cpe.psychopen.eu | ISSN 2625-3410 | February 2026 | Volume 8 | Issue 1 |

CLINICAL PSYCHOLOGY IN EUROPE

The Official Academic Journal of the European Association of Clinical Psychology and Psychological Treatment

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Conducting Behavioural Experiments Using an App-Based Self-Help Program for Social Anxiety Disorder (SMASH): Outcomes of a Quasi-Experimental Pre-Post Pilot Trial

Johanna S. Schüller, Jacob Kajut, Jan M. Schittenhelm, Ronja von Rechenberg, Antonia Čerič, Jürgen Hoyer, Ulrich Stangier

An unguided app-based self-help program for social anxiety showed promising symptom reductions and good feasibility in this pilot study, warranting further evaluation in controlled trials.

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Editorial

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The Need for a Translational Model of Childhood Maltreatment: From Research to Principles to Action

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Clinical Psychology in Europe, 2026, Vol. 8(1), Article e22213, https://doi.org/10.32872/cpe.22213

Published (VoR): 2026-02-27

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Over the past two decades, research on the impact of childhood maltreatment (CM) has expanded rapidly, revealing complex physiological, neurobiological, and psychological effects. This growth in research is warranted: in 2025, the World Health Organization reported that over half of all children worldwide – more than 1 billion – experience some form of maltreatment each year. Despite this growing understanding, few studies demonstrate how this research translates into clinical practice. Without a clear translational framework, research risks remaining isolated, clinical care fragmented, and policy impact limited. The result is a gap between what we know and what we do.

A Translational Model of Childhood Maltreatment (TMCM) therefore needs to go beyond summarizing evidence. One effective approach is to turn *research findings* into *guiding principles* that directly inform *actionable strategies* across clinical settings. While calls for such translational efforts are not new (e.g., Samson et al., 2024), clinical psychology is now uniquely positioned to respond. This editorial presents a Research-Principles-Action framework for children and youth, showing how a TMCM can guide frontline practice. Given space constraints, this contribution does not propose a comprehensive model but instead serves as a call for action.

TMCM: Research

Among the many insights from past research, five key findings stand out.

1. **CM Impacts Brain Development and Increases Vulnerability to Psychopathology** (e.g., Teicher & Samson, 2016; McLaughlin et al., 2019). CM is

associated with changes in structural and functional brain development, partly through dysregulation of the hypothalamic-pituitary adrenal (HPA) axis and corticotropin-releasing factor (CRF) signalling. Neuroimaging studies have linked CM to altered threat detection, emotion reactivity and regulation, and reward processing. While these adaptations may have been protective in an abusive or neglectful environment, in safe contexts they can increase risk for psychopathology, including posttraumatic stress disorder (PTSD), major depression, and anxiety disorders.

2. **Type and Timing of CM Shape Clinical Trajectories and Brain Aging** (e.g., Fleming et al., 2025). Dimensions of CM (e.g., threat vs. deprivation), specific CM subtypes, and developmental timing of CM exposure are associated with distinct neurodevelopmental outcomes, clinical presentations, and acceleration in brain aging. CM represents a complex interaction of CM-related factors rather than an isolated experience.
3. **CