. https://doi.org/10.1016/j.jbtep.2009.09.001.
Fowler, D., Hodgekins, J., Garety, P., Freeman, D., Kuipers, E., Dunn, G., ... Bebbington, P. E. (2012). Negative cognition, depressed mood, and paranoia: A longitudinal pathway analysis using structural equation modeling. *Schizophrenia Bulletin, 38*(5), 1063–1073. https://doi.org/10.1093/schbul/sbr019.
Frajo-Apor, B., Pardeller, S., Kemmler, G., Welte, A. S., & Hofer, A. (2016). Emotional intelligence deficits in schizophrenia: The impact of non-social cognition. *Schizophrenia Research, 172*(1–3), 131–136. https://doi.org/10.1016/j.schres.2016.02.027.
Freeman, D., Dunn, G., Startup, H., Pugh, K., Cordwell, J., Mander, H., ... Kingdon, D. (2015). *Effects of cognitive behaviour therapy for worry on persecutory delusions in patients with psychosis (WIT): a parallel, single-blind, randomised controlled trial with a mediation analysis.* 305–313. https://doi.org/10.1016/S2215-0366(15)00039-5.
Freeman, D., & Garety, P. (2014). *Advances in understanding and treating persecutory delusions: a review.* 1179–1189. https://doi.org/10.1007/s00127-014-0928-7.
Freeman, D., Garety, P. A., & Kuipers, E. (2001). Persecutory delusions: developing the understanding of belief maintenance and emotional distress. *Psychological Medicine, 31*(7), 1293–1306.
Freeman, D., Stahl, D., McManus, S., Meltzer, H., Brugha, T., Wiles, N., & Bebbington, P. (2012). Insomnia, worry, anxiety and depression as predictors of the occurrence and persistence of paranoid thinking. *Social Psychiatry and Psychiatric Epidemiology, 47*(8), 1195–1203. https://doi.org/10.1007/s00127-011-0433-1.
Garety, P., Freeman, D., Jolley, S., Dunn, G., Bebbington, P. E., Fowler, D. G., ... Dudley, R. (2005). Reasoning, emotions, and delusional conviction in psychosis. *Journal of Abnormal Psychology, 114*(3), 373–384. https://doi.org/10.1037/0021-843X.114.3.373.
Garety, P. A., Kuipers, E., Fowler, D., Freeman, D., & Bebbington, P. E. (2001). A cognitive model of the positive symptoms of psychosis. *Psychological Medicine, 31*(2), 189–195. https://doi.org/10.1017/S0033291701003312.
Garnefski, N., Kraaij, V., & Spinhoven, P. (2001). Negative life events, cognitive emotion regulation and emotional problems. *Personality and Individual Differences, 30*(8), 1311–1327. https://doi.org/10.1016/S0191-8869(00)00113-6.
Green, M. F., Bearden, C. E., Cannon, T. D., Fiske, A. P., Hellemann, G. S., Horan, W. P., ... Nuechterlein, K. H. (2012). Social cognition in schizophrenia, part 1: Performance across phase of illness. *Schizophrenia Bulletin, 38*(4), 854–864. https://doi.org/10.1093/schbul/sbq171.
Grezellschak, S., Jansen, A., & Westermann, S. (2016). Emotion regulation in patients with psychosis: A link between insomnia and paranoid ideation? *Journal of Behavior Therapy and Experimental Psychiatry,* 8–13. https://doi.org/10.1016/j.jbtep.2016.08.001.
Grezellschak, S., Lincoln, T. M., & Westermann, S. (2015). Cognitive emotion regulation in patients with schizophrenia: Evidence for effective reappraisal and distraction. *Psychiatry Research, 229*(1–2), 434–439. https://doi.org/10.1016/j.psychres.2015.05.103.
Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology, 2*(3), 271–299. https://doi.org/10.1037/1089-2680.2.3.271.
Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology, 85*(2), 348–362. https://doi.org/10.1037/0022-3514.85.2.348.
Gross, J. J., & Thompson, R. A. (2007). Conceptual Foundations. *Handbook of emotion regulation* (pp. 3–24). New York: Guilford Press.
Hartley, S., Haddock, G., Sa, D. V., Emsley, R., & Barrowclough, C. (2014). *An experience sampling study of worry and rumination in psychosis, 1605–1614.* https://doi.org/10.1017/S0033291713002080.
Hayes, S. C., Strosahl, K., & Wilson, K. G. (1999). *Acceptance and commitment therapy: an experiential approach to behavior change.* Guilford Press.
Henry, J. D., Rendell, P. G., Green, M. J., McDonald, S., & O'Donnell, M. (2008). Emotion regulation in schizophrenia: affective, social, and clinical correlates of suppression and reappraisal. *Journal of Abnormal Psychology, 117*(2), 473–478. https://doi.org/10.1037/0021-843X.117.2.473.
Higgins, J. P. T., Altman, D. G., Gøtzsche, P. C., Jüni, P., Moher, D., Oxman, A. D., ... Cochrane Statistical Methods Group (2011). The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ (Clinical Research Ed.), 343*, d5928. https://doi.org/10.1136/BMJ.D5928.
Higgins, J. P. T., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *BMJ (Clinical Research Ed.), 327*(7414), 557–560. https://doi.org/10.1136/bmj.327.7414.557.
Horan, W. P., Hajcak, G., Wynn, J. K., & Green, M. F. (2013). Impaired emotion regulation in schizophrenia: evidence from event-related potentials. *Psychological Medicine, 43*(11), 2377–2391. https://doi.org/10.1017/S0033291713000019.
Ille, R., Schöny, M., Kapfhammer, H.-P., & Schienle, A. (2010). Elevated disgust proneness in schizophrenia. *Journal of Clinical Psychology, 66*(10), 1090–1100. https://doi.org/10.1002/jclp.20714.
Joormann, J., & Stanton, C. H. (2016). Examining emotion regulation in depression: A review and future directions. *Behaviour Research and Therapy, 86*, 35–49. https://doi.org/10.1016/j.brat.2016.07.007.
Kee, K. S., Horan, W. P., Salovey, P., Kern, R. S., Sergi, M. J., Fiske, A. P., ... Green, M. F. (2009). Emotional intelligence in schizophrenia. *Schizophrenia Research, 107*(1), 61–68. https://doi.org/10.1016/j.schres.2008.08.016.
Kern, R. S., Gold, J. M., Dickinson, D., Green, M. F., Nuechterlein, K. H., Baade, L. E., ... Marder, S. R. (2011). The MCCB impairment profile for schizophrenia outpatients: Results from the MATRICS psychometric and standardization study. *Schizophrenia Research, 126*(1–3), 124–131. https://doi.org/10.1016/j.schres.2010.11.008.
Khoury, B., & Lecomte, T. (2012). Emotion regulation and schizophrenia. *International Journal of Cognitive Therapy, 5*(1), 67–76. https://doi.org/10.1521/ijct.2012.5.1.67.
Kimhy, D., Gill, K. E., Brucato, G., Vakhrusheva, J., Arndt, L., Gross, J. J., & Girgis, R. R. (2016). The impact of emotion awareness and regulation on social functioning in individuals at clinical high risk for psychosis. *Psychological Medicine, 46*(14), 2907–2918. https://doi.org/10.1017/S0033291716000490.
Kimhy, D., Vakhrusheva, J., Jobson-Ahmed, L., Tarrier, N., Malaspina, D., & Gross, J. J. (2012). Emotion awareness and regulation in individuals with schizophrenia: Implications for social functioning. *Psychiatry Research, 200*(2–3), 193–201. https://doi.org/10.1016/j.psychres.2012.05.029.
Koole, S. L. (2009). The psychology of emotion regulation: An integrative review. *Cognition & Emotion, 23*(1), 4–41. https://doi.org/10.1080/02699930802619031.
Kramer, I., Simons, C. J. P., Wigman, J. T. W., Collip, D., Jacobs, N., Derom, C., ... Wichers, M. (2014). Time-lagged moment-to-moment interplay between negative affect and paranoia: New insights in the affective pathway to psychosis. *Schizophrenia Bulletin, 40*(2), 278–286. https://doi.org/10.1093/schbul/sbs194.
Kuipers, E., Garety, P., Fowler, D., Freeman, D., Dunn, G., & Bebbington, P. (2006). Cognitive, emotional, and social processes in psychosis: Refining cognitive behavioral therapy for persistent positive symptoms. *Schizophrenia Bulletin, 32*, 24–31. https://doi.org/10.1093/schbul/sbl014.
Laloyaux, J., Dessart, G., Van der Linden, M., Lemaire, M., & Larøi, F. (2016). Maladaptive emotion regulation strategies and stress sensitivity mediate the relation between adverse life events and attenuated positive psychotic symptoms. *Cognitive Neuropsychiatry, 21*(2), 116–129. https://doi.org/10.1080/13546805.2015.1137213.
Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping.* New York: Springer.
Lee, J., Altshuler, L., Glahn, D. C., Miklowitz, D. J., Ochsner, K., & Green, M. F. (2013). Social and nonsocial cognition in bipolar disorder and schizophrenia: Relative levels of impairment. *American Journal of Psychiatry, 170*(3), 334–341. https://doi.org/10.1176/appi.ajp.2012.12040490.
Lincoln, T., Marin, N., & Jaya, E. (2017). Childhood trauma and psychotic experiences in a general population sample: A prospective study on the mediating role of emotion

regulation. *European Psychiatry, 42*(2016), 111–119. https://doi.org/10.1016/j.eurpsy.2016.12.010.
Lincoln, T. M., Hartmann, M., Köther, U., & Moritz, S. (2015a). Dealing with feeling: Specific emotion regulation skills predict responses to stress in psychosis. *Psychiatry Research, 228*(2), 216–222. https://doi.org/10.1016/j.psychres.2015.04.003.
Lincoln, T. M., Hartmann, M., Köther, U., & Moritz, S. (2015b). Do people with psychosis have specific difficulties regulating emotions? *Clinical Psychology and Psychotherapy, 22*(6), 637–646. https://doi.org/10.1002/cpp.1923.
Lincoln, T. M., Peter, N., Schäfer, M., & Moritz, S. (2009). Impact of stress on paranoia: an experimental investigation of moderators and mediators. *Psychological Medicine, 39*(7), 1129–1139. https://doi.org/10.1017/S0033291708004613.
Livingstone, K., Harper, S., & Gillanders, D. (2009). An exploration of emotion regulation in psychosis. *Clinical Psychology and Psychotherapy, 16*(5), 418–430. https://doi.org/10.1002/cpp.635.
Louise, S., Fitzpatrick, M., Strauss, C., Rossell, S. L., & Thomas, N. (2018). Mindfulness- and acceptance-based interventions for psychosis: Our current understanding and a meta-analysis. *Schizophrenia Research, 192*, 57–63. https://doi.org/10.1016/J.SCHRES.2017.05.023.
Marquez-Arrico, J. E., Benaiges, I., & Adan, A. (2015). Strategies to cope with treatment in substance use disorder male patients with and without schizophrenia. *Psychiatry Research, 228*(3), 752–759. https://doi.org/10.1016/j.psychres.2015.05.028.
Mayer, J., Salovey, P., & Caruso, D. (2002). *Mayer-Salovey-Caruso emotional intelligence test (MSCEIT) (Multi-Heal). Toronto, Ontario*.
Mayer, J. D., Salovey, P., Caruso, D. R., & Sitarenios, G. (2003). Measuring emotional intelligence with the MSCEIT V2.0. *Emotion, 3*(1), 97–105. https://doi.org/10.1037/1528-3542.3.1.97.
McRae, K. (2013). Emotion regulation frequency and success: Separating constructs from methods and time scale. *Social and Personality Psychology Compass, 7*(5), 289–302. https://doi.org/10.1111/spc3.12027.
McRae, K., Jacobs, S. E., Ray, R. D., John, O. P., & Gross, J. J. (2012). Individual differences in reappraisal ability: Links to reappraisal frequency, well-being, and cognitive control. *Journal of Research in Personality, 46*(1), 2–7. https://doi.org/10.1016/j.jrp.2011.10.003.
Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., Altman, D., Antes, G., ... Tugwell, P. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine, 6*(7), https://doi.org/10.1371/journal.pmed.1000097.
Moos, R. H. (1993). *Coping responses inventory adult form manual (psychologi)*. Odessa, FL.
Moritz, S., Jahns, A. K., Schröder, J., Berger, T., Lincoln, T. M., Klein, J. P., & Göritz, A. S. (2016). More adaptive versus less maladaptive coping: What is more predictive of symptom severity? Development of a new scale to investigate coping profiles across different psychopathological syndromes. *Journal of Affective Disorders, 191*, 300–307. https://doi.org/10.1016/j.jad.2015.11.027.
Moritz, S., Lüdtke, T., Westermann, S., Hermeneit, J., Watroba, J., & Lincoln, T. M. (2016). Dysfunctional coping with stress in psychosis. An investigation with the maladaptive and adaptive coping styles (MAX) questionnaire. *Schizophrenia Research, 175*(1–3), 129–135. https://doi.org/10.1016/j.schres.2016.04.025.
Morris, S. B. (2008). Estimating effect sizes from pretest-posttest-control group designs. *Organizational Research Methods, 11*(2), 364–386. https://doi.org/10.1177/1094428106291059.
Morrison, A. P., & Wells, A. (2000). Thought control strategies in schizophrenia: A comparison with non-patients. *Behaviour Research and Therapy, 38*(12), 1205–1209. https://doi.org/10.1016/S0005-7967(99)00153-9.
Nittel, C. M., Lincoln, T. M., Lamster, F., Leube, D., Rief, W., Kircher, T., & Mehl, S. (2018). Expressive suppression is associated with state paranoia in psychosis: An experience sampling study on the association between adaptive and maladaptive emotion regulation strategies and paranoia. *British Journal of Clinical Psychology*. https://doi.org/10.1111/bjc.12174.
Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and post-traumatic stress symptoms after a natural disaster: the 1989 Loma Prieta Earthquake. Journal of Personality and Social 61(1), 115.
Nolen-Hoeksema, S., & Watkins, E. R. (2011). A heuristic for developing transdiagnostic models of psychopathology: Explaining multifinality and divergent trajectories. *Perspectives on Psychological Science, 6*(6), 589–609. https://doi.org/10.1177/1745691611419672.
O'Donoghue, E. K., Morris, E. M. J., Oliver, J. E., & Johns, L. C. (2018). *ACT for psychosis recovery: A practical manual for group-based interventions using acceptance and commitment therapy. ACT for psychosis recovery: A practical manual for group-based interventions using acceptance and commitment therapy*. Oakland, CA, US: Context Press/New Harbinger Publications.
O'Driscoll, C., Laing, J., & Mason, O. (2014). Cognitive emotion regulation strategies, alexithymia and dissociation in schizophrenia, a review and meta-analysis. *Clinical Psychology Review, 34*(6), 482–495. https://doi.org/10.1016/j.cpr.2014.07.002.
Opoka, S. M., Ludwig, L., & Lincoln, T. M. (2018). A systematic review of trials targeting depression and anxiety in patients with delusions. *Zeitschrift Für Psychologie, 226*(3), 142–151.
Orellana, G., & Slachevsky, A. (2013). Executive functioning in schizophrenia. *Frontiers in Psychiatry, 4*(JUN), 1–15. https://doi.org/10.3389/fpsyt.2013.00035.
Pearlin, L. I., Mullan, J. T., Semple, S. J., & Skaff, M. M. (1990). Caregiving and the stress process: an overview of concepts and their measures. *Gerontologist, 30*, 583–594.
Peña-Sarrionandia, A., Mikolajczak, M., & Gross, J. J. (2015). Integrating emotion regulation and emotional intelligence traditions: A meta-analysis. *Frontiers in Psychology, 6*(FEB), 1–27. https://doi.org/10.3389/fpsyg.2015.00160.
Perry, Y., Henry, J. D., & Grisham, J. R. (2011). The habitual use of emotion regulation strategies in schizophrenia. *British Journal of Clinical Psychology, 50*(2), 217–222. https://doi.org/10.1111/j.2044-8260.2010.02001.x.
Perry, Y., Henry, J. D., Nangle, M. R., & Grisham, J. R. (2012). Regulation of negative affect in schizophrenia: The effectiveness of acceptance versus reappraisal and suppression. *Journal of Clinical and Experimental Neuropsychology, 34*(5), 497–508. https://doi.org/10.1080/13803395.2012.661405.
Pietrzak, R. H., Olver, J., Norman, T., Piskulic, D., Maruff, P., & Snyder, P. J. (2009). A comparison of the CogState Schizophrenia battery and the measurement and treatment research to improve cognition in schizophrenia (MATRICS) battery in assessing cognitive impairment in chronic schizophrenia. *Journal of Clinical and Experimental Neuropsychology, 31*(7), 848–859. https://doi.org/10.1080/13803390802592458.
Ponizovsky, A., Grinshpoon, A., Sasson, R., & Levav, I. (2004). Stress in adult students with schizophrenia in a supported education program. *Comprehensive Psychiatry, 45*(5), 401–407. https://doi.org/10.1016/j.comppsych.2004.03.012.
Ponizovsky, A. M. (2013). Interpersonal distances, coping strategies and psychopathology in patients with depression and schizophrenia. *World Journal of Psychiatry, 3*(3), 74. https://doi.org/10.5498/wjp.v3.i3.74.
Preti, A., & Cella, M. (2010). Paranoid thinking as a heuristic. *Early Intervention in Psychiatry, 4*(3), 263–266. https://doi.org/10.1111/j.1751-7893.2010.00190.x.
Rajji, T. K., Voineskos, A. N., Butters, M. A., Miranda, D., Arenovich, T., Menon, M., ... Mulsant, B. H. (2013). Cognitive performance of individuals with schizophrenia across seven decades: A study using the MATRICS consensus cognitive battery. *The American Journal of Geriatric Psychiatry, 21*(2), 108–118. https://doi.org/10.1016/j.jagp.2012.10.011.
Ritsner, M. S., Gibel, A., Ponizovsky, A. M., Shinkarenko, E., Ratner, Y., & Kurs, R. (2006). Coping patterns as a valid presentation of the diversity of coping responses in schizophrenia patients. *Psychiatry Research, 144*(2–3), 139–152. https://doi.org/10.1016/j.psychres.2005.09.017.
Roger, D., & Najarian, B. (1989). The construction and validation of a new scale for measuring emotion control. *Personality and Individual Differences, 10*(8), 845–853. https://doi.org/10.1016/0191-8869(89)90020-2.
Rowland, J. E., Hamilton, M. K., Lino, B. J., Ly, P., Denny, K., Hwang, E., ... Green, M. J. (2013). Cognitive regulation of negative affect in schizophrenia and bipolar disorder. *Psychiatry Research, 208*(1), 21–28. https://doi.org/10.1016/j.psychres.2013.02.021.
Rowland, J. E., Hamilton, M. K., Vella, N., Lino, B. J., Mitchell, P. B., & Green, M. J. (2013). Adaptive associations between social cognition and emotion regulation are absent in schizophrenia and bipolar disorder. *3*, 1–11. https://doi.org/10.3389/fpsyg.2012.00607.
Salovey, P., Mayer, J. D., Goldman, S. L., Turvey, C., & Palfai, T. P. (1995). Emotional attention, clarity, and repair: Exploring emotional intelligence using the trait meta-mood scale. *Emotion, Disclosure, and Health*. https://doi.org/10.1037/10182-006.
Schwartz, S., & Susser, E. (2006). What is a cause? In E. Susser, S. Schwartz, A. Morabia, & E. J. Bromet (Eds.). *Psychiatric epidemiology: Searching for the causes of mental disorder*. New York, NY: (Oxford Uni).
Siegle, G. J., Condray, R., Thase, M. E., Keshavan, M., & Steinhauer, S. R. (2010). Sustained gamma-band EEG following negative words in depression and schizophrenia. *International Journal of Psychophysiology: Official Journal of the International Organization of Psychophysiology, 75*(2), 107–118. https://doi.org/10.1016/j.ijpsycho.2008.04.008.
Spidel, A., Lecomte, T., Kealy, D., & Daigneault, I. (2018). Acceptance and commitment therapy for psychosis and trauma: Improvement in psychiatric symptoms, emotion regulation, and treatment compliance following a brief group intervention. *Psychology and Psychotherapy: Theory, Research and Practice, 91*(2), 248–261. https://doi.org/10.1111/papt.12159.
Spielberger, C. D. (1988). *Manual for the state-trait anger expression scale (STAX)*. Odessa, FL: Psychological Assessment Resources.
Strauss, G. P., Kappenman, E. S., Culbreth, A. J., Catalano, L. T., Lee, B. G., & Gold, J. M. (2013). Emotion regulation abnormalities in schizophrenia: Cognitive change strategies fail to decrease the neural response to unpleasant stimuli. *Schizophrenia Bulletin, 39*(4), 872–883. https://doi.org/10.1093/schbul/sbs186.
Suslow, T., Roestel, C., Ohrmann, P., & Arolt, V. (2003). The experience of basic emotions in schizophrenia with and without affective negative symptoms. *44*(4), 303–310. https://doi.org/10.1016/S0010-440X(03)00085-3.
Tabak, N. T., Green, M. F., Wynn, J. K., Proudfit, G. H., Altshuler, L., & Horan, W. P. (2015). Perceived emotional intelligence is impaired and associated with poor community functioning in schizophrenia and bipolar disorder. *Schizophrenia Research, 162*(1–3), 189–195. https://doi.org/10.1016/j.schres.2014.12.005.
Thewissen, V., Bentall, R. P., Oorschot, M., À Campo, J., van Lierop, T., van Os, J., & Myin-Germeys, I. (2011). Emotions, self-esteem, and paranoid episodes: An experience sampling study. *British Journal of Clinical Psychology, 50*(2), 178–195. https://doi.org/10.1348/014466510X508677.
Thomas, N., Morris, E. M. J., Shawyer, F., & Farhall, J. (2013). Acceptance and commitment therapy for voices. *Acceptance and commitment therapy and mindfulness for psychosis* (pp. 95–111). Oxford: John Wiley & Sons. https://doi.org/10.1002/9781118499184.ch7.
Thompson, R. A. (1994). Emotion regulation: a theme in search of definition. *Monographs of the Society for Research in Child Development, 59*(2–3), 25–52.
Thompson, R. A., & Calkins, S. D. (1996). The double-edged sword: Emotional regulation for children at risk. *Development and Psychopathology, 8*(01), 163. https://doi.org/10.1017/S0954579400007021.
Tobin, D. L., Holroyd, K. A., Reynolds, R. V., & Wigal, J. K. (1989). The hierarchical factor structure of the coping strategiesinventory. *Cognitive Therapy & Research, 13*(4), 343–361.
Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: A psychometric analysis. *Cognitive Therapy and Research, 27*(3), 247–259. https://doi.org/10.1023/A:1023910315561.
Tso, I. F., Grove, T. B., & Taylor, S. F. (2010). Emotional experience predicts social adjustment independent of neurocognition and social cognition in schizophrenia.

Schizophrenia Research, 122(1), 156–163. https://doi.org/10.1016/j.schres.2009.12.007.

Van der Meer, L., & Aleman, A. (2009). Emotion regulation strategies in patients with schizophrenia. *Psychiatry Research, 170*(2–3), 108–113. https://doi.org/10.1016/j.psychres.2009.07.010.

Van der Meer, L., Swart, M., Van Der Velde, J., Pijnenborg, G., Wiersma, D., Bruggeman, R., & Aleman, A. (2014). Neural correlates of emotion regulation in patients with schizophrenia and non-affected siblings. *PLoS ONE, 9*(6), https://doi.org/10.1371/journal.pone.0099667.

Ventura, J., Nuechterlein, K. H., Subotnik, K. L., Green, M. F., & Gitlin, M. J. (2004). Self-efficacy and neurocognition may be related to coping responses in recent-onset schizophrenia. *Schizophrenia Research, 69*(2–3), 343–352. https://doi.org/10.1016/j.schres.2003.09.002.

Visser, K. F., Esfahlani, F. Z., Sayama, H., & Strauss, G. P. (2018). An ecological momentary assessment evaluation of emotion regulation abnormalities in schizophrenia. *Psychological Medicine,* 1–9. https://doi.org/10.1017/S0033291717003865.

Vorontsova, N., Garety, P., & Freeman, D. (2013). Cognitive factors maintaining persecutory delusions in psychosis: The contribution of depression. *Journal of Abnormal Psychology, 122*(4), 1121–1131. https://doi.org/10.1037/a0034952.

Wang, X., Wang, X., & Ma, H. (1999). Rating scales for mental health (update version). *Chinese Mental Health Journal*.

Webb, T. L., Miles, E., & Sheeran, P. (2012). Dealing with feeling: A meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. *Psychological Bulletin, 138*(4), 775–808. https://doi.org/10.1037/a0027600.

Wells, A., & Davies, M. I. (1994). The thought control questionnaire: A measure of individual differences in the control of unwanted thoughts. *Behaviour Research and Therapy, 32*(8), 871–878. https://doi.org/10.1016/0005-7967(94)90168-6.

Wells, G. A., Shea, B., O'Connel, D., Petersen, J., Welch, V., & Losos, M. (2011). *The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses*.

Wright, N. P., Turkington, D., Kelly, O. P., Davies, D., Jacobs, A. M., & Hopton, J. (2014). *Treating psychosis: A clinician's guide to integrating acceptance and commitment therapy, compassion-focused therapy, and mindfulness approaches within the cognitive behavioral therapy tradition.* Oakland, CA: New Harbinger Publications.

Xu, Z. Y., Zu, S., Xiang, Y. T., Wang, N., Guo, Z. H., Kilbourne, A. M., ... Li, Z. J. (2013). Associations of self-esteem, dysfunctional beliefs and coping style with depression in patients with schizophrenia: A preliminary survey. *Psychiatry Research, 209*(3), 340–345. https://doi.org/10.1016/j.psychres.2013.02.012.

Zilverstand, A., Parvaz, M. A., & Goldstein, R. Z. (2017). Neuroimaging cognitive reappraisal in clinical populations to define neural targets for enhancing emotion regulation. A systematic review. *NeuroImage, 151*, 105–116. https://doi.org/10.1016/j.neuroimage.2016.06.009.

Zou, Y. min, Ni, K., Yang, Z. ya, Li, Y., Cai, X. lu, Xie, D. jie, … Chan, R. C. K. (2017). Profiling of experiential pleasure, emotional regulation and emotion expression in patients with schizophrenia. *Schizophrenia Research,* 6–11. https://doi.org/10.1016/j.schres.2017.08.048.

Supplementary Data – Studie I

Appendix A. Search terms, adapted from O'Driscoll, Laing, & Mason (2014)

Concept 1: (psychosis[Title] OR delusion[Title] OR schizophrenia[Title])

Concept 2: "emotion regulation" and related terms

Concept 3: scales

Concept 1 + 2

OVID (PsychINFO, MEDLINE)

((emotion regulation.ti) or (alexithymia.ti) or (affect.ti) or (dissociation.ti) or (affect* blunt*.ti) or (emotion* blunt*.ti) or (emotion* process*.ti) or (emotion* regulation.ti) or (emotion?regulation.ti) or (affect regulation.ti) or (mood regulation.ti) or (self regulation.ti) or (emotion expression.ti) or (emotion experience.ti) or (experience sampling method.ti) or (experiential avoidance.ti) or (distract*.ti) or (concentration.ti) or (attentional deployment.ti) or (attention control.ti) or (hyper vigilance.ti) or (hypervigilance.ti) or (vigilance.ti) or (hyper arousal.ti) or (hyperarousal.ti) or (hypoarousal.ti) or (ruminat.ti) or (worry.ti) or (problem solv*).ti or (suppression.ti) or (reappraisal.ti) or (cognitive change.ti) or (cognitive appraisal.ti) or (acceptance.ti) or (resignation.ti) or (coping style?.ti) or (coping mechanism?.ti) or (coping strateg*.ti)) and (psychosis or delusion or schizophrenia).ti

Concept 1 + 3

OVID (PsychINFO, MEDLINE)

(psychosis or delusion or schizophrenia).ti. and ((acceptance action questionnaire.af.) or (affective autonomic response discrepancy.af.) or (anger expression inventory.af) or (Anger Expression Scale.af) or (anxious thoughts inventory.af) or (Behavioral Anger Response Questionnaire.af) or (Behavioural Anger

Response Questionnaire.af) or (Body Sensation Questionnaire.af) or (Bermond Vorst Alexithymia Questionnaire.af) or (Body vigilance scale.af) or (Cognitive Behavioral Avoidance Scale.af) or (Cognitive Behavioural Avoidance Scale.af) or (Cognit* Checklist.af) or (Checklist Emotion Avoidance Strategy Engagement.af) or (Cognitive Emotion Regulation Questionnaire.af) or (Coping Health Injuries Problems.af) or (Coping Index.af) or (Coping Inventory Stressful Situations.af) or (COPE Inventory.af) or (Cognitive Responses Inventory.af) or (Coping Strategy Inventory.af) or (Coping Styles Questionnaire.af) or (Difficulties Emotion Regulation Questionnaire.af) or (Dissociative Experience Questionnaire.af) or (Dissociative Experiences Scale.af) or (Dissociative Processes Scale.af) or (Emotion Avoidance Strategy Inventory.af) or (Emotion Approach Coping Questionnaire.af) or (Experiential Avoidance Scale.af) or (Emotion Avoidance Hierarchy.af) or (Emotion Control Questionnaire.af) or (Endler Multidimensional Anxiety Scales.af) or (Emotion Regulation Questionnaire.af) or (Global Rumination Scale.af) or (Interpersonal Problem Solving Questionnaire.af) or (Mayer Salovey Caruso Emotion Intelligence Test.af) or (Metacognition* Questionnaire.af) or (Online Alexithymia Questionnaire.af) or (Observer Alexithymia Scale.af) or (Perceptual Alteration Scale.af) or (Penn State Worry Questionnaire.af) or (Problem-Solving Inventory.af) or (Questionnaire experiences dissociation.af) or (Responses Depression Scale.af) or (Rumination Inventory.af) or (Rumination Sadness.af) or (Rumination Reflection Questionnaire.af) or (Ruminative Response Scale.af) or (Ruminative Style Questionnaire.af) or (Rumination Scale.af) or (Response Style Questionnaire.af) or (Revised Ways Coping Checklist.af) or (Survey Coping Profile Endorsement.af) or (Scott McIntosh Rumination Index.af) or (Social Problem Solving Inventory.af) or (State Trait Anger Expression Inventory.af) or (Silencing Self Scale.af) or (Toronto Alexithymia Scale.af) or (Temperament Character Inventory.af) or (Thought Control Questionnaire.af) or (Trait Meta Mood Scale.af) or (White Bear Suppression Inventory.af) or (Ways Coping Questionnaire.af) or (Young Rygh Avoidance Inventory.af) or (Stress Process Questionnaire.af) or (Need for closure Scale.af) or (intolerance uncertainty scale.af) or (Worry Domains Questionnaire.af) or (Cognitive Avoidance Questionnaire.af) or (why worry.af) or (multidimensional anger inventory.af) or (emotion regulation skill questionnaire.af) or (Emotion regulation Skills Questionnaire.af))

Appendix B. Quality Items and Risk of Bias Items, adapted from O'Driscoll, Laing, & Mason (2014)

(1) Quality Appraisal

Case definition

DSM/ICD clinical interview - good

From records only or met DSM criteria but no evidence of assessment - fair

No description - poor

Appropriate sample

Schizophrenia spectrum – full description - good

Schizophrenia spectrum – no evidence of mixing - fair

Mixed with personality disorder and/or bipolar or no full description - poor

Selection of controls

Community controls or evidence of good matching - good

Hospital staff/students (opportunity sample) - fair

Clinical sample - poor

Definition of controls

No current diagnosis of Axis 1 or Axis 2 disorder as formally assessed - good

No history reported but not formally assessed (both Axis 1 and 2) - fair

No description - poor

Matching

Study matching individual cases and controls for age, gender, and education/IQ, or parental education/socioeconomic status - good

Study matched for age and one other - fair

not described, or age only - poor

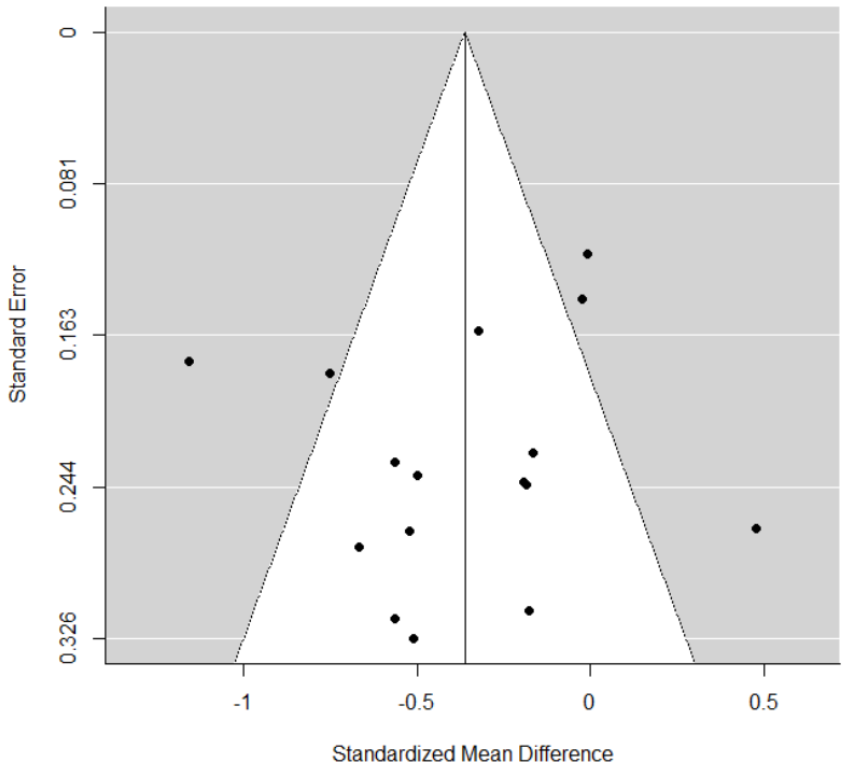
(2) Classification scheme for bias

Type of bias	Description	Domains
Selection bias	Systematic differences between baseline characteristics of the groups that are compared	- Study population definition - Controls represent the population from which the cases arose
Confounders	Estimate of the association between an exposure and an outcome is mixed up with the real effect of another exposure on the same outcome	- Matching - Have they *adjusted* or *controlled* for the effects of the confounder?
Measurement bias	Where self-report measure is poorly measuring the outcome	- Poor measure, subscale use not validated for construct

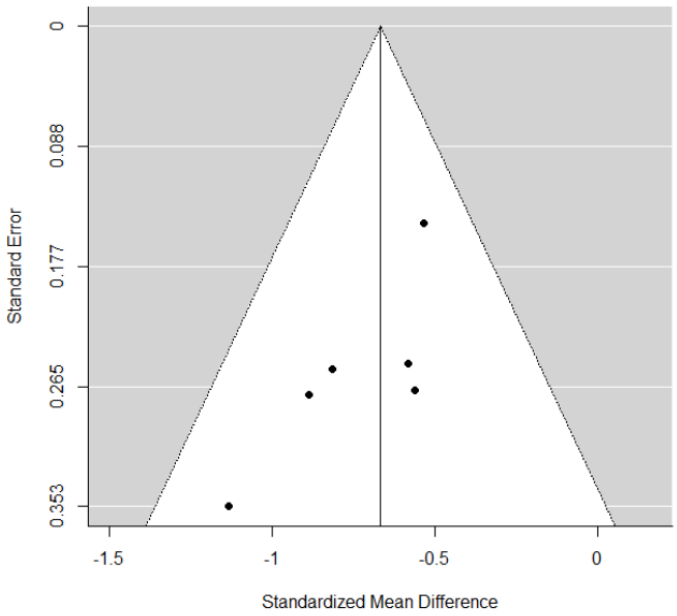
Risk of bias	Interpretation	Within a study	Across studies
Low risk	Plausible bias, unlikely to seriously alter the results	Low risk of bias for all domains	Most information is from studies at low risk of bias
Unclear	Plausible bias that raises some doubt about the results	Unclear risk of bias for one or more key domains.	Most information is from studies at low or unclear risk of bias
High risk	Plausible bias that serious weakens confidence in results	High risk of bias for one or more key domains	The proportion of information from studies at high risk of bias is sufficient to affect the interpretation of results

Appendix C. Funnel plots

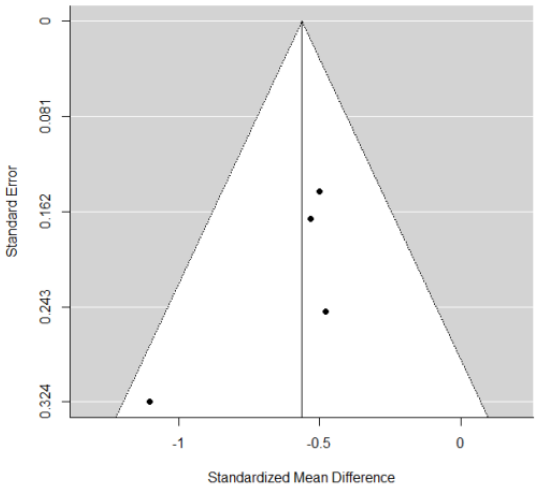
Suppression



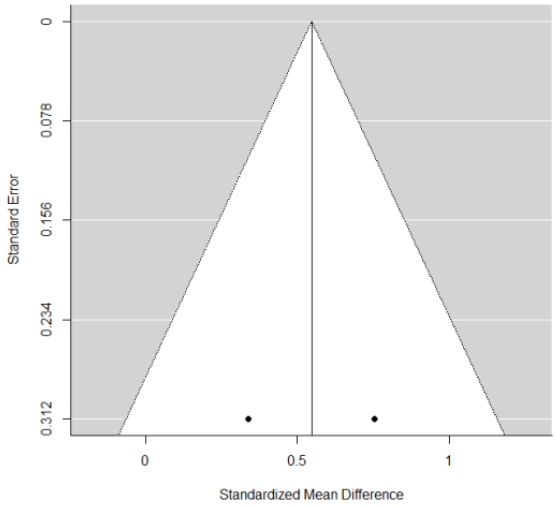
Rumination



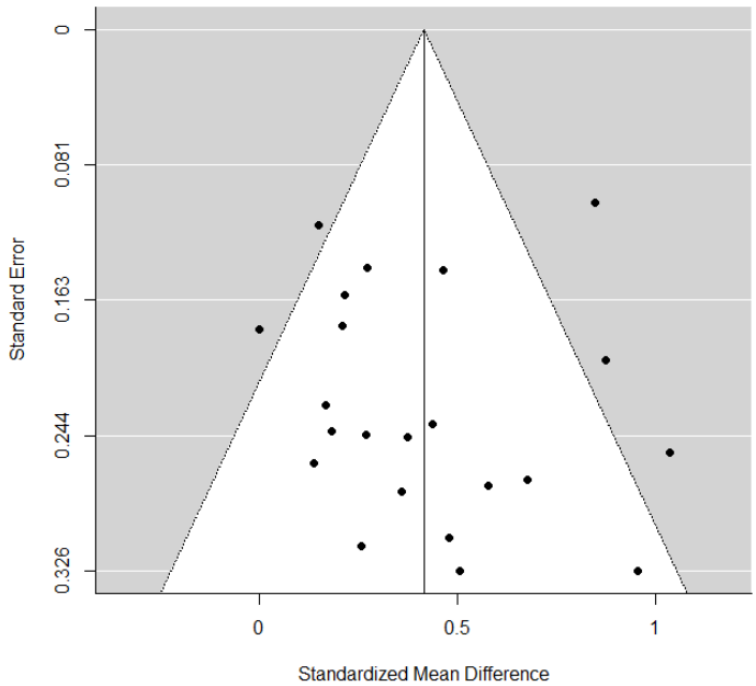
Self-blaming



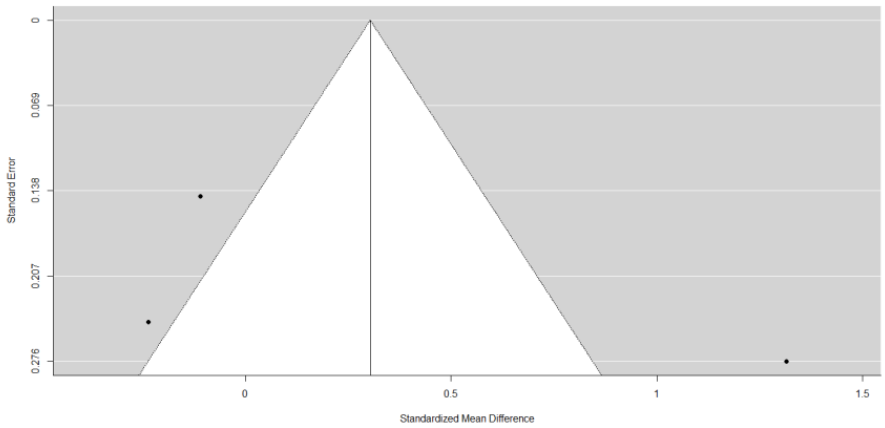
Distraction



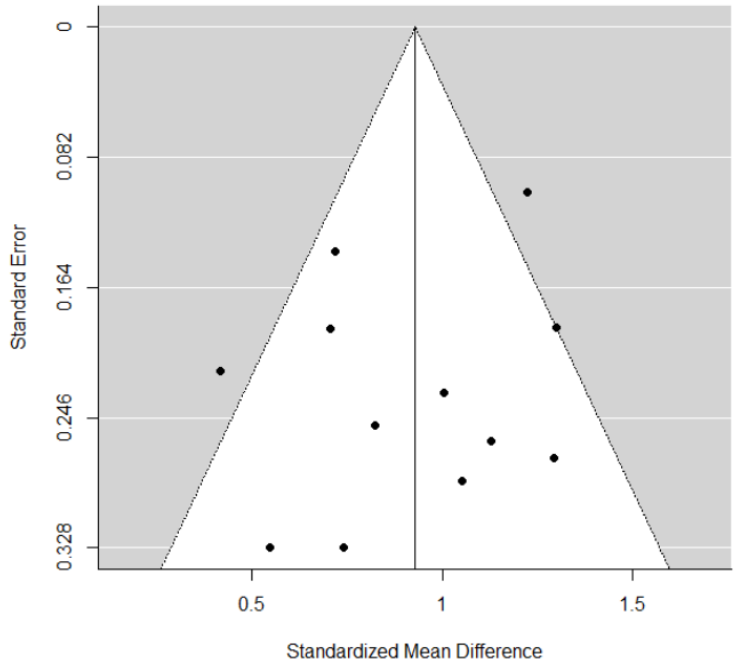
Cognitive Reappraisal



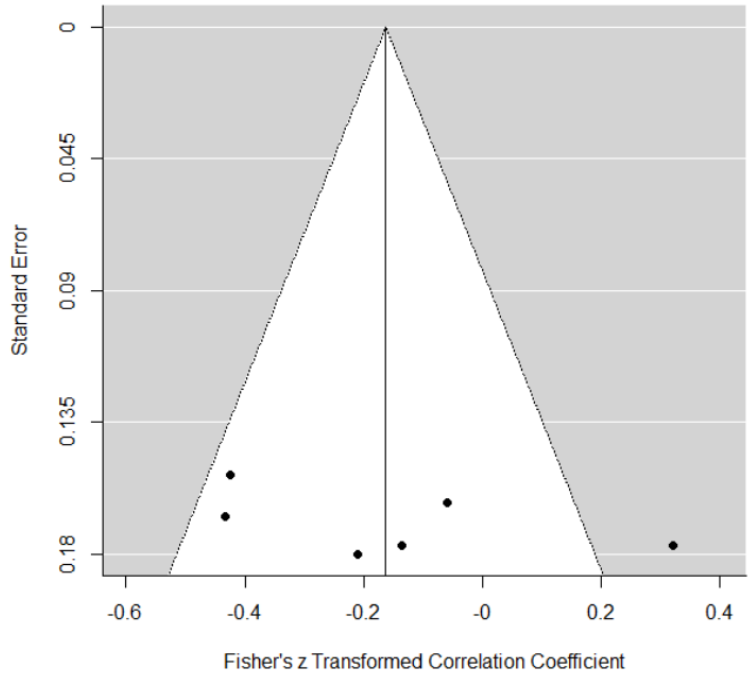
Acceptance



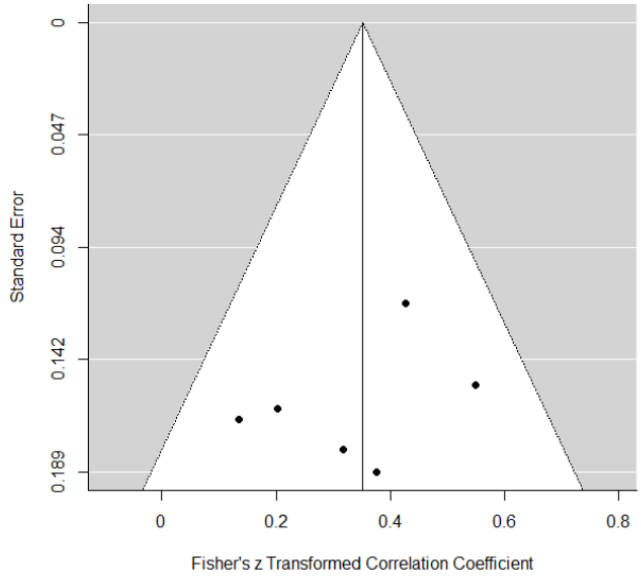
Managing emotions



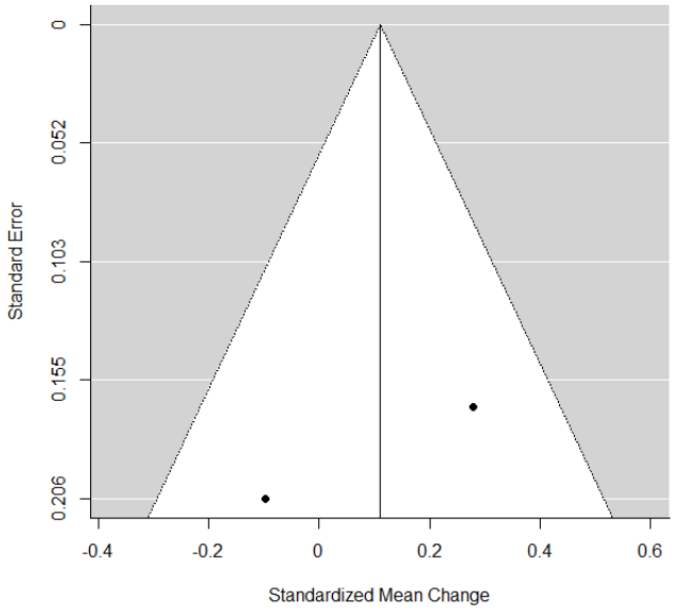
Correlation Adaptive strategies



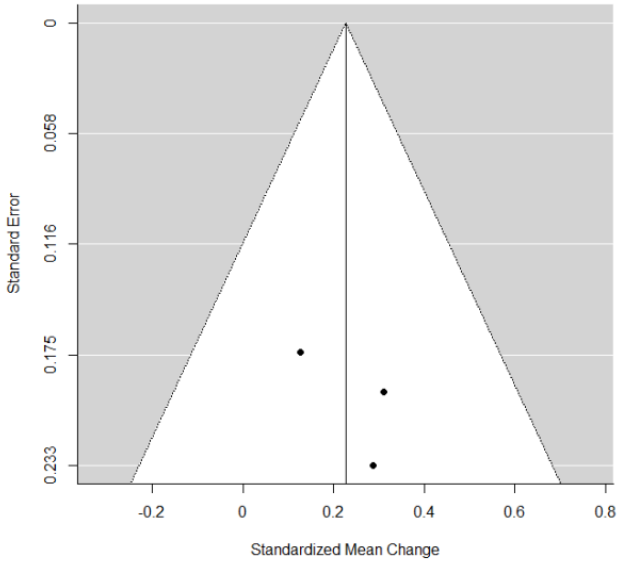
Correlation Maladaptive strategies



Experimental studies Suppression



Experimental studies Cognitive reappraisal



9. Anhang B: Studie II

Effectiveness of emotion regulation in daily life in individuals with psychosis and non-clinical controls – an experience sampling study.

Ludwig, L.[1], Mehl, S.[2,3], Krkovic, K.[1], Lincoln, T.M.[1], (2020). *Journal of Abnormal Psychology*. (in press)

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Abstract

Individuals with psychosis report employing more maladaptive and less adaptive emotion regulation (ER) strategies compared to non-clinical controls (NC). However, it is unknown whether this is predictive of affect experienced in daily life and whether ER-strategies are used less frequently and effectively by individuals with psychosis in daily life. Individuals with psychosis and current delusions (PD, *n*=71) and NC (*n*=42) completed questionnaires of habitual ER and experience sampling over six consecutive days, in which they reported ten times a day on the presence of negative and positive affect and deployment of ER-strategies (reappraisal, acceptance, awareness, suppression, rumination, distraction and social sharing). Effectiveness of strategy use was operationalised by examining successive differences in positive and negative affect. Multilevel regression analyses were conducted. Questionnaires of habitual ER were largely predictive of affect in daily life. There was indication of a more frequent use of putatively maladaptive strategies, but either no differences in individual adaptive strategies or even a more frequent use (reappraisal) in PD compared to NC. Several ER-strategies (e.g. reappraisal, rumination) proved effective in reducing negative affect by the next prompt, independent of group, but suppression was only effective in PD and acceptance had unfavourable effects in both groups. Thus, PD demonstrated an increased use of ER-strategies in daily life, of which the majority helped them to reduce negative affect. This indicates that their increased levels of negative affect are not explicable by difficulties in deploying explicit ER-strategies.

Keywords: psychosis, schizophrenia, emotion regulation, reappraisal, suppression

Introduction

Numerous studies have corroborated the notion that negative affect constitutes a key factor in the formation, maintenance and exacerbation of delusions. In light of the often considerable amount of distress accompanying psychotic symptoms, it does not come as a surprise that individuals with psychosis consistently report higher negative affect in trait self-report questionnaires compared to non-clinical controls (NC) (Cohen, Callaway, Najolia, Larsen, & Strauss, 2012; Strauss et al., 2013). A recent meta-analysis of studies applying the experience sampling method (ESM), which enables assessment of phenomena in everyday life, supports these results by showing that individuals with psychosis experience higher levels of negative affect as well as lower levels of positive affect compared to NC in their daily lives (Cho et al., 2017). Moreover, longitudinal studies (Fowler et al., 2012) and ESM studies (Ben-Zeev, Ellington, Swendsen, & Granholm, 2011; Hartley, Haddock, Sa, Emsley, & Barrowclough, 2014) found negative affect to be a reliable predictor of subsequent psychotic symptoms. This indicates that negative affect is directly linked to the emergence of psychotic symptoms. How effectively individuals with psychosis regulate their high levels of negative affect has therefore become a topic of increased interest.

Emotion regulation (ER) is commonly defined as a process by which people seek to impact on the valence, intensity and temporal features of their emotional reactions (Thompson, 1994). Research in this field has focused on the array of strategies that are consciously employed to either down- or up-regulate emotions (Koole, 2009). Frequently studied strategies encompass cognitive reappraisal, suppression, distraction (Webb, Miles, & Sheeran, 2012) and rumination (Zawadzki, 2015). Since most of the strategies require being aware of one's own emotions, emotion awareness has been discussed as a key component of the ER process (Berking et al., 2008; Van Rijn et al., 2011). Most researchers have used questionnaires to assess the customary use of these ER strategies at a trait-level, often referred to as habitual ER (Gyurak et al., 2011). Whilst some of these strategies have been classified as adaptive, such as cognitive reappraisal (John & Gross, 2004) and acceptance (Hayes et al., 1999), others have been argued to be maladaptive, particularly suppression (Campbell-Sills, Barlow, Brown, & Hofmann, 2006) and rumination (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Although this distinction has been made on the basis of associated health outcomes, the suggested dichotomy has been challenged by several authors, who argue that the context can qualify the same strategy as adaptive or maladaptive (for an overview: Aldao & Nolen-Hoeksema, 2012).

Impaired habitual ER in psychosis has been demonstrated by a constantly growing body of research. In a recently conducted meta-analysis of questionnaire-based and experimental studies (Ludwig, Werner, & Lincoln, 2019), we found that – compared to NC – individuals with psychosis reported engaging habitually in more putatively maladaptive strategies (rumination, self-blaming and suppression) and in less cognitive reappraisal. Furthermore, the self-reported habitual use of putatively maladaptive strategies was positively correlated with the extent of positive symptoms (Ludwig et al., 2019). In comparison, the experimental studies, in which participants were instructed to use either suppression or cognitive reappraisal to down-regulate negative affect, did not yield unequivocal differences between these two groups (Grezellschak et al., 2015; Van der Meer et al., 2014; Perry et al., 2012). However, both of the existing approaches (i.e. questionnaire studies assessing habitual ER and experimental studies assessing the application of ER) have relevant limitations: Self-report questionnaires that ask individuals to report the ER strategies they use habitually or the ones they have used over the course of the previous week bear the risk of recall biases. Furthermore, the questionnaires have different foci, which further complicates their interpretation: some questionnaires assess the frequency of use (e.g., Emotion-Regulation Skills Questionnaire, Berking & Znoj, 2008) whereas others measure the thoughts that individuals have following emotionally arousing information (e.g. Cognitive Emotion Regulation Questionnaire, Garnefski et al., 2001). In comparison to the questionnaire-based studies, one of the major advantages of experimental ER designs is that they enable the direct measurement of the success of deployed ER strategies (e.g., reduction of negative affect). Their disadvantage is, however, that they are restricted to the artificial setting of the laboratory and therefore lack ecological validity. This seems particularly important in the realm of ER research, given the variation in emotional experiences within the complexity of daily life (Brans, Koval, Verduyn, Lim, & Kuppens, 2013). So far, thus, both methods are unsatisfactory.

A promising addition to these conventionally used designs was introduced in form of the experience sampling method (ESM) (Mehl & Conner, 2012), which has been documented to be feasible and valid for use in psychosis samples (Edwards, Cella, Tarrier, & Wykes, 2016; Myin-Germeys et al., 2018). With its aptitude to display ER in the real-world context, ESM can overcome some of the limitations depicted above. So far, only a few studies have used ESM in psychosis samples to study ER. These have focused on different types of questions and also used different approaches. Nittel et al. (2018) used time-lagged analyses to investigate the interplay of ER strategies and symptoms within daily life. They found that momentary use of suppression, but not rumination, predicted subsequent state paranoia. Using a similar design, however, Hartley

et al. (2014) found rumination to be predictive of pronounced levels of paranoia at the next timepoint. Visser et al. (2018) reported on differences in the frequency of strategy use between individuals with psychosis and NC. Contrary to what one would expect from the findings stemming from questionnaires of habitual ER, individuals with psychosis employed a comparable or even higher number of ER strategies than the controls within a daily life context. In an additional post-hoc analysis, the authors analysed the effectiveness of ER by calculating a correlation between the difference in negative affect between one timepoint (t-1) to the next (t) and a composite score of mean frequency of strategy use at t-1 (averaged across all strategies). The results of this analysis (i.e. a lower correlation in the psychosis group than in the controls) were interpreted by the authors as indication that the clinical sample used ER strategies less effectively than NC. Although, the approach taken is an interesting first step towards understanding whether individuals with psychosis use ER strategies effectively in daily life, the composite score of ER may have obscured relevant differences and similarities between the psychosis group and NC in the use of specific strategies. Moreover, Visser et al. (2018) did not take the hierarchical structure of the ESM data into account (e.g. Zyzanski et al., 2004). Furthermore, a separate investigation of the success of the various kinds of ER strategies may be more informative as several findings have suggested an independent relation of different ER strategies to psychopathology (Lincoln, Sundag, Schlier, & Karow, 2017; Zawadzki, 2015). Finally, Moran et al. (2018) investigated whether habitual ER assessed with questionnaires at baseline predicts affect in the daily life of individuals with psychosis. They found habitual suppression to be associated with greater negative and less positive affect in daily life, whereas cognitive reappraisal was only predictive of greater positive affect. These few studies tentatively confirm the maladaptive role of suppression in predicting increased negative affect and the adaptive role of reappraisal in predicting increased positive affect, which we consider to be worth pursuing further. Interestingly, the studies also indicate that the habitual ER assessed in questionnaires may not be reliably predictive of the mere frequency of strategy use in daily life, although the preliminary analysis by Visser et al. (2018) suggests that the strategies are being used less effectively.

Existing research leaves open, however, to which extent questionnaires of habitual ER predict the affect experienced in daily life and whether individuals with psychosis are less effective than NC in down-regulating negative and up-regulating positive affect in daily life. Also, research has largely focused on the broad category of psychosis without acknowledging the heterogeneity of symptoms which may have led to inconsistent findings. Since the affective

pathway to positive symptoms has been most reliably established for persecutory delusions (e.g. Lincoln et al., 2009, Thewissen et al., 2011), it seems promising to choose a single symptom approach, concentrating on ER in a psychosis sample with current delusions.

Therefore, we investigated habitual ER as well as a broad range of ER strategies deployed in daily life (cognitive reappraisal, acceptance, awareness, suppression, rumination and distraction), adding an interpersonal strategy, based on the approach taken in previous research (social sharing, e.g. Visser et al., 2018; McMahon & Naragon-Gainey, 2018) in a group of patients with psychosis and current delusions (PD) and non-clinical controls (NC).

(1) In line with previous research, we predicted our questionnaire assessment of habitual ER to indicate less frequent use of putatively adaptive strategies and more frequent use of putatively maladaptive strategies (i.e. suppression) in PD compared to NC and analysed to which extent these differences are also reflected in the strategy use within daily life.

(2) We hypothesised that the habitual use of putatively adaptive strategies (as assessed in questionnaires) would predict reduced negative and increased positive affect in daily life (ESM). For putatively maladaptive strategies we predicted the opposite pattern in both groups.

(3) Finally, we predicted the use of putatively adaptive strategies in daily life (ESM) to be effective in down-regulating negative and up-regulating positive affect (i.e. with strategy use predicting the respective changes in subsequent affect) and putatively maladaptive strategies to be non-effective (i.e. by predicting the opposite pattern) in both groups. However, we also hypothesised that the psychosis group would be less effective at down-regulating negative and up-regulating positive affect via the use of strategies than the controls (moderation effect).

Method

1. Participants

Data were consecutively collected as part of a large multi-center randomised controlled treatment trial of an emotion-focused version of cognitive behavioural therapy (CBTd-E). This study is based on the data collected at baseline using ESM. Ethics approval for the therapy trial (clinicaltrials.gov, NCT02787135) including a baseline comparison of PD and NC was obtained from the Ethical Committee of the German Psychological Society (DGPs).

Clinical sample. PD either directly contacted the outpatient department or were recruited via referrals from local psychiatrists, general practitioners and by community mental health units. They were seen at the outpatient departments of the faculties of psychology in Hamburg and in Marburg (Germany) between May 2016 and July 2018 for an unbinding first session in which

information about the therapy was provided. Interested patients were subsequently invited for a screening session in which clinical interviews took place. Inclusion criteria were: (1) age between 16 and 70 years, (2) a diagnosis of a psychotic disorder (schizophrenia, schizoaffective disorder or delusional disorder), (3) acute and persistent delusions over three months of at least mild degree (≥ 2) in at least three of the six Psychotic Symptoms Rating Scale delusions subscale items (PSYRATS; Haddock, McCarron, Tarrier, & Faragher, 1999), given the range from 0-4, this inclusion criteria reflects an at least moderate degree of delusions, (4) an estimated general intelligence score of at least 85 in the German Mehrfachwahlwortschatztest (MWT-B; Lehrl, 2005), (5) either no medication or a stable medication dosage for at least the past month. In case of recent drug changes, the inclusion into the study was postponed until a stable medication of one month was ensured. Diagnoses were obtained or verified with the Structured Clinical Interview for Mental Disorders (SCID; German version: Wittchen, Wunderlich, Gruschwitz, & Zaudig, 1997) by a clinical psychologist adhering to the Diagnostic and Statistical Manual of Mental Disorders–5th edition (DSM-5: Falkai & Wittchen, 2018). Exclusion criteria were (1) present suicidal ideation, (2) a comorbid diagnosis of a borderline personality disorder (3), an acute substance use disorder which was present in the last three months, (4) use of benzodiazepines during the last four weeks and (5) a current engagement in individual psychological therapy.

Non-clinical controls. The study was advertised on a local website and by leaflets. Additionally, participants from previous studies who had consented to be informed about future projects were contacted via phone. Potential participants were invited for a screening interview and were paid 10€ for their attendance. Inclusion criteria were (1) age between 16 and 70 years, (2) no current or lifetime diagnosis of any Axis-I disorder verified with the SCID (conducted by trained student assistants) and (3) an estimated general intelligence score of at least 85 in the German Mehrfachwahlwortschatztest (MWT-B; Lehrl, 2005). Exclusion criteria were (1) current use of psychoactive substances and (2) first-degree relatives with a diagnosis of a psychotic disorder.

The psychosis group and NC were matched with regard to their age, gender and education level. All participants provided written informed consent.

2. Procedures

Participants underwent three stages of assessment.

a. Baseline assessment

After inclusion in the study, participants were invited for a 2.5-hr assessment where experiments as part of the larger study took place (for further information please see clinicaltrials.gov, NCT02787135). Participants were then trained by a research assistant following a standardised protocol which consisted of two parts. In the first part, participants were trained to use the electronic mobile assessment device (Android smartphones), which only allowed access to the movisensXS ESM application (Movisens GmbH). They were then introduced to a test version of the ESM programming. In the second part, ESM items were explained by the research assistant, exemplifying the meaning of the ESM items according to the protocol. Any subsequent questions were answered in a non-standardised way. Additionally, a take-home manual was provided which consisted of (1) technical information and (2) an example of each ER strategy (adapted from Nittel et al., 2018), intended as an additional source of reassurance. Self-report questionnaires, as described below, were distributed to be completed at home on day 1. Participants agreed to be contacted on the third day of assessment by the research assistant via phone in order to ascertain the proper functioning of the assessment. They were also able to contact the research team via phone in case of technical problems.

b. ESM Assessment

The 6-day ESM assessment began on the next day after participants had left the laboratory. Upon awakening, participants initiated each assessment day by filling out a survey of subjective sleep quality (not analysed here). After that, between 10 am and 10 pm, smartphones beeped at 10 random times a day in approximately 70-min-intervals, with a gap of at least 30 minutes in between prompts. At any given timepoint (t), participants answered questions concerning negative and positive affect as well as the ER strategies used at t.

c. Return of the smartphones and clinical interviews

After the completion of the momentary assessment, participants returned the smartphones and received a compensation of 40€ for their participation in the experiments and

the experience sampling study. An extra bonus of 5€ was paid to participants who had responded to more than 70% of the prompts.

3. Measures

Symptoms. In PD we measured frequency, distress and conviction of delusions and hallucinations with the PSYRATS (Haddock et al., 1999). We assessed positive, negative, desorganised symptoms of psychosis and general psychopathology with the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987). Depression was assessed with the Calgary Rating Scale for depression in schizophrenia (CDSS; German version: Müller et al., 1999). Global and social functioning was measured with the Role Functioning Scale (RFS; German version as used in Lincoln et al., 2012). Finally, both PD and NC self-rated delusion preoccupation, conviction and distress with the Peters Delusions Inventory (PDI; German version: Lincoln et al., 2009).

Self-reported habitual emotion regulation. The Emotion Regulation Questionnaire (ERQ; German version: Abler & Kessler, 2009) is a 10-item self-report instrument. The scale encompasses the subscales expressive suppression (e.g. "I control my emotions by not expressing them.") and reappraisal (e.g. "I control my emotions by changing the way I think about the situation I'm in.") that are rated on a 7-point Likert scale (strongly disagree to strongly agree). The scale has displayed good psychometric properties (Gross & John, 2003). To assess a broad range of adaptive strategies based on the model by Berking and Whitley (2014), we additionally used the Emotion-Regulation Skills Questionnaire (ERSQ-27; German version: Berking & Znoj, 2008), which assesses the use of nine adaptive ER strategies (acceptance, awareness, clarity, sensations, understanding, tolerance, self-support, confronting, modification), within the past week on a 5-point Likert scale (1 = not at all to 5 = very much). Previous studies have demonstrated adequate-to-good psychometric properties (Berking et al., 2008; Berking & Znoj, 2008). Example items can be found in the Appendix A.

Emotions in daily life. Within the ESM, state negative affect (NA) was operationalised as the mean score of seven items (sad, anxious, guilty, irritable, lonely, insecure, nervous), which were rated on a 7-point Likert scale (1 = not at all and 7 = very much), indicating the extent to which the respective emotion was experienced at the moment before the prompt. The internal consistency was acceptable with a Cronbach's α=0.75 for the within-subject-level and excellent with a Cronbach's α=0.91 for the between-subject-level. State positive affect (PA) was operationalised as the mean score of four items (satisfied, happy, relaxed, proud). The internal consistency was acceptable with a Cronbach's α=0.73 for the within-subject-level and good with

a Cronbach's α=0.87 for the between-subject-level. Both scales were adapted from Drees et al., (2008).

Emotion regulation in daily life. Seven state ER strategies were measured (acceptance, awareness, cognitive reappraisal, distraction, rumination, social sharing, suppression), each assessed with a single item. Six of these seven items were used in the ESM study by Nittel et al. (2018). The item to measure the ability to be aware of emotions (awareness) was adapted from the ERSQ-27 (Berking & Znoj, 2008)[4]. Participants rated to which extent they were using the ER strategy at the moment prior to the prompt, on a 7-point Likert scale (1 = not at all and 7 = very much; e.g. cognitive reappraisal: "Just before the prompt, I tried to think differently about the situation in order to feel better.", see Appendix B).

A comprehensive description of additional items assessed within ESM but not analysed in this study can be found in the Appendix C.

4. Analyses

Preliminary analyses. IBM SPSS Statistics software (version 23) and R were used to conduct the analyses. First, we set a minimum threshold of 10% of responses to all administered prompts per participant for inclusion in the data analysis. This threshold was chosen in order to reduce the risk of losing representativeness of the sample (e.g. losing those with more problems responding to all beeps as this sample may differ from the remaining sample in relevant regards, such as negative symptoms). However, we were also cognisant of the potential risk of bias that can be introduced by participants choosing when to respond. Thus, we conducted sensitivity analyses and examined the robustness of the findings by applying a 0%, 30% and 50% threshold. We also calculated the median and the interquartile range (IQR) of completed questionnaires over the whole assessment period (10 prompts à 6 days). In order to control for between-person differences in affect and ER, we person-mean centered repeated measures (Nezlek, 2012) and grand-mean centered the habitual ER measures.

Data structure. In order to account for the hierarchical data structure of ESM data, we applied a multilevel approach. Thereby, assessment points (level 1) were nested within days (level 2), and days were nested within individuals (level 3). To enable the time-lagged analysis we paired the assessment points (t) with previous assessment points (t-1) within each day. We did not predefine a minimum number of days needed to be included in the model. However, we reported the mean number of days included into our analyses.

[4] Although awareness is being considered as an integral part of the ER process rather than an ER strategy as such (Van Rijn et al., 2011), we refer to it as ER strategy for reasons of simplicity.

Test of hypotheses. (1) Group differences in habitual ER were tested using t-tests. In order to explore group differences in the momentary use of ER, we took the hierarchical structure of the ESM data into account and conducted multilevel linear mixed-effect models with group as a predictor.

(2) To test whether baseline habitual ER predicts levels of NA and PA in daily life, we used PA and NA reported in the ESM assessment for each participant as dependent variable. We conducted linear mixed-effect models with the habitual ER strategies as predictors. We then entered group (PD vs. NC) as potential moderators in the final model.

(3) To test the effectiveness of ER, we calculated successive differences in affect between any two consecutive timepoints (t and t-1) as the dependent variable. Positive values reveal an increase in NA/PA, whereas negative values indicate a decrease in NA/PA. We then tested whether ER strategies deployed at t-1 predict successive differences in NA and PA respectively, by calculating linear mixed-effect models with random intercept and fixed slope. A negative unstandardised estimate indicates that a more intensive use of a strategy predicts a relative decrease in NA or PA compared with a less intensive use of the strategy. Thus, the negative unstandardised estimate indicates that NA/PA decreased more or increased less than would have been the case if the strategy had not been employed. We then entered group (PD vs. NC) as a potential moderator in the final model. We defined the use of a strategy as effective, when the respective strategy was negatively associated with successive differences in NA or positively associated with successive differences in PA.

For each hypothesis, all relevant variables (e.g. all ER strategies) were entered in one single model. Following suggestions by Singer and Willett (2003) we calculated pseudo-R statistic as an indicator of the effect size and classified these as small, medium or large (Cohen, 1992). We applied a Bonferroni adjustment to control for alpha inflation for all our analyses. Only p-values with $p<.017$ for hypotheses including habitual measures (=α/3) and $p<.007$ for those of daily life ER (=α/7) were considered as statistically significant.

Fluctuation in affect. In addition, we tested for the moment-to-moment variability in affect and calculated the mean square successive difference (MSSD) (see Jahng et al., 2008) for NA and PA. We then performed a t-test to test for group differences in the affect variability. To test whether NA and PA fluctuated from day to day, we calculated the mean fluctuation per person for each day and applied multi-level analyses with two levels, with assessment points (level 1) nested in participants (level 2) and entered 'day' as a predictor into the model.

Additional analyses. To rule out an impact of potentially relevant constructs on the dependent variables, we tested whether (1) the site of recruitment and age predicted any of the dependent variables in the entire sample and (2) whether the duration of disorder or prior engagement with psychotherapy predicted any of the dependent variables in the psychosis group.

Further, we explored whether baseline delusions (measured with the PSYRATS) predicted or moderated any of the dependent variables in the psychosis group and whether the contextual variable (alone vs. in social context) significantly predicted or moderated affect and ER regulation in daily life. Finally, we explored to which extent the habitual use of individual ER strategies predicted the use of the respective strategy in daily life. For this means, we investigated the habitual strategies suppression and reappraisal from the ERQ, as well as awareness and acceptance from the ERSQ-27, as these four strategies were also assessed (and with comparable wording) in daily life. As outcome variable we used the mean of the respective ER strategy deployed in daily life for each participant.

Results

1. Sample characteristics

From the total of 80 PD included in the trial, 77 agreed to take part in the ESM study and 71 delivered sufficient (>10%) ESM data to be included in the analyses. This sample comprised patients with a diagnosis of schizophrenia (*n*=51), schizoaffective disorder (*n*=16) and delusional disorder (*n*=4), 85.9% were taking antipsychotic medication (from those, atypical: 71.7%; typical: 6.6%, both: 21.7%), with a mean chlorpromazine equivalent of *M*=526.9 mg, *SD*=450.4. The mean number of psychiatric hospitalisations since psychosis onset was *M*=3.6 times (*SD*=4.9, based on reports of *n*=64). From the 43 included NC, 42 delivered sufficient ESM data to be included. The groups differed in their employment status, with more participants who were unemployed and fewer who reported working in a full- or part-time job in the psychosis group compared to NC (Table 1). More details on the characteristics of both samples can be found in Table 1.

Non-completers (those who declined to take part as well as those who did not respond to a sufficient number of prompts) did not significantly differ from the included sample in regard to age, gender and education level. Within the psychosis group, non-completers (*M*=13.89, *SE*=3.59) did not differ from completers (*M*=15.13, *SE*=3.61) on the delusion score in the PSYRATS, t(78)=-0.97, *p*=.335 (see Appendix J).

Table 1. Socio-demographic and clinical data of individuals with psychosis and non-clinical controls.

Variable	Psychosis group (*n* = 71)			Non-clinical controls (n = 42)			
	M (*SD*)	*Min-Max*	*n*	*M* (*SD*)	*n*	*Min-Max*	*Statistic*
Age (years)	37.80 (12.15)	20-66	71	37.14 (13.56)	42	20-66	t(111)= -0.179, p=0.858
Age of psychosis onset*	23.94 (8.30)	6-49	68				
Duration of psychosis (years) *	13.46 (9.87)	1-37	69				
PDI							
Distress	21.05 (17.30)	0-80	65	2.2 (4.58)	40	0-26	t(77.731)= -8.324, p<.001
Preoccupation	19.57 (16.20)	0-65	65	2.23 (4.33)	40	0-23	t(77.999)= -8.172, p<.001
Conviction	21.80 (17.65)	0-77	65	3.15 (5.21)	40	0-27	t(80.724)= -7.973, p<.001
Total	7.43 (5.37)	0-21	69	1.22 (1.81)	41	0-9	t(90.821)= -8.805, p<.001
PSYRATS*							
Delusion	15.13 (3.61)	7-22	71				
Hallucination	9.69 (12.89)	0-35	71				
Total	24.82 (14.41)	7-55	71				
PANSS*							
Positive score	16.72 (3.92)	9-27	71				
Negative score	15.79 (4.85)	9-31	71				
General psychopathology	33.82 (6.64)	19-54	71				
Total	66.32 (11.41)	42-99	71				
RFS*	7.46 (1.58)	3.4-10.4	71				
CDSS*	6.10 (3.96)	0-17	71				

	%	*n*	%	*n*	
Gender male	57.8	71	57.1	42	$\chi^2(1)= 0.004$, p=.950
Education final level°		71		42	
High	50.7		66.7	39	$\chi^2(2)= 5.504$, p=.138
Medium	25.4		26.2		
Low	22.5		7.1		
None	1.4		0		
Employment status		69		40	
Unemployed	44.9		15		$\chi^2(5)=25,671$, p<.001
Full-time	11.6		22.5		
Part-time	17.4		22.5		
Volunteer	14.5		0.0		
Retired	2.9		2.5		
Student	8.7		37.5		
Prior psychotherapy*	42	69			
Number of psychotherapies*		61			
0	65,6				
1	18.0				
2	11.5				
3	4.9				

Note: PDI, Peters Delusions Inventory; PSYRATS, Psychotic Symptoms Rating Scale; PANSS, Positive and Negative Syndrome Scale; RFS, Role Functioning Scale; CDSS, Calgary Depression Rating Scale for Schizophrenia;

* measures only collected for psychosis group

° Low, Hauptschulabschluss, 9 years; medium, Realschulabschluss, 10 years; high, Abitur (A-level or high school equivalent), 13 years

2. Preparatory analyses of the ESM data

PD and NC did not differ in regard to the percentage of completed ESM questionnaires, t(111)=.081, *p*=.936. On average, PD completed 72% (IQR=36%, *Min*=17%, *Max*=98%) of ESM questionnaires compared to 73% (IQR=29%, *Min*=22%, *Max*=100%) in NC. Data from a mean of 5.8 assessment days (*SE*=0.67) were included in the analyses.

Across timepoints NA scores were significantly higher in PD with *M*=2.66, *SD*=1.26 than in NC with *M*=1.41, *SD*=0.68, t(110)=6.84, *p*<.0001. PA scores were significantly lower in PD with *M*=3.48, *SD*=1.30 than in NC with *M*=4.77, *SD*=1.32, *t*(110)=6.42, *p*<.0001. PD showed more pronounced fluctuations in NA (*M*=0.63, *SE*=0.63) compared to controls (*M*=0.34, *SE*=0.59). This difference was significant *t*(111)=-2.42, *p*=.017. No group differences were found in regard to PA (*M*=1.00, *SE*=0.84 in PD versus *M*=0.96, *SE*=1.10 in NC), t(111)=-0.24, *p*=.800. Fluctuations in NA were significantly predicted by day, *b*=-0.039, *SE*=0.017, *p*=.020, 95% *CI* [-0.072, -0.006]. Also, levels of PA were significantly predicted by day, *b*=-0.076, *SE*=0.023, *p*=.001, 95% *CI* [0.121, -0.031]. The later the day during the assessment, the less fluctuations were reported in NA and PA. These findings support the approach taken in our multi-level analyses, in which we accounted for day-to-day fluctuations on level 2.

3. Hypothesis I: Cross-sectional differences in habitual ER and ER in daily life between PD and NC

Figure 1 presents the mean scores and standard deviations of habitual ER in the questionnaires as well as ER use in daily life in the ESM assessment. As hypothesised, PD endorsed using suppression habitually significantly more often and both reappraisal and the comprehensive battery of adaptive strategies assessed in the ERSQ less often compared to NC.

Within daily life, the group differences varied between strategies, with no significant differences in use of social sharing, acceptance and awareness but a more frequent use of cognitive reappraisal, distraction, rumination and suppression in PD compared to NC (Fig. 1). On average, PD reported using around four strategies at one timepoint (*M*=4.31, *SD*=1.98) whereas NC used around three strategies (*M*=2.95, *SD*=1.94). This difference was statistically significant, *t*(111)=4.36, *p*<.0001. Patterns of pairings of ER strategies in daily life can also be found in the Appendix (K).

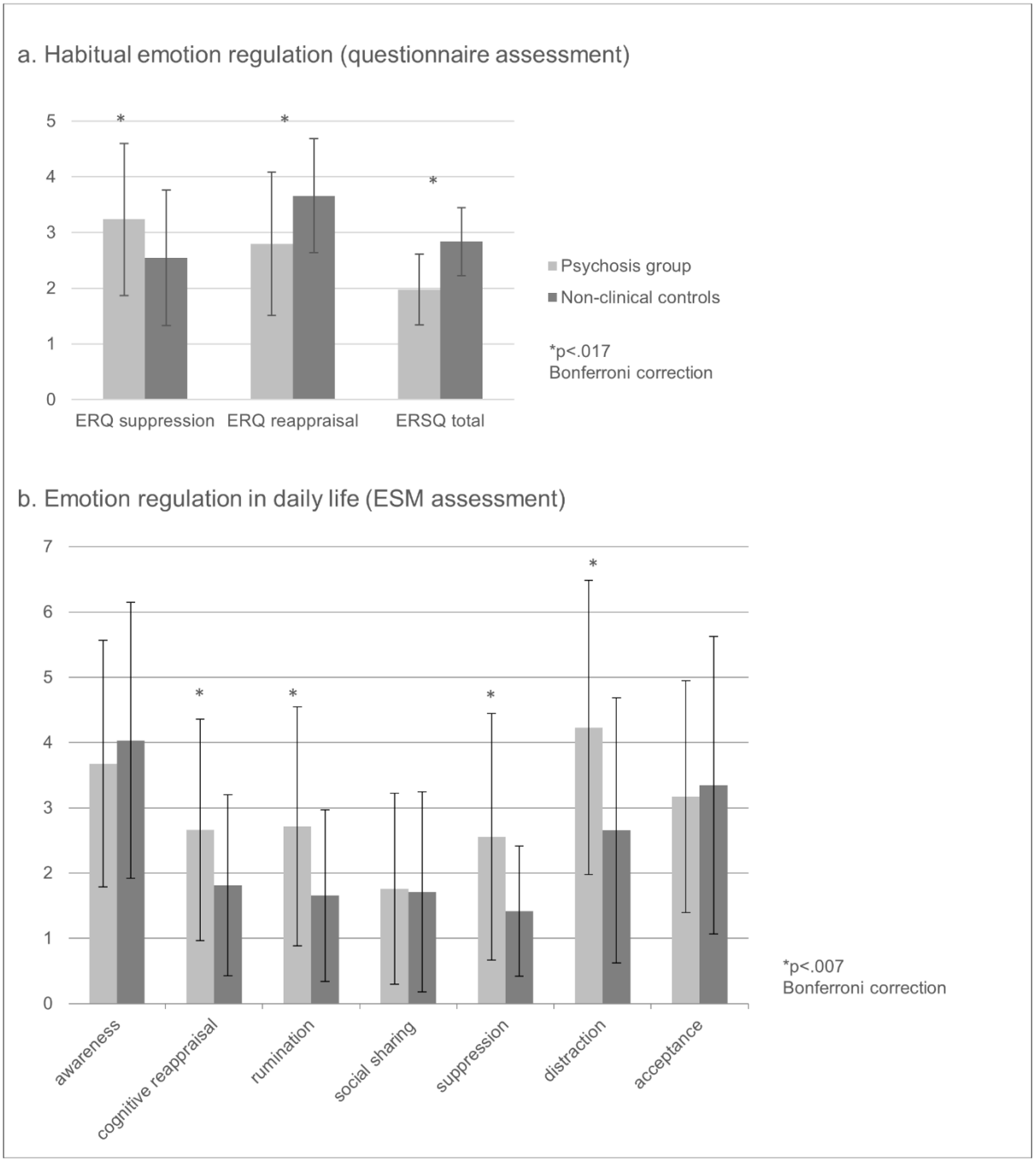

Figure 1. Mean frequency of a) habitual emotion regulation and b) emotion regulation strategies in daily life in individuals with psychosis compared to non-clinical controls.

ERQ = Emotion Regulation Questionnaire, ERSQ total = Sum score of the Emotion-Regulation Skills Questionnaire (including the following putatively adaptive strategies: awareness, clarity, sensations, understanding, acceptance, tolerance, self-support, confronting, modification. Detailed results for all measures as well as the subscales can be found in the Appendix D.)

4. Hypothesis II: Habitual ER strategies as predictors of affect in daily life

Habitual reappraisal was a significant predictor of reduced NA in daily life, whereas habitual suppression was not (see Figure 2). Together, both strategies explained 11% of variance, indicating a medium effect (R^2=0.11). By contrast, both, habitual reappraisal and suppression were significant predictors of PA in daily life, albeit in different directions: the more reappraisal a participant reported in the habitual measures the more likely this participant was to report PA in the ESM. In contrast, the more a participant indicated using suppression habitually, the less likely he or she was to report PA in daily life, explaining 22% of variance (medium effect, R^2=0.22). Again, this result was not moderated by group. The sumscore of the ERSQ was a significant predictor for both PA and NA in daily life, indicating that the more a participant reported using the set of adaptive strategies covered in the ERSQ the less NA (large effect, R^2=0.34) and the more PA (large effect, R^2=0.27) was reported in daily life. None of the effects were moderated by group.

5. Hypothesis III: ER strategies as predictors of successive differences in NA and PA in daily life

Results of the main analyses are depicted in Figure 3. As can be seen in the left part of the figure, cognitive reappraisal, awareness, suppression and rumination used in daily life were significant predictors of successive changes in NA between any two successive timepoints (t-1 and t). Specifically, the negative unstandardised estimate indicated that the more a participant used these four ER strategies at a given timepoint (t-1), the more the NA decreased (or refrained from increasing) between t-1 and t. The group variable significantly moderated the path from suppression to successive differences in NA, but was non-significant for the remaining strategies. A post-hoc analysis revealed suppression to be a predictor of successive differences in NA in PD but not in NC.

As can be seen in the right part of Figure 3, cognitive reappraisal, suppression and rumination were also significant predictors of successive changes in PA with a positive unstandardised estimate. Thus, the more a participant used these strategies at a given timepoint the more likely PA increased (or refrained from decreasing) by the next timepoint. By contrast, acceptance significantly predicted successive differences in PA, with a negative unstandardised estimate. In a post-hoc analysis, suppression was a predictor of successive differences in PA in PD but not in NC. By contrast, rumination was a predictor of successive differences in PA in both groups, but in NC to a greater extent than in PD. Awareness was a significant predictor of successive differences in PA only in NC, in terms of higher awareness being predictive of lower

successive differences in PA, *b*=-0.048, *SE*=0.022, *p*=.025, 95% *CI* [-0.091, -0.006]. A separate analysis of cases including only successive differences in terms of an actual decrease in NA and an increase in PA yielded only marginally different results, warranting no divergent interpretation. These results can be found in the Appendix G.

Sensitivity analyses indicated that results for all hypotheses including ESM data were effectively identical when applying a 0%, 30% and 50% response rate as threshold.

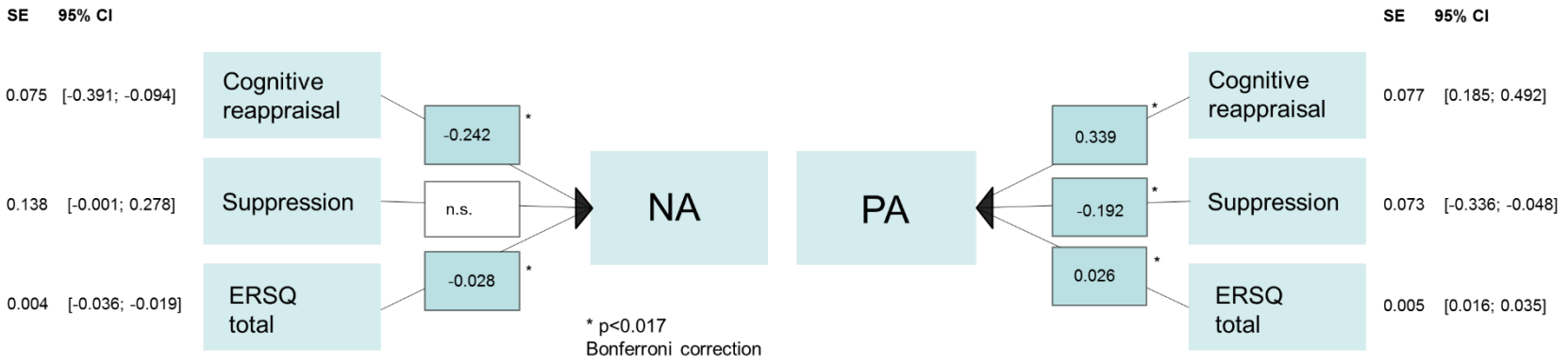

Figure 2. Habitual ER strategies as predictors of negative affect (NA) and positive affect (PA) in daily life.

ERSQ total = Sum score of the Emotion-Regulation Skills Questionnaire (including the following putatively adaptive strategies: awareness, clarity, sensations, understanding, acceptance, tolerance, self-support, confronting, modification.). Detailed results for all strategies as well as the subscales of the ERSQ can be found in Appendix E.

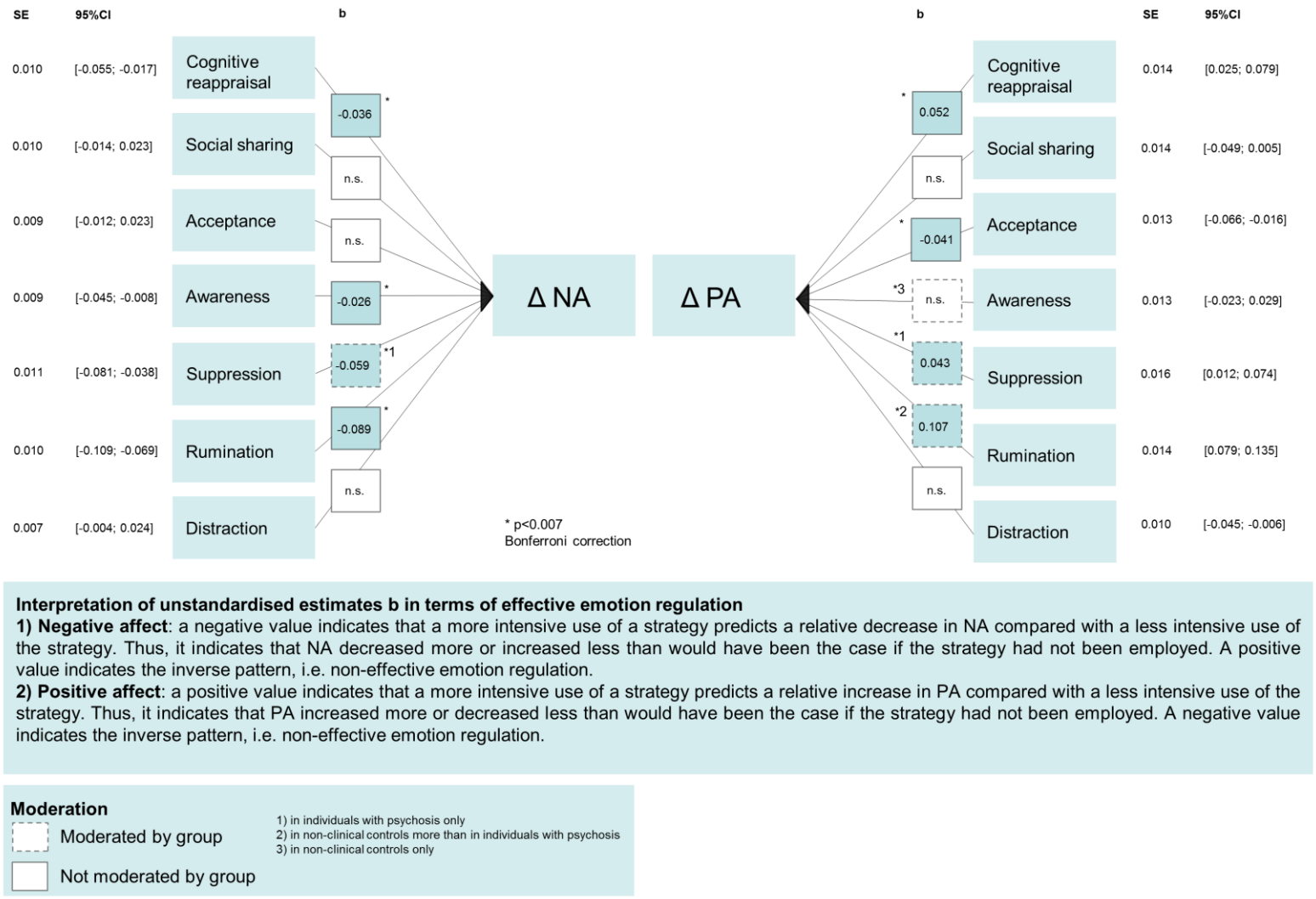

Figure 3. Daily ER strategies as predictors of successive differences between (t-1 and t) in negative affect (NA) and positive affect (PA), moderated by group. Detailed results are shown in Appendix F.

6. Additional analyses

The site of recruitment and age were no significant predictors of any of the dependent variables. Further, we tested in the psychosis group whether the duration of disorder or prior engagement with psychological therapy significantly predicted the scores in the habitual ER questionnaires and the use of the various ER strategies in daily life, which it did not.
Baseline delusions significantly predicted NA (*b*=0.096, *SE*=0.033, *p*=.005, 95% *CI* [0.030, 0.162]), but not PA over time (*b*=-0.004, *SE*=0.005, *p*=.434, 95% *CI* [-0.013, 0.005]). None of the moderation effects were significant, indicating that the strategies used were equally effective independent of the level of symptoms at baseline.

Further, both groups differed significantly in the proportion of prompts at which they endorsed being alone with 62.6% in PD versus 39.2%, $\chi2(1)=236.071$, $p<.001$. The contextual variable (alone vs. in social context) significantly predicted affect in daily life. Being alone was significantly associated with more pronounced NA (*b*=0.156, *SE*=0.024, *p*<.001, 95% *CI* [0.108, 0.204]) and less pronounced PA (*b*=-0.195, *SE*=0.034, *p*<.001, 95% *CI* [-0.262, -0.129]), independent of group. Further, we examined, whether the contextual variable moderated the effectiveness of the ER strategies, which it did not.

To test for the correspondence between habitual use of ER and the deployment of ER strategies in daily life, we conducted linear regression models, which revealed habitual suppression to be a significant predictor of momentary suppression, *b*=0.290, *SE*=0.086, *p*=.001, 95% *CI* [0.119, 0.461]. The explained proportion of variance was $R^2=0.093$, which means that 9% of variance in momentary use of suppression was explained by the report of habitually deployed suppression in the ERQ. Also, habitual reappraisal was not a significant predictor of reappraisal used in daily life, *b*=-0.027, *SE*=0.078, *p*=.729, 95% *CI* [-0.183, 0.128], $R^2=0.001$. Habitual awareness of emotions was a significant predictor of awareness in daily life, *b*=0.131, *SE*=0.052, *p*=.014, 95% *CI* [0.027, 0.234], $R^2=0.053$. Habitual acceptance of emotions was not a significant predictor of acceptance in daily life, *b*=0.075, *SE*=0.051, *p*=.14, 95% *CI* [-0.026, 0.176], $R^2=0.019$.

Given the pronounced levels of negative affect in the psychosis group compared to the controls, we post-hoc analysed whether increased ER was due to the increased experience of negative affect. Therefore, we conducted multi-level analyses with NA at t-1 as a predictor for the various ER strategies at t. The findings indicated that those strategies which were employed more frequently by PD than NC were significantly predicted by prior NA (except for distraction). Acceptance, social sharing and awareness at t were not significantly predicted by NA at t-1. Detailed results can be found in Appendix H.

In line with this, we approached the question whether the effectiveness of ER strategies depended on the level of NA the participant aimed to regulate, and thus, whether changes in affect following high levels of NA may simply reflect regression to the mean. Since our dependent variable based on the successive difference between t and t-1 already contained affect at t, its inclusion as a covariate would likely result in spurious findings, as discussed in different fields of research on change-score analyses (e.g. Glymour et al., 2005). We therefore calculated the median of NA based on all prompts and repeated our analyses for both subgroups, one with only those prompts representing an event where NA was above the median and the other where NA was below the median. Following high NA scores, suppression and rumination remained significant predictors of subsequent reductions in NA, whereas the other strategies were non-significant. Following low NA scores, cognitive reappraisal was additionally significant (the results are depicted in Appendix H). This suggests that higher levels of NA are not associated with greater changes in affect following ER use.

Discussion

This study tested whether differences in the habitual tendency to deploy ER strategies as assessed in self-report questionnaires by individuals with psychosis and non-clinical controls are also evident in daily life. Furthermore, we investigated the effectiveness of the ER strategies used in daily life in terms of successive differences in negative and positive affect between two sequential timepoints.

Consistent with our first hypothesis and the overall picture resulting from previous meta-analyses (O'Driscoll, Laing, & Mason, 2014; Ludwig et al., 2019), habitual measures indicated a more frequent use of suppression and a less frequent use of the putatively adaptive strategies by individuals with psychosis compared to controls. Interestingly, these group differences did not entirely hold up when we moved into the context of participants' daily life and repeatedly asked them to indicate which strategies they were currently using. Although the pattern in daily life confirmed the self-reported overuse of putatively maladaptive strategies in the psychosis group, it also became apparent that the psychosis sample did not fail to use the putatively adaptive strategies in their daily life. In fact, they even employed cognitive reappraisal more frequently than the controls. Although this seems counter-intuitive, it corroborates the findings by Visser et al. (2018). Thus, rather than being able to explain the higher levels of negative affect in the psychosis group by an overuse of certain ER strategies and an underuse of others, it appears that they are not only using the range of strategies available, but are doing so to a larger

extent than the controls. Given their high levels of negative affect, a plausible assumption is that they may be using these strategies less effectively.

Surprisingly, however, our multi-level analysis does not support the assumption of a less effective ER in the psychosis group compared to controls. Those strategies which were effective in non-clinical controls in terms of down-regulating negative and up-regulating positive affect were equally effective in the psychosis group. Even expressive suppression, which is widely assumed to be maladaptive – and was indeed not effective in the controls – was followed by reductions in negative and increases in positive affect in the psychosis group. This suggests that the psychosis group used the ER strategies as successfully as the controls. This seems puzzling in the light of the significantly higher levels of negative affect reported by the psychosis group: Can the psychosis group truly be equally effective in ER if they report continuously higher levels of negative affect?

One explanation is that we only assessed the short-term effect of ER. The down-regulation of negative and up-regulation of positive affect proved largely successful from one timepoint to the next (in approximately 70-minutes intervals). Whether the regulatory success is sustainable over the long-term remains unanswered. Particularly in regard to suppression, which has been found to be associated with psychopathology (Aldao, Nolen-Hoeksema, & Schweizer, 2010) and detrimental long-term effects on health outcomes (Gross & John, 2003) or social interactions (Ben-Naim, Hirschberger, Ein-Dor, & Mikulincer, 2013), it is intuitive to expect the benefits evidenced in the psychosis group to be short-lived, which could be indicated by the higher fluctuations in negative affect found in the psychosis group. Nevertheless, an experimental study in a healthy sample found favourable short- and longer-term effects of suppression (i.e. sustained reduced levels in negative affect after one week, Dunn et al., 2009). Future research will thus need to clarify the question of short- versus long-term effects of the several ER strategies, taking into account the temporal processes underlying ER (Kalokerinos, Résibois, Verduyn, & Kuppens, 2017).

A second explanation is that we focused on frequently studied strategies, which were in line with our definition of ER, and did not investigate all of the strategies that might have been relevant. Assessing problem-solving for example, a more preventive coping strategy focused on changing the distressing features of a situation rather than the emotion itself might have led to differences in the effectiveness among the two groups due to its negative association with cognitive deficits (Addington & Addington, 2008). Also, further maladaptive strategies such as self-blaming or blaming others might have been relevant in order to detect differences, given

their link to symptomatology (Rowland et al., 2013). Thus, the groups might have differed in the deployment of other explicit strategies. Also, ER has been hypothesised to consist of both explicit, more effortful ER, which is accessible on a conscious level and can be self-reported, as well as implicit ER, involving rather automatic processes, which do not require conscious monitoring. These implicit aspects of ER have been argued to contribute considerably to the effectiveness of ER (Koole & Rothermund, 2011) and, although probably interrelated (Gyruak, 2011), do not seem to be merely two sides of the same coin: For example, in a neurophysiological experiment, Strauss et al. (2013) found that whilst the psychosis sample did not differ in self-reported ER from controls, they showed abnormalities in implicit ER as reflected by the late positive potential in the EEG assessment. Our design is restricted to the assessment of self-reported explicit ER. If we assume that negative affect is entirely explicable by the sum of explicit and implicit ER and that we captured the relevant aspects of explicit ER, then the fact that our explicit ER did not explain the higher levels of negative affect in the psychosis group points to the relevance of further investigating implicit ER in this group.

A third possible explanation is that the affective system is challenged more in individuals with psychosis since psychosocial stress is more likely to occur in this group (Van Os, Kenis, & Rutten, 2010). The increased psychosocial challenges might trigger stronger emotional responses that then require individuals with psychosis to develop even better ER skills than controls in order to re-arrive at "baseline". In our sample, however, individuals with psychosis were equally rather than more effective than the controls (i.e. they started at a higher level and ended at a higher level of negative affect). It is interesting, though, that PD to deployed more strategies at any given timepoint than the controls (four versus just under three), which could reflect the attempt to deal with the higher levels of negative affect. Our post-hoc analysis on whether the usage of the various ER strategies was predicted by prior negative affect adds weight to this interpretation. One could conclude that individuals with psychosis are effective in regulating their affect, but not effective enough to reduce negative affect to a satisfactory level.

In sum, there are several possible explanations for the somewhat puzzling finding that the psychosis group was as effective as the controls in their use of ER strategies, but nevertheless report higher levels of negative affect. These explanations range from questions concerning the sustainability of the effects, over the relative contribution of explicit versus implicit ER to the challenges that come along with exposure to higher levels of social adversity in the psychosis group. Clearly, the elevated levels of negative affect in the psychosis group are a challenge to the interpretation of our findings. It remains open whether a non-clinical control group with a

comparable high level of negative affect would have utilised ER to an equal or even greater extent. However, such a group may be hard to find and non-representative in other aspects. Post-hoc analyses revealed a similar pattern of the effectiveness of strategies following high (above the median) and low (below the median) negative affect, which speaks against the interpretation that changes following ER were mainly explicable by regression to the mean. Thus, the differences in affect do not generally question our main result, that the ER strategies were effective in down- and up-regulating negative and positive affect. An interesting step forward for future research would be to compare participants with psychosis with other clinical control groups, who have comparable levels of negative affect. This might enable to extract the specific pattern of ER use related to having a psychotic disorder relative to other disorders, such as depression.

As expected, and partly in line with findings from Moran et al. (2018), the reported scores in habitual suppression and cognitive reappraisal were associated with the experience of affect in daily life, explaining 11% of variance in negative and 22% in positive affect. Therefore, self-report habitual ER measures seem to be predictive of the levels of affect experienced in the complexity of daily life. In the explorative analysis, in which we looked at the link between habitual and daily measures of ER at the level of individual strategies, we found that at least some variance in the momentary use of suppression and awareness was explained by the habitual scores of the respective strategy. However, cognitive reappraisal and acceptance in daily life were not significantly associated with these scores. Although these findings were only explorative and restricted to those strategies that were assessed with both methods, they raise questions regarding the ecological validity of the habitual measures, which may be prone to memory bias. On the contrary, the questionnaires have been validated and show good psychometric properties (Berking & Znoj, 2008; Gross & John, 2003) while the ER strategies in the ESM were assessed with less reliable one-item scales in order to reduce the burden for the participants. Although this approach corresponds with the commonly taken approach in previous ESM studies (Brans et al., 2013; Nittel et al., 2018) we cannot rule out the alternative explanation, namely, that the ESM measures did not capture ER adequately. On a more critical note, one might argue that the reported use of ER in habitual measures and ER in daily life represent entirely distinct processes. It may be helpful to view habitual and momentary use of ER on a macro- and micro-level. Whereas the micro-level represents actual ER use in daily life, the macro-level is formed by more enduring constructs such as self-efficacy (Gunzenhauser et

al., 2013), control beliefs (De Castella et al., 2013) and negative self-schema (Kesting & Lincoln, 2013).

In addition to aspects already mentioned, our results should be interpreted in light of some limitations. For one, our psychosis group may constitute a particularly motivated group as they were recruited as part of a therapy trial. The psychosis group might therefore have had a higher introspection ability than a randomly selected sample. Also, although we excluded people with a current or lifetime diagnosis of any Axis-I disorder from the non-clinical control group, we did not ask about their prior engagement with psychological therapy. However, as the German health care system only covers psychological therapy when it is indicated based on a clinical ICD-10/DSM-5 diagnosis, we can assume the proportion of non-clinical controls with past therapy to be negligible. Moreover, despite a thorough training for the master level student assistants who conducted the SCID screening for the controls, and the joint consultation of a clinical psychologist in uncertain cases, we cannot rule out that the ratings differed between student assistants and clinical psychologists, as we did not assess their inter-rater reliability. Lobbestael et al. (2011) showed that generally the inter-rater reliability for trained raters was satisfactory to high for the SCID-I. A further limitation is that the research assistants who trained the participants for the ESM study were unblinded to their condition (PD vs. NC). Although the large part of the training was standardised, we cannot rule out that a bias was introduced by, for example, taking more time to respond to the questions from individuals with psychosis compared to controls, which might have impacted on the extent of ER use in daily life. However, the patterns of ER use were comparable to those reported by Visser et al. (2018) which speaks against this potential bias. Further, it should be noted that in order to reduce the burden of the assessment in the laboratory, the participants were instructed to complete the self-report questionnaires at home before the start of the ESM. As this was not controlled, we cannot exclude the possibility that some participants completed the questionnaires at a later timepoint and were then influenced by their responses during the ESM. This might have increased the self-report of ER in the questionnaires. However, this potential impact would have affected both groups. In addition, when interpreting the discrepant findings of strategy use in daily life between the psychosis group and controls, it is perhaps important to note that groups differed in employment status. This is likely to impact on activities in daily life, which might have influenced the engagement with ER and levels of affect. Further, our study was designed to measure state ER during daily life. Thus, we asked participants about their engagement with ER just before the prompt rather than asking them to recall the most salient emotion episode and

their regulation response since the last prompt. This approach has the advantage of reduced recall bias and provides a more realistic picture of ER in daily life, but it is important to note that we may have missed some of the more intense emotions. However, with extensively repeated measures, we hope to have reduced this potential bias. Finally, we focused on self-report data only. It would be helpful to use other indicators of emotions (e.g. psychophysiological indicators of arousal) as we cannot exclude the possibility that individuals with psychosis consider their high levels of negative affect inherent to their negative self-view (Kesting & Lincoln, 2013) and thus might tend to over-report the levels of experienced negative affect.

To sum up, in contrast to what one would expect from habitual measures, in our longitudinal ESM study, the psychosis group demonstrated an increased use of explicit ER strategies, of which most resulted – at least in the short-term – in reduced negative and increased positive affect. Despite their effective use of ER strategies, the psychosis group showed increased levels of negative affect and higher moment-to-moment fluctuation in negative affect. In addition, we found the measures of habitual ER to be predictive of affect but to show little correspondence with strategy use in daily life, pointing to the need for future research on the validity of ER measures and the potential sources for these discrepant findings.

General Scientific Summary

Abnormalities in emotion regulation in individuals with psychosis (i.e. the use of more maladaptive and less adaptive strategies) are well documented by studies using self-report questionnaires, and have provided a plausible explanation for elevated levels of negative affect. In this study, we complemented a prototypical questionnaire assessment of emotion regulation in the laboratory with an assessment in the context of everyday life, in which we repeatedly asked acutely psychotic individuals with delusions to report on their affect and emotion regulation strategies. The questionnaire assessment showed limited correspondence with the strategies used in daily life. The acutely psychotic sample did not only deploy maladaptive strategies more frequently than non-clinical controls, but also the adaptive strategy of cognitive reappraisal. Our findings also indicate that the acutely psychotic sample deployed the emotion regulation strategies as effectively as the healthy control group.

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Contribution

LL, TL and SM contributed to the study conception and design. LL and KK did the data preparation and undertook the statistical analyses. LL wrote the first draft of the manuscript. All authors critically revised the manuscript adding important intellectual content, and contributed and approved the final draft.

References

Abler, B., & Kessler, H. (2009). Emotion Regulation Questionnaire – Eine deutschsprachige Fassung des ERQ von Gross und John, (2003), 144–152. https://doi.org/10.1026/0012-1924.55.3.144

Addington, J., & Addington, D. (2008). Social and cognitive functioning in psychosis, 99, 176–181. https://doi.org/10.1016/j.schres.2007.07.004

Aldao, A., & Nolen-Hoeksema, S. (2012). When are adaptive strategies most predictive of psychopathology? Journal of Abnormal Psychology, 121(1), 276–281. https://doi.org/10.1037/a0023598

Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. Clinical Psychology Review, 30(2), 217–237. https://doi.org/10.1016/j.cpr.2009.11.004

Ben-Naim, S., Hirschberger, G., Ein-Dor, T., & Mikulincer, M. (2013). An experimental study of emotion regulation during relationship conflict interactions: The moderating role of attachment orientations. Emotion, 13(3), 506–519. https://doi.org/10.1037/a0031473

Ben-Zeev, D., Ellington, K., Swendsen, J., & Granholm, E. (2011). Examining a cognitive model of persecutory ideation in the daily life of people with schizophrenia: A computerized experience sampling study. Schizophrenia Bulletin, 37(6), 1248–1256. https://doi.org/10.1093/schbul/sbq041

Berking, M., & Whitley, B. (2014). The Adaptive Coping with Emotions Model (ACE Model). In Affect Regulation Training (pp. 19–29). New York, NY: Springer New York. https://doi.org/10.1007/978-1-4939-1022-9_3

Berking, M., Wupperman, P., Reichardt, A., Pejic, T., Dippel, A., & Znoj, H. (2008). Emotion-regulation skills as a treatment target in psychotherapy. Behaviour Research and Therapy, 46(11), 1230–1237. https://doi.org/10.1016/j.brat.2008.08.005

Berking, M., & Znoj, H. (2008). Entwicklung und Validierung eines Fragebogens zur standardisierten Selbsteinschätzung emotionaler Kompetenzen (SEK-27), 56(2), 141–153. https://doi.org/10.1024/1661-4747.56.2.141

Brans, K., Koval, P., Verduyn, P., Lim, Y. L., & Kuppens, P. (2013). The Regulation of Negative and Positive Affect in Daily Life. Emotion (Washington, D.C.), June.

https://doi.org/10.1037/a0032400

Campbell-Sills, L., Barlow, D. H., Brown, T. A., & Hofmann, S. G. (2006). Effects of suppression and acceptance on emotional responses of individuals with anxiety and mood disorders. Behaviour Research and Therapy, 44(9), 1251–1263. https://doi.org/10.1016/j.brat.2005.10.001

Cho, H., Gonzalez, R., Lavaysse, L. M., Pence, S., Fulford, D., & Gard, D. E. (2017). Do people with schizophrenia experience more negative emotion and less positive emotion in their daily lives? A meta-analysis of experience sampling studies. Schizophrenia Research, 183, 49–55. https://doi.org/10.1016/j.schres.2016.11.016

Cohen, A. S., Callaway, D. A., Najolia, G. M., Larsen, J. T., & Strauss, G. P. (2012). On "risk" and reward: Investigating state anhedonia in psychometrically defined schizotypy and schizophrenia. Journal of Abnormal Psychology, 121(2), 407–415. https://doi.org/10.1037/a0026155

Cohen, J. (1992). A power primer. Psychological Bulletin, 112(1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155

De Castella, K., Goldin, P., Jazaieri, H., Ziv, M., Dweck, C. S., & Gross, J. J. (2013). Beliefs About Emotion: Links to Emotion Regulation, Well-Being, and Psychological Distress. Basic and Applied Social Psychology, 35(6), 497–505. https://doi.org/10.1080/01973533.2013.840632

Drees, J. (2008). Associating daily life stress with the intensity of psychotic symptoms in the prodromal phase of schizophrenia. Unpublished thesis. University of Maastricht, Netherlands

Dunn, B. D., Billotti, D., Murphy, V., & Dalgleish, T. (2009). The consequences of effortful emotion regulation when processing distressing material: A comparison of suppression and acceptance. Behaviour Research and Therapy, 47(9), 761–773. https://doi.org/10.1016/j.brat.2009.05.007

Edwards, C. J., Cella, M., Tarrier, N., & Wykes, T. (2016). The optimisation of experience sampling protocols in people with schizophrenia. Psychiatry Research, 244, 289–293. https://doi.org/10.1016/j.psychres.2016.07.048

Falkai, P., & Wittchen, H.-U. (2018). Diagnostisches und Statistisches Manual Psychischer Störungen DSM-5. American Psychiatric Association Hogrefe-Verlag.

Fowler, D., Hodgekins, J., Garety, P., Freeman, D., Kuipers, E., Dunn, G., ... Bebbington, P. E. (2012). Negative cognition, depressed mood, and paranoia: A longitudinal pathway analysis using structural equation modeling. Schizophrenia Bulletin, 38(5), 1063–1073. https://doi.org/10.1093/schbul/sbr019

Garnefski, N., Garnefski, N., Kraaij, V., Kraaij, V., Spinhoven, P., & Spinhoven, P. (2001). Negative life events, cognitive emotion regulation and emotional problems. Personality and Individual Differences, 30, 1311–1327. https://doi.org/10.1016/S0191-8869(00)00113-6

Glymour, M.M., Weuve, J., Berkman, L.F., Kawachi, I., Robins, J.M., 2005. When is baseline adjustment useful in analyses of change? An example with education and cognitive change. Am. J. Epidemiol. 162, 267–278. https://doi.org/10.1093/aje/kwi187

Grezellschak, S., Lincoln, T. M., & Westermann, S. (2015). Cognitive emotion regulation in patients with schizophrenia: Evidence for effective reappraisal and distraction. Psychiatry Research, 229(1–2), 434–439. https://doi.org/10.1016/j.psychres.2015.05.103

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. Journal of Personality and Social Psychology, 85(2), 348–362. https://doi.org/10.1037/0022-3514.85.2.348

Gunzenhauser, C., Heikamp, T., Gerbino, M., Alessandri, G., Van Suchodoletz, A., Di Giunta, L., ... Trommsdorff, G. (2013). Self-efficacy in regulating positive and negative emotions: A validation study in Germany. European Journal of Psychological Assessment, 29(3), 197–204. https://doi.org/10.1027/1015-5759/a000151

Gyurak, A., Gross, J. J., Etkin, A., Gyurak, A., Gross, J. J., & Etkin, A. (2011). Explicit and implicit emotion regulation : A dual- process framework Explicit and implicit emotion regulation : A dual-process framework, 9931. https://doi.org/10.1080/02699931.2010.544160

Haddock, G., McCarron, J., Tarrier, N., & Faragher, E. B. (1999). Scales to measure dimensions of hallucinations and delusions: the psychotic symptom rating scales (PSYRATS). Psychological Medicine, 29(4), 879–889. https://doi.org/10.1017/S0033291799008661

Hartley, S., Haddock, G., Sa, D. V., Emsley, R., & Barrowclough, C. (2014). An experience sampling study of worry and rumination in psychosis, 1605–1614. https://doi.org/10.1017/S0033291713002080

Hayes, S. C., Bissett, R. T., Korn, Z., Zettle, R. D., Rosenfarb, I. S., Cooper, L. D., & Grundt, A. M. (1999). The Impact of Acceptance Versus Control Rationales on Pain Tolerance. The Psychological Record, 49(1), 33–47. https://doi.org/10.1007/BF03395305

Jahng, S., Wood, P.K., Trull, T.J., 2008. Analysis of Affective Instability in Ecological Momentary Assessment: Indices Using Successive Difference and Group Comparison via Multilevel Modeling. Psychol. Methods 13, 354–375. https://doi.org/10.1037/a0014173

John, O. P., & Gross, J. J. (2004). Healthy and Unhealthy Emotion Regulation: Personality Processes, Individual Differences, and Life Span Development. Journal of Personality, 72(6), 1301–1334. https://doi.org/10.1111/j.1467-6494.2004.00298.x

Kalokerinos, E. K., Résibois, M., Verduyn, P., & Kuppens, P. (2017). The temporal deployment of emotion regulation strategies during negative emotional episodes. Emotion, 17(3), 450–458. https://doi.org/10.1037/emo0000248

Kay, S. R., Fiszbein, a, & Opler, L. a. (1987). The positive and negative syndrome scale (PANSS) for schizophrenia. Schizophrenia Bulletin, 13(2), 261–276.

Kesting, M.-L., & Lincoln, T. M. (2013). The relevance of self-esteem and self-schemas to persecutory delusions: A systematic review. Comprehensive Psychiatry, 54(7), 766–789. https://doi.org/10.1016/j.comppsych.2013.03.002

Koole, S. L. (2009). The psychology of emotion regulation: An integrative review. Cognition & Emotion, 23(1), 4–41. https://doi.org/10.1080/02699930802619031

Koole, S. L., & Rothermund, K. (2011). "I feel better but I don't know why": The psychology of implicit emotion regulation. Cognition & Emotion, 25(3), 389–399. https://doi.org/10.1080/02699931.2010.550505

Lehrl, S. (2005). MWT-B - Mehrfachwahl-Wortschatz-Intelligenztest (5th Editio). Göttingen: Hogrefe.

Lincoln, T M, Ziegler, M., Mehl, S., Kesting, M.-L., Lüllmann, E., Westermann, S., & Rief, W. (2012). Moving from efficacy to effectiveness in cognitive behavioral therapy for psychosis: a randomized clinical practice trial. Journal of Consulting and Clinical Psychology, 80(4), 674–686. https://doi.org/10.1037/a0028665

Lincoln, Tania M., Keller, E., & Rief, W. (2009). Die Erfassung von Wahn und Halluzinationen in der Normalbevölkerung. Diagnostica, 55(1), 29–40. https://doi.org/10.1026/0012-1924.55.1.29

Lincoln, Tania M, Sundag, J., Schlier, B., & Karow, A. (2017). The Relevance of Emotion Regulation in Explaining Why Social Exclusion Triggers Paranoia in Individuals at Clinical High Risk of Psychosis. Schizophrenia Bulletin, (October), 1–11. https://doi.org/10.1093/schbul/sbx135

Lobbestael, J., Leurgans, M., & Arntz, A. (2011). Inter-rater reliability of the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID I) and Axis II Disorders (SCID II). Clinical Psychology & Psychotherapy, 18(1), 75–79. https://doi.org/10.1002/cpp.693

Ludwig, L., Werner, D., & Lincoln, T. M. (2019). The relevance of cognitive emotion regulation to psychotic symptoms – A systematic review and meta-analysis. Clinical Psychology Review, 101746. https://doi.org/10.1016/J.CPR.2019.101746

McMahon, T. P., & Naragon-Gainey, K. (2018). The Multilevel Structure of Daily Emotion-Regulation-Strategy Use: An Examination of Within- and Between-Person Associations in Naturalistic Settings. Clinical Psychological Science, 216770261880740. https://doi.org/10.1177/2167702618807408

Meer, L. Van Der, Swart, M., Velde, J. Van Der, & Pijnenborg, G. (2014). Neural Correlates of Emotion Regulation in Patients with Schizophrenia and Non-Affected Siblings, 9(6). https://doi.org/10.1371/journal.pone.0099667

Mehl, M. R., & Conner, T. S. (2012). Handbook of research methods for studying daily life. Guilford Press.

Moran, E. K., Culbreth, A. J., & Barch, D. M. (2018). Emotion Regulation Predicts Everyday Emotion

Experience and Social Function in Schizophrenia. Clinical Psychological Science, 6(2), 271–279. https://doi.org/10.1177/2167702617738827

Müller, M. J., Marx-Dannigkeit, P., Schlösser, R., Wetzel, H., Addington, D., & Benkert, O. (1999). The Calgary Depression Rating Scale for Schizophrenia: Development and interrater reliability of a German version (CDSS-G). Journal of Psychiatric Research, 33(5), 433–443. https://doi.org/10.1016/S0022-3956(99)00018-7

Myin-Germeys, I., Kasanova, Z., Vaessen, T., Vachon, H., Kirtley, O., Viechtbauer, W., & Reininghaus, U. (2018). Experience sampling methodology in mental health research: new insights and technical developments. World Psychiatry, 17(May), 123–132. https://doi.org/10.1002/wps.20513

Nezlek, J. B. (2012). Multilevel modeling analyses of diary-style data. In M. R. Mehl & T. S. Conner (Eds.), Handbook of research methods for studying daily life (Guilford P, pp. 357–383). New York.

Nittel, C. M., Lincoln, T. M., Lamster, F., Leube, D., Rief, W., Kircher, T., & Mehl, S. (2018). Expressive suppression is associated with state paranoia in psychosis: An experience sampling study on the association between adaptive and maladaptive emotion regulation strategies and paranoia. British Journal of Clinical Psychology. https://doi.org/10.1111/bjc.12174

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking Rumination. Perspectives on Psychological Science, 3(5), 400–424. https://doi.org/10.1111/j.1745-6924.2008.00088.x

O'Driscoll, C., Laing, J., & Mason, O. (2014). Cognitive emotion regulation strategies, alexithymia and dissociation in schizophrenia, a review and meta-analysis. Clinical Psychology Review, 34(6), 482–495. https://doi.org/10.1016/j.cpr.2014.07.002

Perry, Y., Henry, J. D., Nangle, M. R., & Grisham, J. R. (2012). Regulation of negative affect in schizophrenia: The effectiveness of acceptance versus reappraisal and suppression. Journal of Clinical and Experimental Neuropsychology, 34(5), 497–508. https://doi.org/10.1080/13803395.2012.661405

Rowland, J. E., Hamilton, M. K., Lino, B. J., Ly, P., Denny, K., Hwang, E., ... Green, M. J. (2013). Cognitive regulation of negative affect in schizophrenia and bipolar disorder. Psychiatry Research, 208(1), 21–28. https://doi.org/10.1016/j.psychres.2013.02.021

Singer, J. D., & Willett, J. B. (2003). Applied Longitudinal Data Analysis. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195152968.001.0001

Strauss, G. P., Kappenman, E. S., Culbreth, A. J., Catalano, L. T., Lee, B. G., & Gold, J. M. (2013). Emotion regulation abnormalities in schizophrenia: Cognitive change strategies fail to decrease the neural response to unpleasant stimuli. Schizophrenia Bulletin, 39(4), 872–883. https://doi.org/10.1093/schbul/sbs186

Thewissen, V., Bentall, R. P., Oorschot, M., van Lierop, T., van Os, J., & Myin-Germeys, I. (2011). Emotions, self-esteem, and paranoid episodes: An experience sampling study. British

Journal of Clinical Psychology, 50(2), 178–195.

Thompson, R. A. (1994). Emotion regulation: a theme in search of definition. Monographs of the Society for Research in Child Development, 59(2–3), 25–52.

Van Os, J., Kenis, G., & Rutten, B. P. F. (2010). The environment and schizophrenia. Nature, 468(7321), 203–212. https://doi.org/10.1038/nature09563

Van Rijn, S., Schothorst, P., Wout, M. V., Sprong, M., Ziermans, T., van Engeland, H., ... Swaab, H. (2011). Affective dysfunctions in adolescents at risk for psychosis: Emotion awareness and social functioning. Psychiatry Research, 187(1–2), 100–105. https://doi.org/10.1016/j.psychres.2010.10.007

Visser, K. F., Esfahlani, F. Z., Sayama, H., & Strauss, G. P. (2018). An ecological momentary assessment evaluation of emotion regulation abnormalities in schizophrenia. Psychological Medicine, 1–9. https://doi.org/10.1017/S0033291717003865

Webb, T. L., Miles, E., & Sheeran, P. (2012). Dealing with feeling: A meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. Psychological Bulletin, 138(4), 775–808. https://doi.org/10.1037/a0027600

Wittchen, H. U., Wunderlich, U., Gruschwitz, S., & Zaudig, M. (1997). Strukturiertes Klinische Interview fuer DSM-IV. Göttingen: Hogrefe.

Zawadzki, M. J. (2015). Rumination is independently associated with poor psychological health: Comparing emotion regulation strategies. Psychology and Health, 30(10), 1146–1163. https://doi.org/10.1080/08870446.2015.1026904

Zyzanski, S. J., Flocke, S. A., & Dickinson, L. M. (2004). On the Nature and Analysis of Clustered Data, 199–200. https://doi.org/10.1370/afm.197.tudies

Appendix

Appendix A. Example items of the Emotion-Regulation Skills Questionnaire (Berking & Znoj, 2008)

Awareness: "I paid attention to my feelings."
Clarity: "I was clear about what emotions I was experiencing."
Sensations: "My physical sensations were a good indication of how I was feeling."
Understanding: "I was aware of why I felt the way I felt."
Acceptance: "I accepted my emotions."
Tolerance: "I felt I could cope with even intense negative feelings."
Self-support: "I supported myself in emotionally distressing situations."
Confronting: "I did what I had planned, even if it made me feel uncomfortable."
Modification: "I was able to influence my negative feelings."

Appendix B. Overview of ESM items to assess emotion regulation

Overview of ESM items to assess emotion regulation

"Just before the beep..."
Rumination = "I ruminated without reaching a result"
Suppression = "I have tried to hide my feelings from others"
Cognitive Reappraisal = "I tried to think differently about the situation in order to feel better"
Distraction = "I have distracted myself from my feelings (through chatting, reading, listening to music, watching TV, etc.)"
Social sharing = "I have told others (acquaintances, friends, family), how I am feeling"
Acceptance = "I told myself it is all right how I am feeling."
Awareness = "I was aware of my feelings."

Appendix C. Overview of all constructs assessed in the ESM study

Experience Sampling Methodology	Construct being assessed	Items
	Sleep quality	"How satisfied are you with your sleep?", "How deeply did you sleep?", "How restful was your sleep?"
	Positive affect	Satisfied, happy, relaxed, proud
	Negative affect	Anxious, sad, irritable, lonely, insecure, nervous
	Emotion regulation	Awareness, acceptance, cognitive reappraisal, seeking support, suppression, rumination, distraction
	Paranoia	Brief 3-item version of Paranoia Checklist + "I feel suspicious.", "My thoughts are influenced by someone else.", "I feel others intend to harm

		me." (Thewissen et al., 2011)
	Context	"I am alone." Yes/no
	Self-acceptance	"I like myself at the moment.", "I doubt myself at the moment.", "I accept myself the way I am at the moment.", "I am ashamed of myself at the moment." (Thewissen et al., 2011)

Appendix D. Mean habitual and daily ER in individuals with psychosis compared to non-clinical controls.

		Psychosis group (PD)	Non-clinical controls (NC)	
	n (PD, NC)	*M* (SD)	*M* (SD)	Statistic (*t* (*p*))
Habitual Emotion Regulation				
Suppression (ERQ)	71,41	3,2347(1,36490)	2,5488(1,21478)	t(110)=-2,665, p=.009
Reappraisal (ERQ)	71,42	2,7958(1,28921)	3,6595(1,02263)	t(111)=3,705, p<.001
ERSQ total	68,39	1,9760(0,63807)	2,8329(0,60899)	t(105)=6,796, p<.001
Awareness	71,42	6,5493(2,73490)	7,8333(2,54632)	t(111)=2,473, p=.015
Clarity	71,42	6,8169(2,98238)	9,2439(2,25589)	t(110)=4,515, p<.001
Sensations	71,42	6,6056(2,75929)	8,9524(2,75816)	t(111)=4,370, p<.001
Understanding	70,41	6,4571(2,66858)	8,8780(2,44126)	t(109)=4,758, p<.001
Acceptance	71,42	5,9296(2,48035)	8,8571(1,95774)	t(111)=6,941, p<.001
Tolerance	70,42	5,1571(2,68455)	8,8571(2,07860)	t(110)=8,156, p<.001
Self-support	69,42	5,6087(2,72902)	8,6667(2,70200)	t(109)=5,747, p<.001

Confronting	71,41	6,3944(2,73328)	8,3415(2,44550)	t(110)=3,771, p<.001
Modification	71,42	4,2535(3,00342)	7,3810(2,74041)	t(111)=5,523, p<.001
Emotion Regulation in daily life				
Cognitive reappr.	2895,1714	2,66(1,698)	1,81(1,387)	t(110)=-4,056,
Social sharing	2894,1718	1,759(1,4637)	1,709(1,5317)	p<.001
Acceptance	2890,1717	3,171(1,7745)	3,346(2,2762)	t(112)=-0,433,
Awareness	2902,1728	3,675(1,8894)	4,033(2,1131)	p=.666
Suppression	2898,1719	2,556(1,8883)	1,417(0,9976)	t(111)=0,133, p=.895
Rumination	2897,1714	2,716(1,8314)	1,656(1,3142)	t(111)=0,608, p<.544
Distraction	2895,1721	4,228(2,2530)	2,655(2,0336)	t(111)=-4,696, p<.001 t(109)=-4,329, p<.001 t(111)=-5,978, p<.001

ERQ = Emotion Regulation Questionnaire, ERSQ-27 = Emotion-Regulation Skills Questionnaire

Appendix E. Habitual ER strategies as predictors of negative and positive affect.

	b	*SE*	*p*	*CI* (95%)
Negative affect				
ERQ_Reappraisal	-0.242	0.075	.002	-0.391; -0.094
ERQ_Suppression	0.138	0.070	.052	-0.001; 0.278
ERSQ Total	-0.028	0.004	p<.001	-0.036; -0.019
ERSQ_Awareness	0.034	0.047	.470	-0.060; 0.129
ERSQ_Clarity	-0.042	0.051	.411	-0.144; 0.060
ERSQ_Sensations	0.068	0.043	.119	-0.018; 0.154
ERSQ_Understanding	-0.085	0.054	.119	-0.193; 0.022
ERSQ_Acceptance	-0.043	0.056	.438	-0.154; 0.067
ERSQ_Tolerance	-0.068	0.045	.134	-0.159; 0.022
ERSQ_Self-support	-0.060	0.045	.188	-0.150; 0.030
ERSQ_Confronting	-0.045	0.044	.308	-0.131; 0.042
ERSQ_Modifaction	0.008	0.043	.854	-0.078; 0.093
ERQ_Reappraisal x Group	-0.090	0.161	.577	-0.409; 0.229
ERQ_Suppression x Group	0.059	0.141	.677	-0.221; 0.339
ERSQ x Group	-0.018	0.010	.082	-0.038; 0.002
ERSQ_Awareness x Group	-0.056	0.104	.590	-0.263; 0.150
ERSQ_Clarity x Group	-0.046	0.132	.729	-0.309; 0.217
ERSQ_Sensations x Group	0.015	0.106	.890	-0.196; 0.225
ERSQ_Understanding x Group	0.046	0.125	.713	-0.203; 0.295
ERSQ_Acceptance x Group	0.004	0.137	.978	-0.269; 0.276
ERSQ_Tolerance x Group	-0.066	0.107	.539	-0.278; 0.147
ERSQ_Self-support x Group	-0.046	0.092	.621	-0.228; 0.137
ERSQ_Confronting x Group	-0.050	0.096	.603	-0.241; 0.141
ERSQ_Modifaction x Group	0.046	0.096	.631	-0.145; 0.238
Positive affect				
ERQ_Reappraisal	0.339	0.077	p<.001	0.185; 0.492
ERQ_Suppression	-0.192	0.073	.010	-0.336; -0.048
ERSQ Total	0.026	0.005	p<.001	0.016; 0.035
ERSQ_Awareness	-0.030	0.054	.577	-0.138; 0.077
ERSQ_Clarity	0.068	0.059	.251	-0.049; 0.184
ERSQ_Sensations	0.016	0.049	.740	-0.081; 0,114
ERSQ_Understanding	-0.053	0.062	.394	-0.176; 0.070
ERSQ_Acceptance	0.071	0.063	.264	-0.055; 0.197
ERSQ_Tolerance	0.090	0.052	.085	-0.013; 0.192
ERSQ_Self-support	0.011	0.052	.832	-0.092; 0.114
ERSQ_Confronting	0.000	0.050	.999	-0.099; 0.099

ERSQ_Modifaction	0.042	0.049	.390	-0.055; 0.140
ERQ_Reappraisal x Group	-0.101	0.170	.553	-0.438; 0.236
ERQ_Suppression x Group	-0.087	0.149	.553	-0.383; 0.210
ERSQ x Group	0.127	0.011	.271	-0.010; 0.035
ERSQ_Awareness x Group	0.080	0.115	.489	-0.148; 0.308
ERSQ_Clarity x Group	-0.181	0.146	.218	-0.472; 0.109
ERSQ_Sensations x Group	-0.043	0.117	.716	-0.275; 0.190
ERSQ_Understanding x Group	0.313	0.139	.027	0.037; 0.588
ERSQ_Acceptance x Group	-0.081	0.151	.593	-0.382; 0.220
ERSQ_Tolerance x Group	0.087	0.118	.462	-0.148; 0.322
ERSQ_Self-support x Group	0.004	0.102	.970	-0.198; 0.206
ERSQ_Confronting x Group	-0.131	0.106	.220	-0.343; 0.080
ERSQ_Modifaction x Group	0.050	0.106	.643	-0.162; 0.261

Appendix F. Daily ER strategies as predictors of successive differences between (t-1 and t) in negative and positive affect, moderated by group.

	b	*SE*	*p*	*CI* (95%)
Negative affect				
Cognitive reappraisal	-0.036	0.010	p<.001	-0.055; -0.017
Social sharing	0.005	0.010	.634	-0.014; 0.023
Acceptance	0.006	0.009	.531	-0.012; 0.023
Awareness	-0.026	0.009	.006	-0.045; -0.008
Suppression	-0.059	0.011	p<.001	-0.081; -0.038
Rumination	-0.089	0.010	p<.001	-0.109; -0.069
Distraction	0.010	0.007	.153	-0.004; 0.024
Cognitive reappraisal x Group	-0.007	0.022	.753	-0.049; 0.035
Seeking help x Group	0.035	0.020	.079	-0.004; 0.074
Acceptance x Group	0.006	0.019	.748	-0.031; 0.043
Awareness x Group	-0.034	0.020	.078	-0.073; 0.004
Suppression x Group	-0.060	0.028	.032	-0.115; -0.005
Rumination x Group	0.043	0.024	.078	-0.005; 0.090
Distraction x Group	0.008	0.015	.607	-0.022; 0.038
Positive affect				

Cognitive reappraisal	0.522	0.014	p<.001	0.025; 0.079
Social sharing	-0.022	0.014	.104	-0.049; 0.005
Acceptance	-0.041	0.013	.002	-0.066; -0.016
Awareness	0.003	0.013	.816	-0.023; 0.029
Suppression	0.043	0.016	.006	0.012; 0.074
Rumination	0.107	0.014	p<.001	0.079; 0.135
Distraction	-0.025	0.010	.011	-0.045; -0.006
Cognitive reappraisal x Group	0.006	0.031	.851	-0.054; 0.066
Seeking help x Group	-0.015	0.028	.588	-0.071; 0.040
Acceptance x Group	-0.021	0.026	.425	-0.073; 0.031
Awareness x Group	0.081	0.028	.003	0.027; 0.136
Suppression x Group	0.121	0.040	.002	0.044; 0.199
Rumination x Group	-0.132	0.034	p<.001	-0.120; -0.065
Distraction x Group	0.021	0.022	.326	-0.021; 0.064

Appendix G. Sensitivity analysis of cases including SD_NA ≤ 0 and SD_PA ≥ 0.

Separate analysis of cases including only successive differences in terms of an actual decrease in NA and an increase in PA. Daily ER strategies as predictors of successive differences between (t-1 and t) in negative and positive affect, moderated by group. Included cases: SD_NA ≤ 0 and SD_PA ≥ 0.

	b	*SE*	*p*	*CI* (95%)
Negative affect (SD_NA ≤ 0)				
Cognitive reappraisal	-0.031	0.008	p<.001	-0.046; -0.016
Social sharing	0.003	0.007	.639	-0.011; 0.018
Acceptance	0.017	0.007	.019	0.003; 0.031
Awareness	-0.007	0.008	.359	-0.022; 0.008
Suppression	-0.046	0.009	p<.001	-0.063; -0.029
Rumination	-0.078	0.008	p<.001	-0.094; -0.063
Distraction	0.007	0.006	.201	-0.004; 0.018
Cognitive reappraisal x Group	0.006	0.016	.727	-0.026; 0.037
Seeking help x Group	-0.006	0.015	.692	-0.036; 0.024
Acceptance x Group	0.026	0.015	.075	-0.003; 0.055
Awareness x Group	-0.029	0.015	.060	-0.059; 0.001
Suppression x Group	-0.001	0.022	.977	-0.044; 0.043
Rumination x Group	0.010	0.019	.598	-0.027; 0.046
Distraction x Group	0.028	0.012	.021	0.004; 0.051

Positive affect (SD_PA ≥ 0)				
Cognitive reappraisal	0.022	0.011	.042	0.001; 0.044
Social sharing	-0.009	0.011	.408	-0.032; 0.013
Acceptance	-0.040	0.011	p<.001	-0.061; -0.018
Awareness	0.001	0.011	.909	-0.021; 0.023
Suppression	0.035	0.012	.005	0.011; 0.060
Rumination	0.060	0.011	p<.001	0.038; 0.082
Distraction	-0.009	0.008	.300	-0.025; 0.008
Cognitive reappraisal x Group	-0.030	0.024	.219	-0.077; 0.018
Seeking help x Group	-0.021	0.024	.374	-0.068; 0.025
Acceptance x Group	-0.015	0.022	.510	-0.059; 0.029
Awareness x Group	0.087	0.023	p<.001	0.041; 0.133
Suppression x Group	0.018	0.033	.592	-0.047; 0.083
Rumination x Group	-0.087	0.027	.002	-0.141; -0.033
Distraction x Group	0.013	0.018	.469	-0.022; 0.048

Note: Strategies in bold when this separate analysis led to a different result.

Appendix H. Post-hoc analysis negative affect as a predictor of ER

1. Post-hoc analysis of negative affect at t-1 as predictor of ER strategies at t.

	b	*SE*	*p*	*CI* (95%)
Cognitive reappraisal	0.178	0.0356	<.001	0.109; 0.248
Social sharing	-0.004	0.0333	.916	-0.069; 0.062
Acceptance	-0.010	0.038	.008	-0.173; -0.026
Awareness	-0.012	0.036	.744	-0.083; 0.059
Suppression	0.147	0.029	<.001	0.089; 0.205
Rumination	0.274	0.033	<.001	0.209; 0.339
Distraction	-0.062	0.046	.176	-0.154; 0.028

2. Separate analysis of cases including only events of NA above the median NA (1.9248). Daily ER strategies as predictors of successive differences between (t-1 and t) in negative and positive affect. Included cases: NA > 1.9248.

	b	*SE*	*p*	*CI* (95%)
Negative affect				
Cognitive reappraisal	-0.027	0.016	.094	-0.0589; 0.005
Social sharing	0.006	0.018	.732	-0.028; 0.040
Acceptance	0.006	0.017	.719	-0.027; 0.039
Awareness	-0.042	0.017	.012	-0.075; -0.009
Suppression	-0.079	0.016	p<.001	-0.110; -0.049
Rumination	-0.100	0.015	p<.001	-0.129; -0.071
Distraction	0.009	0.012	.428	-0.014; 0.032

3. Separate analysis of cases including only events of NA below the median NA (1.9248) Daily ER strategies as predictors of successive differences between (t-1 and t) in negative and positive affect. Included cases: NA < 1.9248.

	b	*SE*	*p*	*CI* (95%)
Negative affect				
Cognitive reappraisal	-0.069	0.009	p<.001	-0.086; -0.051
Social sharing	0.017	0.008	.038	0.001; 0.032
Acceptance	0.020	0.008	.008	0.005; 0.035
Awareness	-0.017	0.008	.038	-0.032; -0.001
Suppression	-0.058	0.013	p<.001	-0.083; -0.033
Rumination	-0.098	0.011	p<.001	-0.119; -0.077
Distraction	0.011	0.006	.079	-0.001; 0.024

Appendix J. Completers vs. Non-Completers

Variable	Completers (*n* = 113)		Non-Completers (*n* = 10)		
	M (SD)	*n*	*M (SD)*	*n*	Statistic
Age (years)	37.56	113	34.40	10	t(121)=-0.757, p=.450

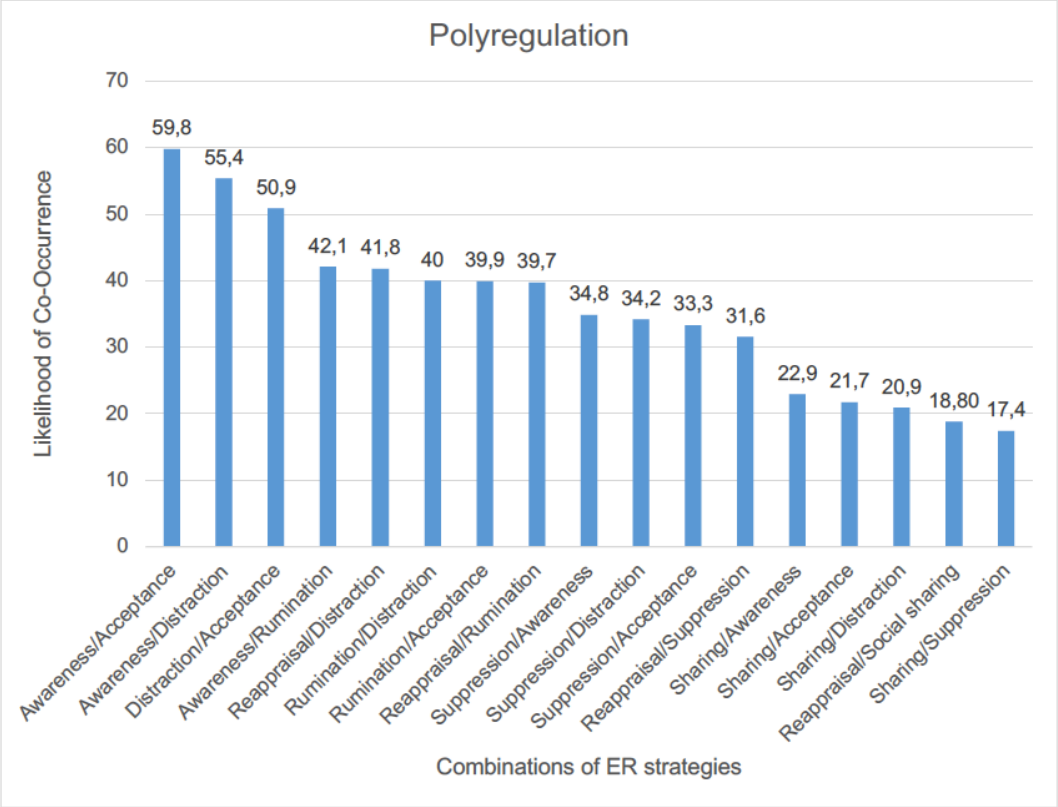
	(12.64)		(12.62)		
PSYRATS – Delusion*	15.13 (3.61)	71	13.89 (3.59)	9	t(78)=-0.97, p=.335
	%	*n*	%	*n*	
Gender male	58.4	113	70.0	10	$\chi^2(1)$= 0.512, p=.474
Education final level°		113		10	
High	56.6		40.0		$\chi^2(3)$= 3.307, p=.347
Medium	25.7		20.0		
Low	16.8		40.0		
None	0.8		0		

Note: PSYRATS, Psychotic Symptoms Rating Scale; Non-Completers (=including those who declined to take part as well as those who did not respond to a sufficient number of prompts)

* measures only collected for psychosis group

° Low, Hauptschulabschluss; medium, Realschulabschluss; high, Abitur (A-level or high school equivalent)

Appendix K. Polyregulation – Combinations of ER Strategies



Note. Percentages indicate the likelihood of one strategy occurring with another. Example: In 59,8% of prompts where awareness was endorsed, acceptance was also endorsed.

References

Berking, M., & Znoj, H. (2008). Entwicklung und Validierung eines Fragebogens zur standardisierten Selbsteinschätzung emotionaler Kompetenzen (SEK-27), 56(2), 141–153. http://doi.org/10.1024/1661-4747.56.2.141

Thewissen, V., Bentall, R. P., Oorschot, M., van Lierop, T., van Os, J., & Myin-Germeys, I. (2011). Emotions, self-esteem, and paranoid episodes: An experience sampling study. British Journal of Clinical Psychology, 50(2), 178–195.

10. Anhang C: Studie III

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Awareness and rumination moderate the affective pathway to paranoia in daily life

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ABSTRACT

Numerous cross-sectional studies found psychosis to be associated with less awareness of emotions, a decreased use of adaptive (e.g. reappraisal) and an increased use of maladaptive emotion regulation (ER) strategies (e.g. suppression). In this study, we tested whether state levels of emotion awareness and momentary use of specific ER strategies moderate the link between negative affect at one timepoint (t-1) and paranoia at the next timepoint (t) in a six-day experience sampling study. Individuals with psychotic disorders ($n = 71$) reported on the presence of paranoia, negative affect, emotion awareness and the use of six ER strategies (reappraisal, acceptance, social sharing, distraction, suppression and rumination) ten times per day. Multilevel regression analysis revealed that higher awareness at t-1 reduced the association of negative affect at t-1 and paranoia at t, whereas rumination had an opposite, amplifying moderation effect. Our results provide novel insight into the conditions under which negative affect translates into delusional beliefs. The finding that emotion awareness and rumination have a relevant role corresponds with current psychological conceptualisations of psychosis and with the attempt to treat delusions by focusing on reducing ruminative thoughts. To investigate the causal effect, treatment trials with a focus on enhancing these components of emotion regulation are needed.

1. Introduction

Clinical and non-clinical studies indicate that negative affect constitutes a pivotal factor for delusion formation and maintenance. In experimental studies, induced negative affect preceded an increase in paranoia (e.g. Freeman et al., 2015b; Lincoln et al., 2009). In longitudinal survey studies, negative affect predicted paranoia levels up to twelve months later (e.g. Fowler et al., 2012; Oliver et al., 2012). Experience sampling method (ESM) studies that aimed to identify the predictors of symptom increases in daily life found a similar temporal pattern between negative affect and increases in paranoia for short-term intervals (Kramer et al., 2014; Thewissen et al., 2011), while there is no evidence for the reverse effect (Krkovic et al., 2018b, 2018a). Finally, several psychological interventions for patients with psychosis that aimed at reducing negative affect rather than targeting delusions directly were successful in reducing delusions (Opoka et al., 2018). Thus, the etiological pathway leading from negative affect to paranoia, which had long been postulated in theoretical conceptualisations (Freeman et al., 2002; Preti and Cella, 2010), is empirically supported by numerous, methodologically diverse studies.

Accordingly, an important question is how this affective pathway to paranoia can be modulated. A viable approach to answer this question is to explore how individuals with psychosis deal with negative affect. The ability to deal with emotions is commonly described as emotion regulation (ER), defined as processes aimed at down- or up-regulating emotions and influencing the valence and dynamic features of emotions (Thompson, 1994). Following this definition, research has predominantly focused on the array of explicit, consciously accessible strategies. Some of these strategies have been labeled as maladaptive (i.e. suppression, rumination) due to their associations with detrimental health outcomes, whereas others have been labeled as adaptive given their associations with positive effects (i.e. reappraisal, distraction) (Aldao and Nolen-Hoeksema, 2012). Over the course of time, the list of adaptive ER strategies has continuously been expanded and now includes strategies such as acceptance (Berking and Whitley, 2014), interpersonal ER (social sharing) (Hofmann, 2016) and, as conscious ER strategies require being aware of one's own emotions, emotion awareness as an integral component of the ER process (Berking et al., 2008).

Most studies on ER and psychosis explored cross-sectional differences in the use of ER strategies, comparing retrospectively self-

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reported ER strategies between patients with psychosis and controls. Overall, these studies found that patients with psychosis use more putatively maladaptive strategies and less putatively adaptive strategies (for a recent review see: Ludwig et al., 2019a). Beyond this correlative data, a therapy trial targeting persecutory delusions (Freeman et al., 2015a) and two experimental studies in non-clinical participants (Martinelli et al., 2013; McKie et al., 2017) both point to effects of reduced perseverative thinking styles (e.g. worry, rumination) on delusions. Building on the evidence of the affective pathway to paranoia and the inherent impact of ER on negative affect, we assume that if negative affect is not sufficiently down-regulated, the resulting increased and/or prolonged emotion intensity is more likely to trigger symptoms. Therefore, we hypothesise that ER not only predicts symptoms directly (direct effect, see Fig. 1, left side) but also moderates the pathway from negative affect to symptoms (moderation effect, see Fig. 1, right side). To date, only a few studies have tested the moderation mechanism: Two experimental studies have found that the extent of ER skills measured at baseline with self-report questionnaires moderated the increase in paranoid symptoms in response to a stressor in individuals at clinical high risk (Lincoln et al., 2017) and in individuals with psychosis (Lincoln et al., 2015a). These findings of a moderating role of ER and the prospective findings mentioned above are based on retrospective questionnaire-based assessments of ER and psychosis symptoms encompassing large time-intervals. Arguably, these designs are not ideal to detect the interplay and thus, the moderating role of ER on the pathway from negative affect to paranoia, as each of these variables can vary from moment to moment in the context of daily life (Brans et al., 2013; Thewissen et al., 2008). ESM studies, in which participants are asked several times a day to report on the phenomena of interest, are better suited to capture momentary changes and dynamics (Myin-Germeys et al., 2018), due to being less prone to retrospective memory bias. Also, they are more ecologically valid because of being embedded in the context of daily life. Moreover, ESM has proved feasible and valid for use in psychosis samples (Edwards et al., 2016).

So far, the question of whether ER strategies predict increases in paranoia in daily life was addressed in two ESM studies: Hartley et al. (2014) found that both worry and rumination preceded pronounced levels of paranoia in time-lagged analyses. Nittel et al. (2018) investigated a range of seven ER strategies and found suppression, but none of the other strategies, including rumination, to predict subsequent paranoia. A further ESM study found an association between the extent of all ER strategies used and positive symptoms as assessed with a clinical interview at baseline (Visser et al., 2018). These studies point to a potential link between the use of some ER strategies and paranoia in daily life. So far, however, no coherent picture of relevant strategies emerged. Also, one study used ESM to address the question of a moderating role of ER. In a population sample with elevated psychosis proneness, a maladaptive ER moderated the association between a composite score of self-reported stress, negative affect and paranoia (Krkovic et al., 2018a). This study provides a promising starting point to continue this line of investigation with participants with more pronounced, clinical levels of paranoia. The question of interest here is whether being aware of emotions and whether the use of putatively adaptive ER strategies weaken the pathway from negative affect to paranoia, while the use of putatively maladaptive strategies may even amplify this pathway.

1.1. Hypotheses

Therefore, we studied the use of a wide range of ER strategies in the daily life of individuals with psychosis and current delusions using ESM. The selected ER strategies were based on a study by Nittel et al. (2018), who tested the items in a real-world context in a psychosis group and demonstrated associations with negative affect and paranoia (Nittel et al., 2019). The ER strategies included reappraisal, acceptance, suppression, rumination, distraction, and social sharing. Furthermore, we added the ability to be aware of one's emotions as an integral part of ER.

(1) In replication of previous research, we hypothesised that state negative affect at one timepoint (t-1) predicts more pronounced levels of state paranoia at the next timepoint (t).
(2) Further, we hypothesised that the use of putatively maladaptive ER strategies (suppression, rumination) at t-1 predicts increased levels of paranoia at t and the use of putatively adaptive strategies (reappraisal, distraction, acceptance social sharing) and higher awareness of emotions predict less pronounced levels of paranoia at t.
(3) In addition, we hypothesised that ER strategies moderate the path from negative affect (t-1) to paranoia (t) (i.e. putatively maladaptive strategies strengthen and putatively adaptive strategies and higher awareness of emotions weaken the relationship between negative affect and paranoia).

The conceptual model of our hypotheses is depicted in Fig. 1.

2. Method

2.1. Participants

The ESM data used in the present study were consecutively collected within the baseline assessment of a large multi-center trial of an emotion-focused version of cognitive behavioural therapy (CBTd-E, see clinicaltrials.gov, NCT02787135). Ethics approval for the therapy trial was received from the Ethical Committee of the German Psychological Society (DGPs). Data from this ESM study have been analysed as part of a further publication on the effectiveness of ER strategies (Ludwig et al., 2019b), which focusses on the frequency of strategy use and on changes in positive and negative affect following the deployment of ER and does not report findings on paranoia. A list of additional items assessed within ESM but not analysed in this study can be found in the Appendix. For further information on additional measures please see clinicaltrials.gov, NCT02787135.

Participants were recruited via referrals from local psychiatrists, general practitioners and by community mental health units. Participants were screened at the outpatient departments of the faculties of psychology in Hamburg and in Marburg (Germany) between May 2016 and July 2018. Inclusion criteria were: (1) age between 16 and 70 years, (2) a diagnosis of a psychotic disorder (schizophrenia, schizoaffective disorder or delusional disorder), (3) acute and persistent delusions over three months of at least mild degree (≥2) in at least three of the six items on the delusions subscale of the Psychotic Symptoms

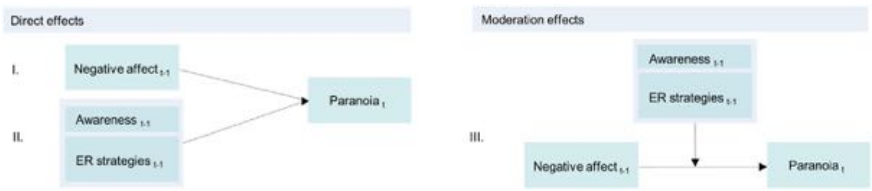

Fig. 1. Graphical depiction of the hypotheses.

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Rating Scale (PSYRATS; (Haddock et al., 1999)), (4) an estimated IQ of at least 85 in the German Mehrfachwahlwortschatztest (MWT-B; (Lehrl, 2005)), (5) either no medication or at least one month of stable medication dosage. Exclusion criteria were (1) present suicidal ideation, (2a) comorbid diagnoses of borderline personality disorder or (2b) an acute substance use disorder within the last three months, (3) use of benzodiazepines during the last month and (4) currently receiving psychological therapy. All participants provided written informed consent.

As reported in Ludwig et al. (2019b), 80 participants were included in the trial, 77 of those agreed to take part in the ESM study from which 71 delivered sufficient (>10%) ESM data. Diagnoses were schizophrenia ($n = 51$), schizoaffective disorder ($n = 16$) and delusional disorder ($n = 4$). Most participants took second-generation antipsychotic medication (71.7%) (first-generation: 6.6%, both: 21.7%, no medication: 14.1%), with a mean chlorpromazine equivalent of $M = 526.9$ mg, $SD = 450.4$. On average, participants were hospitalised on a psychiatric ward 3.6 times ($SD = 4.9$, based on reports of $n = 64$). Socio-demographic and clinical data are summarised in Table 1.

2.2. Clinical interviews

Participants were diagnosed by a clinical psychologist using the Structured Clinical Interview for Mental Disorders (SCID; German version: Wittchen et al., 1997) in an updated version adhering to the Diagnostic and Statistical Manual of Mental Disorders–5th edition (DSM–5: Falkai and Wittchen, 2018). Further, participants were interviewed with a psychosis-specific interview battery consisting of the PSYRATS (Haddock et al., 1999) to assess delusions and hallucinations, the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987) to assess positive, negative, disorganised symptoms of psychosis and general psychopathology and the Calgary Rating Scale for depression in schizophrenia (CDSS; German version: Müller et al., 1999). Social functioning was assessed with the Role Functioning Scale (RFS; German version as used in Lincoln et al., 2012).

Table 1
Socio-demographic and clinical data of individuals with psychosis.

Variable	Psychosis group ($n = 71$)		
	M (*SD*)	Min–Max	*n*
Age (years)	37.80 (12.15)	20–66	71
Age of psychosis onset	23.94 (8.30)	6–49	68
Duration of psychosis (years)	13.46 (9.87)	1–37	69
PSYRATS			
Delusion	15.13 (3.61)	7–22	71
Hallucination	9.69 (12.89)	0–35	71
Total	24.82 (14.41)	7–55	71
PANSS			
Positive score	16.72 (3.92)	9–27	71
Negative score	15.79 (4.85)	9–31	71
General psychopathology	33.82 (6.64)	19–54	71
Total	66.32 (11.41)	42–99	71
RFS	7.46 (1.58)	3–10	71
CDSS	6.10 (3.96)	0–17	71
	%		*n*
Gender male	57.8		71
Education final level[a]			71
High	50.7		
Medium	25.4		
Low	22.5		
None	1.4		
Employment status			69
Unemployed	44.9		
Full-time	11.6		
Part-time	17.4		
Volunteer	14.5		
Retired	2.9		
Student	8.7		

PSYRATS = Psychotic Symptom Rating Scales; PANSS = Positive and Negative Syndrome Scale; RFS = Role Functioning Scale; CDSS = Calgary Depression Rating Scale for Schizophrenia.

[a] Low, Hauptschulabschluss, 9 years; medium, Realschulabschluss, 10 years; high, Abitur (A-level or high school equivalent), 13 years

2.3. ESM assessment

2.3.1. Paranoia

State paranoia was assessed with six items, encompassing the short-version of the Paranoia Checklist comprising three items which have been shown to be sensitive to change: “I need to be on my guard against others”; “Strangers and friends look at me critically”; and “People try to upset me” (Schlier et al., 2016), which we complemented by three further items, previously used in ESM studies, in order to obtain a more reliable assessment of our primary variable of interest: “I feel suspicious.”, “My thoughts are influenced by someone else.”, “I feel others intend to harm me.” (Thewissen et al., 2011). Participants responded on 7-point Likert scales (1 = *not at all*, 7 = *very much*) to which extent these statements applied to them in the moment just before the prompt. Mean scores at each timepoint were calculated. The internal consistency was acceptable ($\alpha = 0.79$) for the within-subject-level and excellent ($\alpha = 0.96$) for the between-subject-level.

2.3.2. Emotions

State negative affect (NA) was assessed with the mean score of seven items (sad, anxious, guilty, irritable, lonely, insecure, nervous; adapted from Drees, 2008). Participants indicated to which extent the respective emotion was experienced at the moment before the prompt on 7-point Likert scales (1 = *not at all*, 7 = *very much*). The internal consistency was acceptable ($\alpha = 0.75$) for the within-subject-level and excellent ($\alpha = 0.91$) for the between-subject-level.

2.3.3. Emotion regulation

Six state ER strategies (acceptance, cognitive reappraisal, distraction, rumination, social sharing, suppression) were assessed with a single item, respectively (e.g. reappraisal: “Just before the prompt, I tried to think differently about the situation in order to feel better.”, see Appendix). We followed pre-established recommendations for ambulatory assessments (Reuschenbach and Funke, 2011, p. 550) and asked about the engagement with ER strategies just before rather than at the moment of the beep in order to capture spontaneous ER (instead of ER prompted by the beep). All of these items were adapted from Nittel et al. (2018, 2019), who modelled them after Brans et al. (2013). For the rumination item, the text comprised ER strategy use (“I ruminated”) and its result (“without reaching a result”) to emphasise the repetitive nature of this thinking style and sufficiently distinguish rumination from other “thinking responses”, such as problem solving or reappraisal, which participants had reported to be difficult in the pre-test phase of the Nittel et al. study. Awareness of emotions was measured with an item adapted from the Emotion-Regulation Skills Questionnaire (Berking and Znoj, 2008). Participants rated their use of each ER strategy and their emotion awareness at the moment prior to the prompt on 7-point Likert scales (1 = *not at all* and 7 = *very much*).

2.4. Procedures

Following inclusion in the study and the completion of a 2.5 h assessment using experimental paradigms as part of the larger study, participants were trained by a research assistant on the use of the electronic mobile assessment device (Android smartphones provided by the study site) programmed with the movisensXS ESM application (Movisens GmbH). ESM items were explained in detail by the research assistant and any questions were resolved. A take-home manual was provided which contained technical information as well as examples of each ER strategy (adapted from Nittel et al., 2018). The 6-day ESM assessment began on the next day after participants had left the

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laboratory. Between 10 am and 10 pm, smartphones beeped at 10 random times a day in approximately 70-min-intervals, with a gap of at least 30 min in between prompts. Participants answered the aforementioned questions concerning NA, state paranoia and ER strategy use at each timepoint. On the third day participants were contacted by a research assistant via phone in order to ascertain the proper functioning of the assessment. Furthermore, participants could contact the research team via phone in case of technical problems. After the assessment period, participants returned the smartphones and received 40€ for the attended experiments and the ESM study plus a bonus of 5€ for completion of at least 70% of the prompts.

2.5. Analyses

First, we set a minimum threshold of 10% of responses to all administered prompts per participant for inclusion in the data analysis. This threshold was chosen in order to reduce the risk of losing representativeness of the sample. However, we were alive to the potential risk of bias that can be introduced by participants choosing when to respond. Thus, we conducted sensitivity analyses and examined the robustness of the findings by applying a 30% and 50% threshold. In order to control for between-person differences in affect and ER, variables were person-mean centered (Nezlek, 2012). For the time-lagged analyses we paired the assessment points (t) with previous assessment points (t-1) within each day. No time-lagged analysis was conducted across missing data points.

We tested whether state NA, deployed ER strategies, and their interaction at t-1 predicted paranoia at t with hierarchical linear mixed-effect models of assessment points (level 1) nested in assessment days (level 2) nested in participants (level 3). Random intercepts and fixed slopes were calculated. One model for the direct effects (Hypotheses I and II) and one model for the moderation effects (Hypothesis III) with all relevant independent variables entered simultaneously were calculated (Hypotheses I and II: NA and ER-strategies, Hypothesis III: NA, ER strategies, and NA × ER strategies). In order to control for autoregressive effects over time and the stability of paranoia, we included timepoint and paranoia at t-1 as control variables in all models. To allow for a comparison of the effect sizes of the associations, standardised beta-scores were calculated for all fixed effects (Lorah, 2018). Analyses were conducted with IBM SPSS Statistics software (version 23) and R (Version 3.4.3).

3. Results

On average, ESM questionnaires were completed for 72% of all prompts (IQR = 36%, Min = 17%, Max = 98%), which is in line with previously reported compliance rates (Silvia et al., 2013). Overall, there was considerable variation in paranoia scores and ER strategy scores both within and between subjects. Information on the individual completion rates per participant, the distribution of paranoia scores and the application of ER strategies is presented in the Appendix.

Hypothesis I. Negative affect as a predictor of subsequent paranoia. NA at one timepoint (t-1) was a significant predictor of paranoia at the next timepoint (t), $b = 0.076$, $SE = 0.024$, $p < .001$, 95% CI [0.029, 0.122] (Table 2).

Hypothesis II. ER strategies as predictors of subsequent paranoia. As can be seen in Table 2, none of the ER strategies (t-1) were significant predictors of paranoia at t.

Hypothesis III. ER strategies as moderators of the pathway from negative affect to paranoia. Awareness of emotions at t-1 moderated the path from NA (t-1) to paranoia (t). The negative unstandardised estimate indicated that the more participants were aware of their emotions at t-1 the less strong was the link between NA at t-1 and paranoia at t. By contrast, rumination showed a reverse pattern: more rumination at t-1 amplified the pathway from NA at t-1 to paranoia at t (see Table 2). The standardised beta-scores point to a slightly stronger moderation effect of rumination than of awareness. No other ER strategies significantly moderated the link between NA and paranoia.

3.1. Post-hoc analyses

Non-completers (those who declined to take part as well as those who did not respond to a sufficient number of prompts) did not significantly differ from the included sample in regard to age, gender and education level. Non-completers ($M = 13.89$, $SE = 3.59$) did also not differ from completers ($M = 15.13$, $SE = 3.61$) on the delusion score in the PSYRATS, $t(78) = -0.97$, $p = .335$ (see Appendix). Applying a 30% and 50% threshold as inclusion criteria revealed no diverging results for Hypotheses I and III. However, a direct effect (Hypothesis II) was found for rumination at t-1 as a significant predictor of paranoia at t for both the 30% and the 50% threshold.

Table 2
Negative affect (t-1) and emotion regulation strategies (t-1) as predictors of paranoia (t) controlled for timepoint and paranoia (t-1), using bootstrapping.

	b	*SE*	*p*	95% CI	Standardised *β*
Timepoint	−0.004	0.001	<**0.001**	−0.006; −0.002	−0.047
Paranoia (t-1)	0.202	0.024	<**0.001**	0.155; 0.251	0.086
Negative affect	0.076	0.024	**0.001**	0.029; 0.122	0.035
Acceptance	−0.013	0.011	0.212	−0.034; 0.008	−0.011
Awareness	−0.016	0.011	0.156	−0.038; 0.006	−0.013
Reappraisal	−0.018	0.011	0.098	−0.039; 0.003	−0.015
Distraction	0.001	0.008	0.940	−0.015; 0.016	0.001
Rumination	−0.020	0.011	0.073	−0.043, 0.001	−0.018
Suppression	−0.016	0.012	0.169	−0.040; 0.007	−0.013
Social sharing	0.010	0.011	0.362	−0.012; 0.032	0.008
Acceptance × negative affect	−0.001	0.013	0.968	−0.026; 0.026	0.000
Awareness × negative affect	−0.030	0.013	**0.020**	−0.055; −0.004	−0.023
Reappraisal × negative affect	0.004	0.012	0.709	−0.020; 0.028	0.004
Distraction × negative affect	0.008	0.010	0.401	−0.011; 0.028	0.008
Rumination × negative affect	0.032	0.011	**0.004**	0.010; 0.054	0.030
Suppression × negative affect	0.000	0.011	0.985	−0.023; 0.023	0.000
Social sharing × negative affect	0.009	0.014	0.503	−0.018; 0.036	0.006

Note. Interpretation of moderation effects. Negative unstandardised estimate: the deployment of a respective emotion regulation strategy weakened the path from negative affect at one timepoint to paranoia at the next. Positive unstandardised estimate: the deployment of a respective emotion regulation strategy strengthened the path from negative affect at one timepoint to paranoia at the next.
Bold values indicates statistically significance at $p < 0.05$.

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4. Discussion

Building on the evidence of an affective pathway to paranoia and a putatively maladaptive pattern of ER-strategies in psychosis, we tested whether the way in which individuals with delusions regulate their emotions in daily life impacts on the link from negative affect to paranoia. We were able to replicate the affective pathway as such by finding a stable time-lagged effect from negative affect to paranoia. Regarding ER, we found that higher levels of emotion awareness weakened the impact of negative affect on paranoia, whereas rumination amplified it.

These findings support the notion of ER as a moderator rather than a direct predictor. Thus, a person's momentary choice of an ER strategy for regulating negative affect determines whether this affect transforms into paranoia or not. These findings are in line with the results from Visser et al. (2018). They found the extent of ER strategies used in daily life to explain 25% of the variance in baseline levels of positive symptoms. When intensity of negative affect was added, the accounted variance increased to 37%, which possibly implies that ER strategies unfold their impact on paranoia through the interplay with negative emotions.

4.1. Awareness as a moderator of the affective pathway to psychosis

More specifically, our findings indicate that emotion awareness constitutes a resilience factor that prevents the emergence of paranoia due to negative emotional states. This further corroborates the view that the ability to be aware of emotions is a crucial prerequisite of ER (Van Rijn et al., 2011) and the bedrock for the successful application of further skills to modify emotions (Berking and Whitley, 2014). Interestingly, the fact that awareness of emotions appears to play a significant role in the translation of negative affect to paranoia corresponds with previous research, which widely suggested that people with psychosis have difficulties in emotion awareness. Building on Berking's model, our own group has found participants with psychosis to report reduced skills related to awareness and understanding emotions, but not in the ability to modify them (Lincoln et al., 2015b). Moreover, emotion awareness is a relevant part of the considerably broader, multidimensional construct alexithymia that has been found to be closely linked to psychosis (see review: O'Driscoll et al., 2014). Alexithymia encompasses cognitive-affective disturbances in identifying and describing emotions next to difficulties in distinguishing feelings from the sensations of emotional arousal (Taylor et al., 1991). Studies on related constructs such as emotional intelligence (Barrett and Gross, 2001), which encompasses emotion processing and includes the ability to identify emotions, also found marked difficulties in people with psychosis (Kee et al., 2009). Finally, a study using the concept of emotional granularity, which captures the degree of precision in differentiating between emotional states, showed that patients with psychosis were less able to differentiate emotions (Kimhy et al., 2014). The ability to identify and describe emotions was also found to be correlated with social functioning in patients with psychosis (Kimhy et al., 2012) and to explain 23% of the variance in social functioning in a high risk sample (Kimhy et al., 2016). Hence, supporting patients with psychosis in emotion awareness might not only ameliorate symptoms of paranoia but also improve social functioning, which may result in a positive self-perpetuating cycle.

Given the links between related constructs of awareness and psychosis, the question arises how awareness might unfold its protective impact on the affective pathway. A beneficial aspect of awareness has been described by Damasio (1994), suggesting that awareness enables emotional information to be processed and integrated into cognitive processes. In other words, awareness might depict an integral metacognitive component, embedding emotional information into their context, and thus allowing for flexibility, distance towards feelings, and adaptive processing. Therefore, awareness might enable a better integration of emotional information into reasoning processes, allowing the person to take a step back in order to purposefully engage into proactive problem-solving or acceptance where little can be done.

4.2. Rumination as a moderator of the affective pathway to psychosis

In contrast to awareness, rumination strengthened the affective pathway to paranoia. Thus, our data suggest that if in response to negative affect a person engages in rumination, "(…) trapped in a vortex of endless questions (…)" (Luca, 2019, p. 1), the subsequent emergence of a paranoid state of mind becomes more likely. Rumination can be described as a process to "escape from aversive self-focus by suppressing negative feelings and thoughts cognitively or by engaging in behaviors to avoid self-awareness." (Nolen-Hoeksema et al., 2008, p. 410). It seems likely that this form of maladaptive repetitive thinking is not a specific risk factor for psychosis, but a general risk factor that enhances habitual thought patterns. For people with psychosis, delusional interpretations may be the predominant habitual thought pattern. Also, rumination – if it focuses on self-devaluation – may lead on to increasingly unbearable negative affect (e.g. strong anxiety) that makes beliefs congruent with the emotion more likely (e.g. threat beliefs (Freeman et al., 2001)). Alternatively, it is conceivable that the avoidance of self-awareness that is stressed in the definition of rumination by Nolen-Hoeksema et al. (2008) might be a function of otherwise unbearable affect or its explanations. It is possible that if people with high levels of arousal fail to identify their emotions (such as anxiety, sadness, or anger), the lack of relevant contextual information may make it more difficult to interpret the situation correctly and increase the risk of attributing it to external causes. This notion might be related to studies applying the misattribution of arousal paradigm, in which initial arousal is attributed to another plausible cause (Cotton, 1981). Possibly, awareness and rumination represent two sides of the same coin, which seems to be reflected in the diametrically opposed moderator effects in our data. The practical implication for this could be the following: what a person seems to avoid through rumination, is reached in a state of awareness.

4.3. Clinical implications

So far, adaptations of acceptance- and mindfulness-based interventions for psychosis constitute approaches that directly address these processes. By promoting the awareness of inner-experiences (e.g. emotions and symptoms) these interventions aim to ease distress and achieve control (Chadwick, 2014). Further, a randomised-controlled treatment trial targeting negative perseverative thinking styles in a psychosis sample yielded promising results in terms of a reduction in the perseverative thinking style itself and the persecutory delusions (Freeman et al., 2015a). Building on these promising developments, our findings suggest that a worthwhile endeavour seems to address both awareness and rumination as valuable treatment targets in a psychological intervention. In such an approach, awareness as a key prerequisite could become the focus of the treatment, with interventions aimed at fostering the ability to describe and label emotions (Kashdan et al., 2015), for example by using visual demonstrations of feelings, such as a 'feeling wheel', as is often provided within psychoeducation on emotions or by encouraging patients to describe physical perceptions of their current states. Indeed, a range of beneficial effects are associated with affect labeling (for a review see Torre and Lieberman, 2018). For example, in a sample of patients with a specific phobia, Kircanski et al. (2012) found that labeling emotions during exposure helped to reduce experienced fear in the moment and to reduce the physiological indicator of emotional arousal one week later. Beyond the pure awareness of emotions, it further appears beneficial to support patients to perceive emotions as indicators of core goals and needs, which is promoted in emotion-focused therapy (Greenberg, 2011, p. 80).

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4.4. Discussion of non-significant remaining ER strategies

Lastly, it is important to understand why the remaining ER strategies (reappraisal, social sharing, acceptance, suppression and distraction) did not moderate the affective pathway to paranoia. This is surprising given the well-established link between the self-reported habitual use of reappraisal or suppression and psychopathology across a variety of disorders (Aldao et al., 2010) and in psychosis (Ludwig et al., 2019a). It is easy to envision that trait measures of ER are formed by control beliefs (De Castella et al., 2013) and self-efficacy (Gunzenhauser et al., 2013). Moving into the context of patients' daily lives provides a different perspective on strategy use. For one, contextual factors might influence the impact of the various strategies (Aldao et al., 2015). Also, it might be necessary to take polyregulation (i.e. the use of multiple ER strategies at the same time; Ford et al., 2019) into account. In that sense, it is conceivable that studying the sequential use of ER strategies could help us to arrive at a more nuanced understanding of whether a particular sequence is more or less likely to increase the symptomatic response to negative affect.

4.5. Limitations

Our results should be interpreted in the light of several limitations. First, the participants in this study might represent a particularly motivated group as they were recruited as part of a therapy trial with a focus on emotions. They may have higher self-awareness than a randomly selected sample or even better ER abilities than other patients. Second, the assessment was restricted to consciously accessible strategies. Arguably, ER not only encompasses explicit strategies but also results from implicit mechanisms (Koole and Rothermund, 2011). Third, the various ER strategies were assessed with one item. So far, this has been common practice in ESM studies on ER (e.g. Visser et al., 2018) in order to minimise the total assessment time per trial. This could have resulted in a less valid assessment of ER. In a different publication on the same sample we showed that most of the ER strategies were indeed linked to affect in daily life and also to some extent to well-validated habitual questionnaires, suggesting some validity of the measures (Ludwig et al., 2019b, submitted). However, further research on the most valid and reliable way to assess ER in ESM designs would be helpful to further pursuing the issues of interest here. Furthermore, although we followed recommendations for ambulatory assessments by asking about the engagement with ER just before rather than at the beep (Reuschenbach and Funke, 2011, p. 550), we cannot rule out that we introduced a recall bias. Also, one item (rumination) included not only the strategy itself but also its result, in order to distinguish it from other thinking styles. Possibly, this item additionally assessed success. Thus, future studies would benefit from further developing items which carefully differentiate between application and success of the respective strategy. Forth, it can be argued that the self-report approach to emotion awareness appears paradoxical, so further studies need to test the validity of self-reported emotion awareness. However, on a trait-level Lischetzke and Eid (2003) suggested that a self-report of awareness is possible. Fifth, although our items asked for the moment just before the prompt, we cannot rule out that the assessment of negative affect increased the awareness of the emotions. Lastly, as the time-lagged data at hand are still correlative in nature, it is not possible to draw a causal inference.

4.6. Conclusion

To conclude, this study shows that emotion awareness and rumination levels modulate the time-lagged association between negative affect and paranoid beliefs. Thus, future studies should investigate the causal effect of these momentary ER strategies on the affective pathway. Once the causal relationship is established, a promising avenue for future research is to continue investigating rumination and to add awareness as potential treatment targets. This could include fostering the combined ability to stop and notice present emotions and to disengage from the thought processes which maintain them.

Contributors

LL, TL and SM contributed to the study conception and design. LL and KK did the data preparation. LL, KK and BS undertook the statistical analyses. LL wrote the first draft of the manuscript. All authors critically revised the manuscript for important intellectual content, and contributed and approved the final draft.

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Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.schres.2019.12.007.

References

Aldao, A., Nolen-Hoeksema, S., 2012. The influence of context on the implementation of adaptive emotion regulation strategies. Behav. Res. Ther. 50, 493–501. https://doi.org/10.1016/j.brat.2012.04.004.

Aldao, A., Nolen-Hoeksema, S., Schweizer, S., 2010. Emotion-regulation strategies across psychopathology: a meta-analytic review. Clin. Psychol. Rev. 30, 217–237. https://doi.org/10.1016/j.cpr.2009.11.004.

Aldao, A., Sheppes, G., Gross, J.J., 2015. Emotion regulation flexibility. Cognit. Ther. Res. 39, 263–278. https://doi.org/10.1007/s10608-014-9662-4.

Barrett, L.F., Gross, J.J., 2001. Emotional intelligence: a process model of emotion representation and regulation. Emotions: Currrent Issues and Future Directions., Emotions and Social Behavior. Guilford Press, New York, NY, US, pp. 286–310.

Berking, M., Whitley, B., 2014. The adaptive coping with emotions model (ACE model). Affect Regulation Training. Springer New York, New York, NY, pp. 19–29. https://doi.org/10.1007/978-1-4939-1022-9_3.

Berking, M., Znoj, H., 2008. Entwicklung und Validierung eines Fragebogens zur standardisierten Selbsteinschätzung emotionaler Kompetenzen (SEK-27). 56, 141–153. https://doi.org/10.1024/1661-4747.56.2.141.

Berking, M., Wupperman, P., Reichardt, A., Pejic, T., Dippel, A., Znoj, H., 2008. Emotion-regulation skills as a treatment target in psychotherapy. Behav. Res. Ther. 46, 1230–1237. https://doi.org/10.1016/j.brat.2008.08.005.

Brans, K., Koval, P., Verduyn, P., Lim, Y.L., Kuppens, P., 2013. The regulation of negative and positive affect in daily life. Emotion June. https://doi.org/10.1037/a0032400.

Chadwick, P., 2014. Mindfulness for psychosis. Br. J. Psychiatry 204, 333–334. https://doi.org/10.1192/bjp.bp.113.136044.

Cotton, J.L., 1981. A review of research on Schachter's theory of emotion and the misattribution of arousal. Eur. J. Soc. Psychol. 11, 365–397. https://doi.org/10.1002/ejsp.2420110403.

Damasio, A.R., 1994. Descartes' Error: Emotion, Reason and the Human Brain (n.d.).

De Castella, K., Goldin, P., Jazaieri, H., Ziv, M., Dweck, C.S., Gross, J.J., 2013. Beliefs about emotion: links to emotion regulation, well-being, and psychological distress. Basic Appl. Soc. Psych. 35, 497–505. https://doi.org/10.1080/01973533.2013.840632.

Drees, J., 2008. Associating Daily Life Stress with the Intensity of Psychotic Symptoms in the Prodromal Phase of Schizophrenia.

Edwards, C.J., Cella, M., Tarrier, N., Wykes, T., 2016. The optimisation of experience sampling protocols in people with schizophrenia. Psychiatry Res. 244, 289–293. https://doi.org/10.1016/j.psychres.2016.07.048.

Falkai, P., Wittchen, H.-U., 2018. Diagnostisches und Statistisches Manual Psychischer Störungen DSM-5. American Psychiatric Association Hogrefe-Verlag.

Ford, B.Q., Gross, J.J., Gruber, J., 2019. Broadening our field of view: the role of emotion polyregulation. Emot. Rev. 11, 197–208. https://doi.org/10.1177/1754073919850314.

Fowler, D., Hodgekins, J., Garety, P., Freeman, D., Kuipers, E., Dunn, G., Smith, B., Bebbington, P.E., 2012. Negative cognition, depressed mood, and paranoia: a longitudinal pathway analysis using structural equation modeling. Schizophr. Bull. 38, 1063–1073. https://doi.org/10.1093/schbul/sbr019.

Freeman, D., Garety, P. a, Kuipers, E., 2001. Persecutory delusions: developing the understanding of belief maintenance and emotional distress. Psychol. Med. 31, 1293–1306. https://doi.org/10.1017/S003329170100455X.

Freeman, D., Garety, P.A., Kuipers, E., Fowler, D., Bebbington, P.E., 2002. A cognitive model of persecutory delusions. Br. J. Clin. Psychol. 41, 331–347. https://doi.org/10.1348/014466502760387461.

Freeman, D., Dunn, G., Startup, H., Pugh, K., Cordwell, J., Mander, H., Černis, E., Wingham, G., Shirvell, K., Kingdon, D., 2015a. Effects of cognitive behaviour therapy for worry on persecutory delusions in patients with psychosis (WIT): a parallel, single-blind, randomised controlled trial with a mediation analysis. Lancet Psychiatry 2, 305–313. https://doi.org/10.1016/S2215-0366(15)00039-5.

Freeman, D., Emsley, R., Dunn, G., Fowler, D., Bebbington, P., Kuipers, E., Jolley, S., Waller, H., Hardy, A., Garety, P., 2015b. The stress of the street for patients with persecutory delusions: a test of the symptomatic and psychological effects of going outside into a busy urban area. Schizophr. Bull. 41, 971–979. https://doi.org/10.1093/schbul/sbu173.

Greenberg, L.S., 2011. Emotionsfokussierte Therapie. Reinhardt, München.

Gunzenhauser, C., Heikamp, T., Gerbino, M., Alessandri, G., Van Suchodoletz, A., Di Giunta, L., Caprara, G.V., Trommsdorff, G., 2013. Self-efficacy in regulating positive and negative emotions: a validation study in Germany. Eur. J. Psychol. Assess. 29, 197–204. https://doi.org/10.1027/1015-5759/a000151.

Haddock, G., McCarron, J., Tarrier, N., Faragher, E.B., 1999. Scales to measure dimensions of hallucinations and delusions: the psychotic symptom rating scales (PSYRATS). Psychol. Med. 29, 879–889. https://doi.org/10.1017/S0033291799008661.

Hartley, S., Haddock, G., Sa, D.V., Emsley, R., Barrowclough, C., 2014. An Experience Sampling Study of Worry and Rumination in Psychosis. , pp. 1605–1614. https://doi.org/10.1017/S0033291713002080.

Hofmann, S.G., 2016. Emotion in Therapy: From Science to Practice., Emotion in Therapy: From Science to Practice. Guilford Press, New York, NY, US.

Kashdan, T.B., Barrett, L.F., McKnight, P.E., 2015. Unpacking emotion differentiation. Curr. Dir. Psychol. Sci. 24, 10–16. https://doi.org/10.1177/0963721414550708.

Kay, S.R., Fiszbein, A., Opler, L.A., 1987. The positive and negative syndrome scale (PANSS) for schizophrenia. Schizophr. Bull. 13, 261–276.

Kee, K.S., Horan, W.P., Salovey, P., Kern, R.S., Sergi, M.J., Fiske, A.P., Lee, J., Subotnik, K.L., Nuechterlein, K., Sugar, C.A., Green, M.F., 2009. Emotional intelligence in schizophrenia. Schizophr. Res. 107, 61–68. https://doi.org/10.1016/j.schres.2008.08.016.

Kimhy, D., Vakhrusheva, J., Jobson-ahmed, L., Tarrier, N., Malaspina, D., Gross, J.J., 2012. Emotion awareness and regulation in individuals with schizophrenia: implications for social functioning. Psychiatry Res. 200, 193–201. https://doi.org/10.1016/j.psychres.2012.05.029.

Kimhy, D., Vakhrusheva, J., Khan, S., Chang, R.W., Hansen, M.C., Ballon, J.S., Malaspina, D., Gross, J.J., 2014. Emotional granularity and social functioning in individuals with schizophrenia: an experience sampling study. J. Psychiatr. Res. 53, 141–148. https://doi.org/10.1016/j.jpsychires.2014.01.020.

Kimhy, D., Gill, K.E., Brucato, G., Vakhrusheva, J., Arndt, L., Gross, J.J., Girgis, R.R., 2016. The impact of emotion awareness and regulation on social functioning in individuals at clinical high risk for psychosis. Psychol. Med. 46, 2907–2918. https://doi.org/10.1017/S0033291716000490.

Kircanski, K., Lieberman, M.D., Craske, M.G., 2012. Feelings into words: contributions of language to exposure therapy. Psychol. Sci. 23, 1086–1091. https://doi.org/10.1177/0956797612443830.

Koole, S.L., Rothermund, K., 2011. "I feel better but I don't know why": the psychology of implicit emotion regulation. Cogn. Emot. 25, 389–399. https://doi.org/10.1080/02699931.2010.550505.

Kramer, I., Simons, C.J.P., Wigman, J.T.W., Collip, D., Jacobs, N., Derom, C., Thiery, E., Van Os, J., Myin-Germeys, I., Wichers, M., 2014. Time-lagged moment-to-moment interplay between negative affect and paranoia: new insights in the affective pathway to psychosis. Schizophr. Bull. 40, 278–286. https://doi.org/10.1093/schbul/sbs194.

Krkovic, K., Krink, S., Lincoln, T.M., 2018a. Emotion regulation as a moderator of the interplay between self-reported and physiological stress and paranoia. Eur. Psychiatry 49, 43–49. https://doi.org/10.1016/j.eurpsy.2017.12.002.

Krkovic, K., Schlier, B., Lincoln, T., 2018b. An experience sampling study on the nature of the interaction between traumatic experiences, negative affect in everyday life, and threat beliefs. Schizophr. Res. 201, 381–387. https://doi.org/10.1016/j.schres.2018.05.030.

Lehrl, S., 2005. MWT-B - Mehrfachwahl-Wortschatz-Intelligenztest. 5th edition. Hogrefe, Göttingen.

Lincoln, T.M., Peter, N., Schäfer, M., Moritz, S., 2009. Impact of stress on paranoia: an experimental investigation of moderators and mediators. Psychol. Med. 39, 1129–1139. https://doi.org/10.1017/S0033291708004613.

Lincoln, T.M., Ziegler, M., Mehl, S., Kesting, M.-L., Lüllmann, E., Westermann, S., Rief, W., 2012. Moving from efficacy to effectiveness in cognitive behavioral therapy for psychosis: a randomized clinical practice trial. J. Consult. Clin. Psychol. 80, 674–686. https://doi.org/10.1037/a0028665.

Lincoln, Tania M., Hartmann, M., Köther, U., Moritz, S., 2015a. Dealing with feeling: specific emotion regulation skills predict responses to stress in psychosis. Psychiatry Res. 228, 216–222. https://doi.org/10.1016/j.psychres.2015.04.003.

Lincoln, Tania M., Hartmann, M., Köther, U., Moritz, S., 2015b. Do people with psychosis have specific difficulties regulating emotions? Clin. Psychol. Psychother. 22, 637–646. https://doi.org/10.1002/cpp.1923.

Lincoln, T.M., Sundag, J., Schlier, B., Karow, A., 2017. The relevance of emotion regulation in explaining why social exclusion triggers paranoia in individuals at clinical high risk of psychosis. Schizophr. Bull., 1–11 https://doi.org/10.1093/schbul/sbx135.

Lischetzke, T., Eid, M., 2003. Is attention to feelings beneficial or detrimental to affective well-being? Mood regulation as a moderator variable. Emotion 3, 361–377. https://doi.org/10.1037/1528-3542.3.4.361.

Lorah, J., 2018. Effect size measures for multilevel models: definition, interpretation, and TIMSS example. Large-Scale Assessments Educ 6. https://doi.org/10.1186/s40536-018-0061-2.

Luca, M., 2019. Maladaptive rumination as a transdiagnostic mediator of vulnerability and outcome in psychopathology. J. Clin. Med. 8, 314. https://doi.org/10.3390/jcm8030314.

Ludwig, L., Werner, D., Lincoln, T.M., 2019a. The relevance of cognitive emotion regulation to psychotic symptoms – a systematic review and meta-analysis. Clin. Psychol. Rev., 101746 https://doi.org/10.1016/J.CPR.2019.101746.

Ludwig, L., Mehl, S., Krkovic, K., Lincoln, L., 2019b. Effectiveness of Emotion Regulation in Daily Life in Individuals With Psychosis and Non-clinical Controls - An Experience Sampling Study (Manuscript submitted for publication).

Martinelli, C., Cavanagh, K., Dudley, R.E.J., 2013. The impact of rumination on state paranoid ideation in a nonclinical sample. Behav. Ther. 44, 385–394. https://doi.org/10.1016/j.beth.2013.02.002.

McKie, A., Askew, K., Dudley, R., 2017. An experimental investigation into the role of ruminative and mindful self-focus in non-clinical paranoia. J. Behav. Ther. Exp. Psychiatry 54, 170–177. https://doi.org/10.1016/j.jbtep.2016.07.014.

Müller, M.J., Marx-Dannigkeit, P., Schlösser, R., Wetzel, H., Addington, D., Benkert, O., 1999. The Calgary depression rating scale for schizophrenia: development and interrater reliability of a German version (CDSS-G). J. Psychiatr. Res. 33, 433–443. https://doi.org/10.1016/S0022-3956(99)00018-7.

Myin-Germeys, I., Kasanova, Z., Vaessen, T., Vachon, H., Kirtley, O., Viechtbauer, W., Reininghaus, U., 2018. Experience sampling methodology in mental health research: new insights and technical developments. World Psychiatry 17, 123–132. https://doi.org/10.1002/wps.20513.

Nezlek, J.B., 2012. Multilevel modeling analyses of diary-style data. In: Mehl, M.R., Conner, T.S. (Eds.), Handbook of Research Methods for Studying Daily Life, pp. 357–383 New York.

Nittel, C.M., Lincoln, T.M., Lamster, F., Leube, D., Rief, W., Kircher, T., Mehl, S., 2018. Expressive suppression is associated with state paranoia in psychosis: an experience sampling study on the association between adaptive and maladaptive emotion regulation strategies and paranoia. Br. J. Clin. Psychol. https://doi.org/10.1111/bjc.12174.

Nittel, C.M., Lamster, F., Rief, W., Kircher, T., Soll, D., Mehl, S., 2019. Emotional instability and expressive suppression are related to paranoia in daily life: an electronic mobile assessment study in nonclinical individuals. J. Exp. Psychopathol. 10, 204380871986811. https://doi.org/10.1177/2043808719868119.

Nolen-Hoeksema, S., Wisco, B.E., Lyubomirsky, S., 2008. Rethinking rumination. Perspect. Psychol. Sci. 3, 400–424. https://doi.org/10.1111/j.1745-6924.2008.00088.x.

O'Driscoll, C., Laing, J., Mason, O., 2014. Cognitive emotion regulation strategies, alexithymia and dissociation in schizophrenia, a review and meta-analysis. Clin. Psychol. Rev. 34, 482–495. https://doi.org/10.1016/j.cpr.2014.07.002.

Oliver, J.E., O'Connor, J.A., Jose, P.E., McLachlan, K., Peters, E., 2012. The impact of negative schemas, mood and psychological flexibility on delusional ideation–mediating and moderating effects. Psychosis 4, 6–18.

Opoka, S.M., Ludwig, L., Lincoln, T.M., 2018. A systematic review of trials targeting depression and anxiety in patients with delusions. Z. Psychol. 226, 142–151.

Preti, A., Cella, M., 2010. Paranoid thinking as a heuristic. Early Interv. Psychiatry 4, 263–266. https://doi.org/10.1111/j.1751-7893.2010.00190.x.

Reuschenbach, B., Funke, J., 2011. Themenbereich B: Methodologie und Methoden/Psychologische Diagnostik/Leistungs-, Intelligenz- und Verhaltensdiagnostik. In: Hornke, L.F., Amelang, M., Kersting, M., Birbaumer, N., Frey, D., Kuhl, J., Schneider, W., Schwarzer, R. (Eds.), Enzyklopädie Der Psychologie: Themenbereich B, Methodologie Und Methoden: Serie 2. Psychologische Diagnostik, Hogrefe Verlag.

Schlier, B., Moritz, S., Lincoln, T.M., 2016. Measuring fluctuations in paranoia: validity and psychometric properties of brief state versions of the Paranoia Checklist. Psychiatry Res. 241, 323–332. https://doi.org/10.1016/j.psychres.2016.05.002.

Silvia, P.J., Kwapil, T.R., Eddington, K.M., Brown, L.H., 2013. Missed beeps and missing data: dispositional and situational predictors of nonresponse in experience sampling research. Soc. Sci. Comput. Rev. 31, 471–481. https://doi.org/10.1177/0894439313479902.

Taylor, G.J., Michael Bagby, R., Parker, J.D.A., 1991. The alexithymia construct: a potential paradigm for psychosomatic medicine. Psychosomatics 32, 153–164. https://doi.org/10.1016/S0033-3182(91)72086-0.

Thewissen, V., Bentall, R.P., Lecomte, T., van Os, J., Myin-Germeys, I., 2008. Fluctuations in self-esteem and paranoia in the context of daily life. J. Abnorm. Psychol. 117, 143–153. https://doi.org/10.1037/0021-843X.117.1.143.

Thewissen, V., Bentall, R.P., Oorschot, M., à Campo, J., van Lierop, T., van Os, J., Myin-Germeys, I., 2011. Emotions, self-esteem, and paranoid episodes: an experience sampling study. Br. J. Clin. Psychol 50, 178–195. https://doi.org/10.1348/014466510X508677.

Thompson, R.A., 1994. Emotion regulation: a theme in search of definition. Monogr. Soc. Res. Child Dev. 59, 25–52.

Torre, J.B., Lieberman, M.D., 2018. Putting feelings into words: affect labeling as implicit emotion regulation. Emot. Rev. 10, 116–124. https://doi.org/10.1177/1754073917742706.

Van Rijn, S., Schothorst, P., Wout, M.V., Sprong, M., Ziermans, T., van Engeland, H., Aleman, A., Swaab, H., 2011. Affective dysfunctions in adolescents at risk for psychosis: emotion awareness and social functioning. Psychiatry Res. 187, 100–105. https://doi.org/10.1016/j.psychres.2010.10.007.

Visser, K.F., Esfahlani, F.Z., Sayama, H., Strauss, G.P., 2018. An ecological momentary assessment evaluation of emotion regulation abnormalities in schizophrenia. Psychol. Med., 1–9 https://doi.org/10.1017/S0033291717003865.

Wittchen, H.U., Wunderlich, U., Gruschwitz, S., Zaudig, M., 1997. Strukturiertes Klinische Interview fuer DSM-IV. Hogrefe, Göttingen.

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Supplementary Data – Studie III

A.

Overview of all constructs assessed in the ESM study.

Experience Sampling Methodology	Construct being assessed	Items
	Sleep quality	"How satisfied are you with your sleep?", "How deeply did you sleep?", "How restful was your sleep?"
	Positive affect	Satisfied, happy, relaxed, proud
	Negative affect	Anxious, sad, irritable, lonely, insecure, nervous
	Emotion regulation	Awareness, acceptance, cognitive reappraisal, seeking support, suppression, rumination, distraction
	Paranoia	Brief 3-item version of Paranoia Checklist (Schlier et al., 2016) + "I feel suspicious.", "My thoughts are influenced by someone else.", "I feel others intend to harm me." (Thewissen et al., 2011)
	Context	"I am alone." Yes/no
	Self-acceptance	"I like myself at the moment.", "I doubt myself at the moment.", "I accept myself the way I am at the moment.", "I am ashamed of myself at the moment." (Thewissen et al., 2011)

B.

Overview of ESM items to assess emotion regulation

"Just before the beep..."
Rumination = "I ruminated without reaching a result"
Suppression = "I have tried to hide my feelings from others"
Cognitive Reappraisal = "I tried to think differently about the situation in order to feel better"
Distraction = "I have distracted myself from my feelings (through chatting, reading, listening to music, watching TV, etc.)"
Social sharing = "I have told others (acquaintances, friends, family), how I am feeling"
Acceptance = "I told myself it is all right how I am feeling."
Awareness = "I was aware of my feelings."

C.

Completers vs. Non-Completers

Variable	Completers (*n* = 71)	Non-Completers (n = 9)	
	M (*SD*)	*M* (*SD*)	*Statistic*
Age (years)	37.80 (12.15)	35.33 (13.01)	t(78)=-0.570, p=.570
PSYRATS – Delusion	15.13 (3.61)	13.89 (3.59)	t(78)=-0.97, p=.335
	%	%	
Gender male	59.2	66.6	$\chi^2(1)$= 0.665
Education final level°			
High	54.9	33.3	$\chi^2(3)$= 2.186, p=.535
Medium	25.4	22.2	
Low	22.5	44.0	
None	1.4	0	

Note: PSYRATS, Psychotic Symptoms Rating Scale; Non-Completers (=including those who declined to take part as well as those who did not respond to a sufficient number of prompts)
° Low, Hauptschulabschluss; medium, Realschulabschluss; high, Abitur (A-level or high school equivalent)

D.

Figure 1. Completion rates in ESM assessments per participant (100% ≙ 60 questionnaires over 6 days).

E.

Figure S1. Frequency of paranoia scores in ambulatory assessment

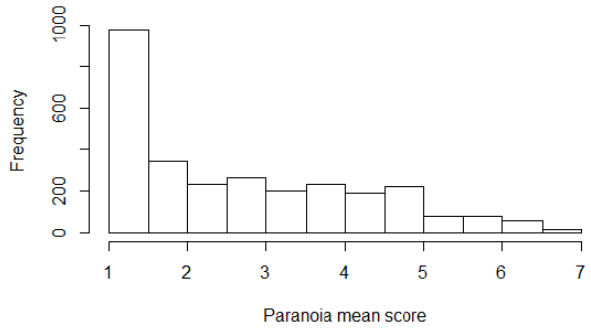


Figure S2. Distribution of paranoia scores by participant

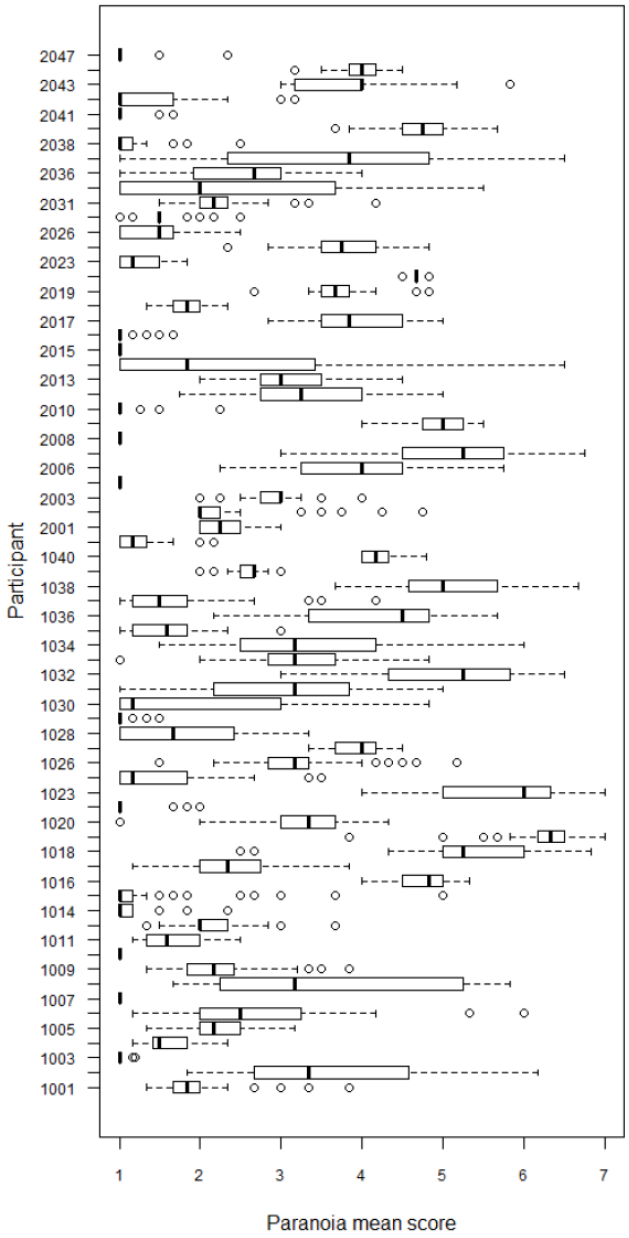


Figure S3. Frequency of awareness scores in ambulatory assessment

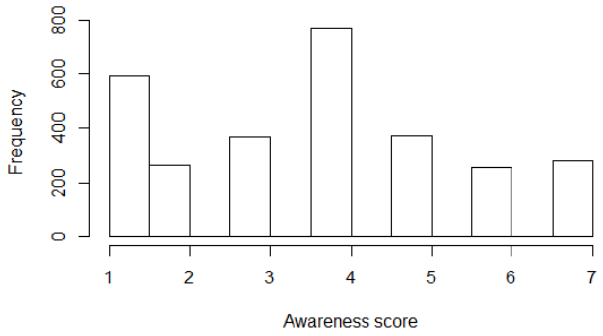


Figure S4. Distribution of awareness scores by participant

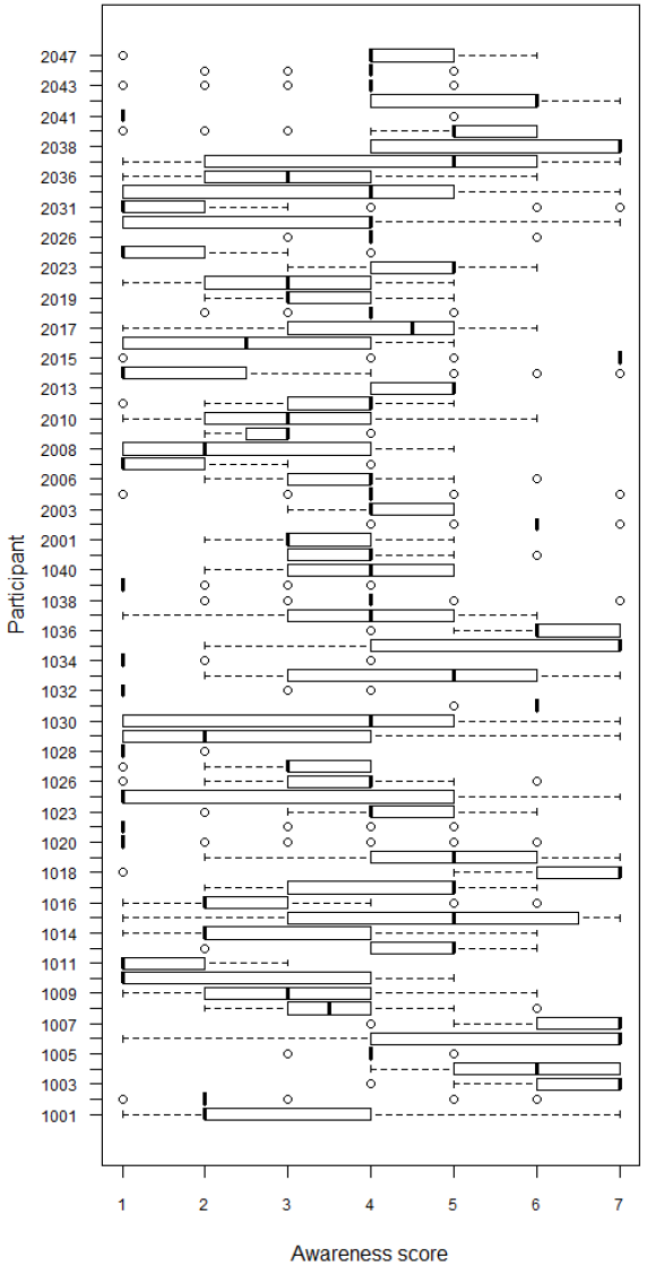


Figure S5. Frequency of reappraisal scores in ambulatory assessment

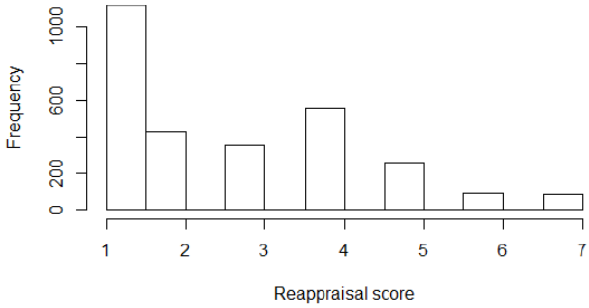


Figure S6. Distribution of reappraisal scores by participant

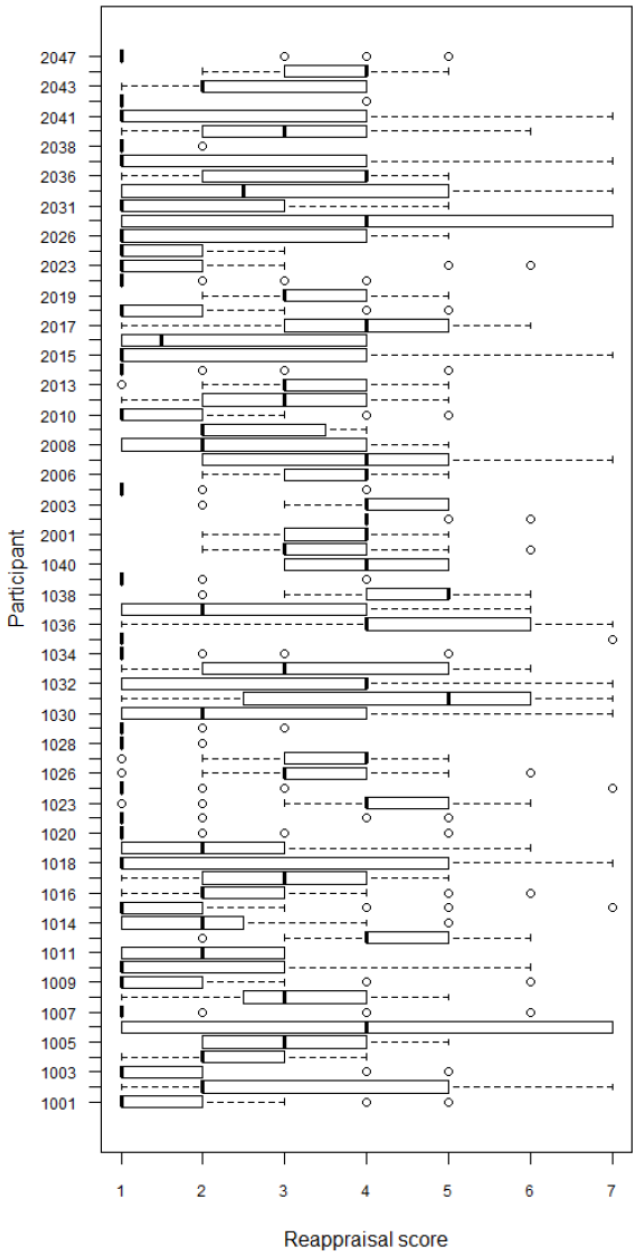


Figure S7. Frequency of rumination scores in ambulatory assessment

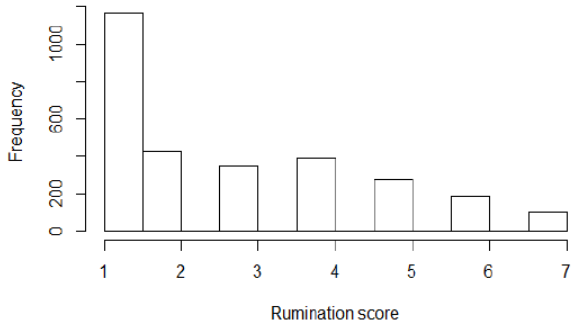


Figure S8. Distribution of rumination scores by participant

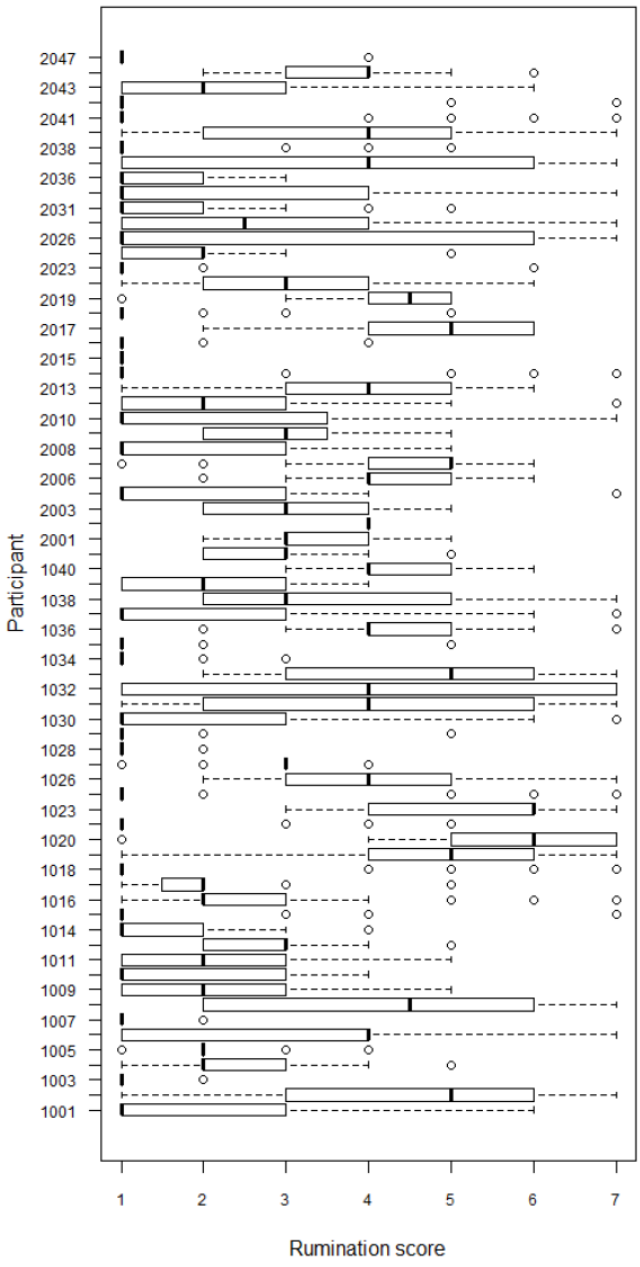


Figure S9. Frequency of social sharing scores in ambulatory assessment

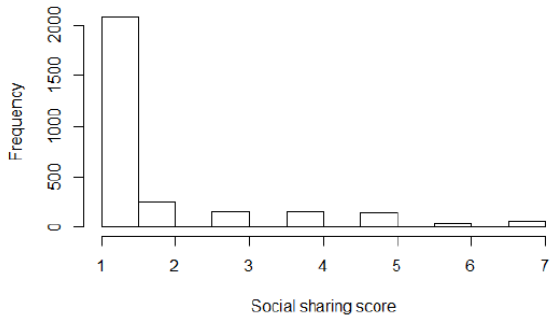


Figure S10. Distribution of social sharing scores by participant

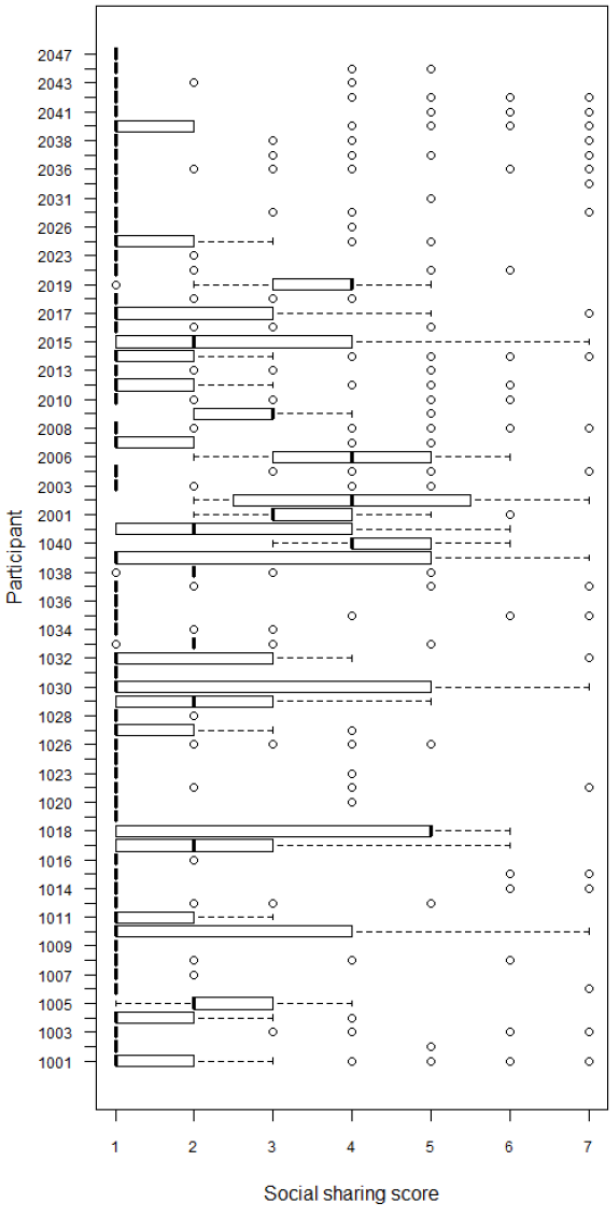


Figure S11. Frequency of suppression scores in ambulatory assessment

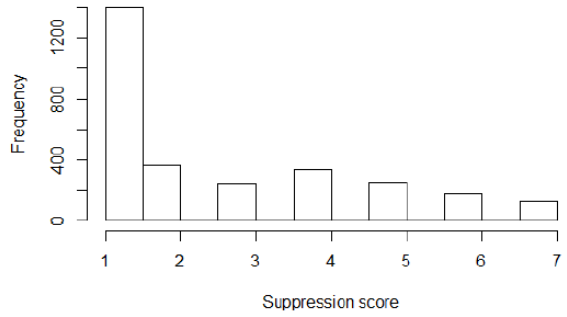


Figure S12. Distribution of suprresion scores by participant

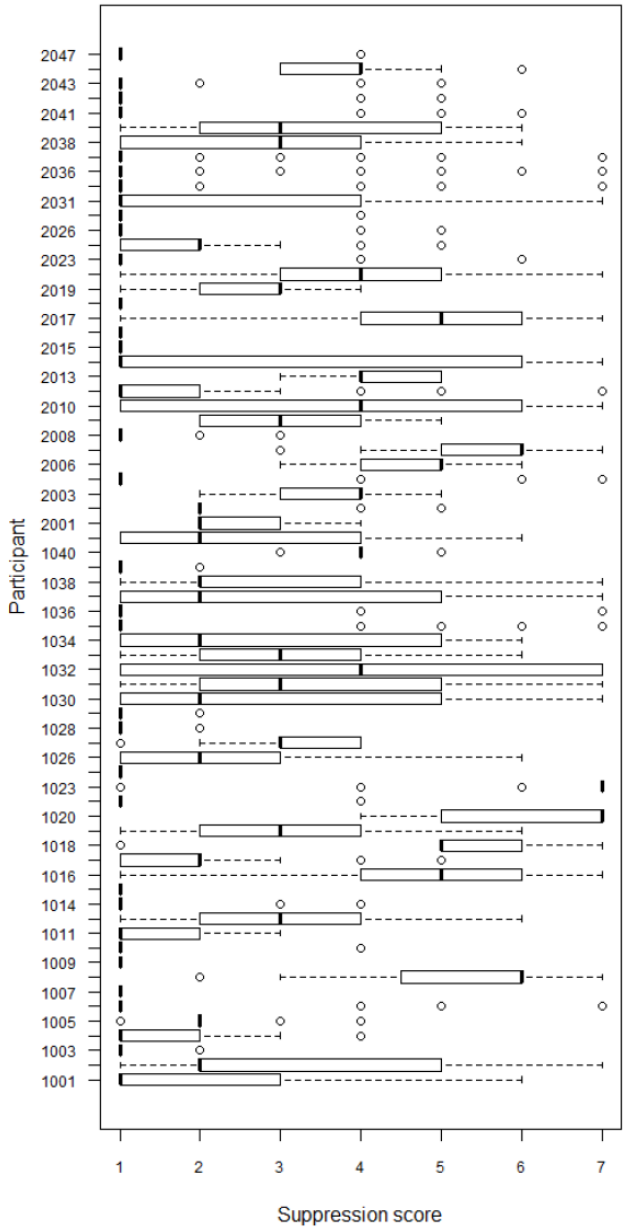


Figure S13. Frequency of distraction scores in ambulatory assessment

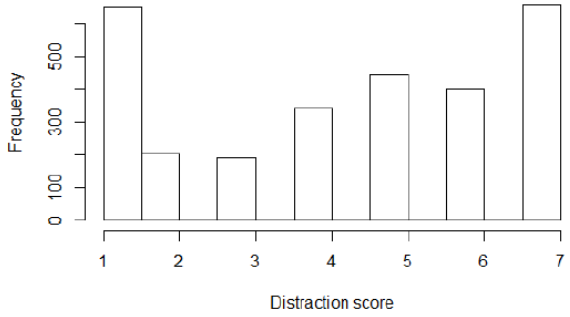


Figure S14. Distribution of distraction scores by participant

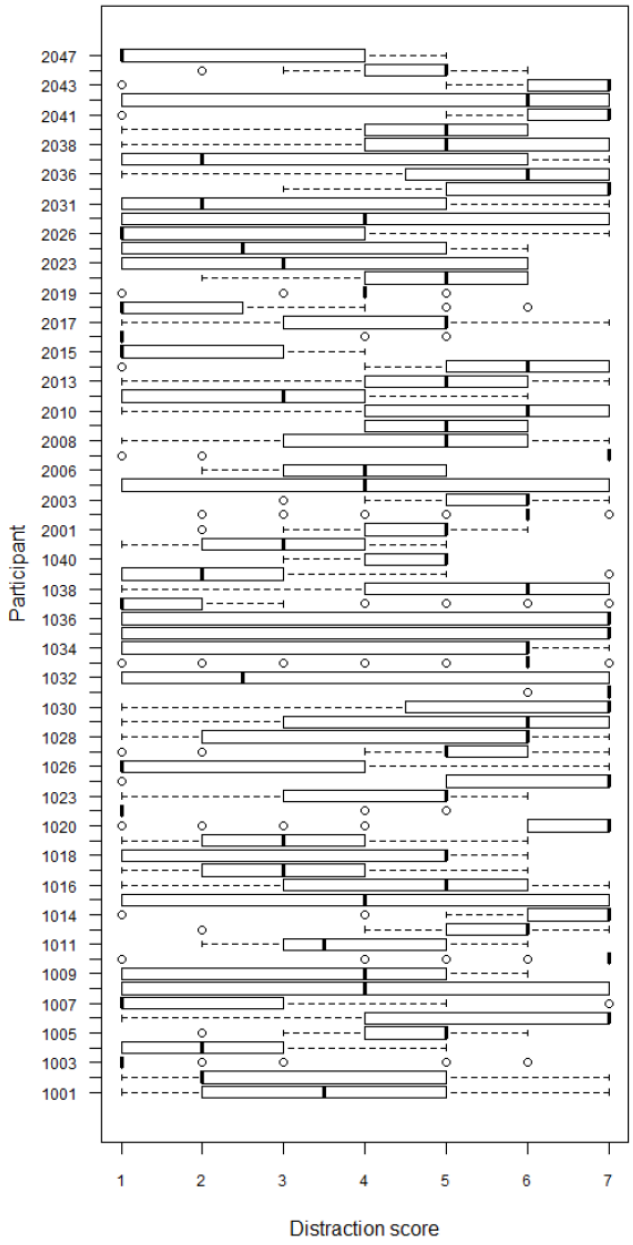


Figure S15. Frequency of accepting scores in ambulatory assessment

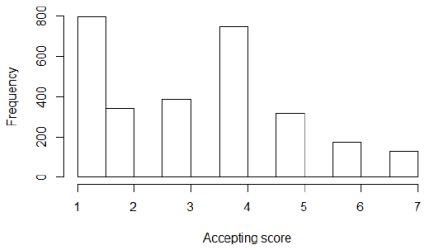
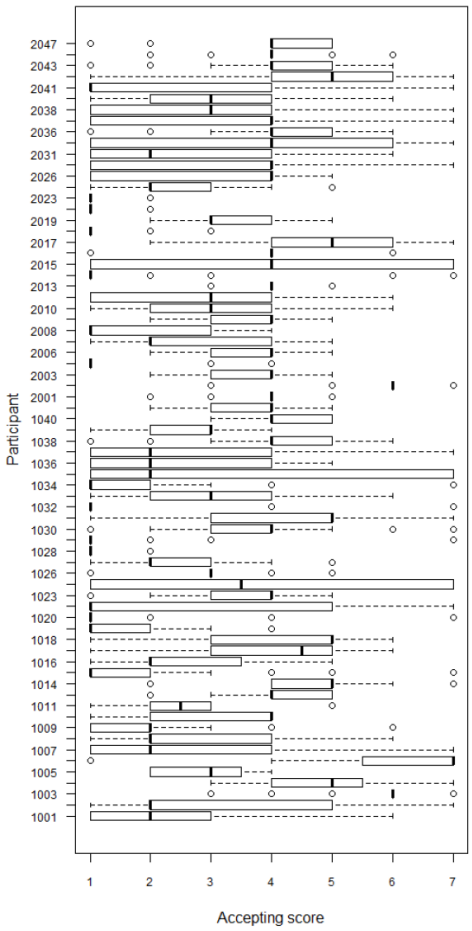


Figure S16. Distribution of accepting scores by participant



References

Schlier, B., Moritz, S., Lincoln, T.M., 2016. Measuring fluctuations in paranoia: Validity and psychometric properties of brief state versions of the Paranoia Checklist. Psychiatry Res. 241, 323–332. https://doi.org/10.1016/j.psychres.2016.05.002

Thewissen, V., Bentall, R.P., Oorschot, M., van Lierop, T., van Os, J., Myin-Germeys, I., 2011. Emotions, self-esteem, and paranoid episodes: An experience sampling study. Br. J. Clin. Psychol. 50, 178–195.

11. Anhang D: Curriculum vitae

Entfällt aus datenschutzrechtlichen Gründen

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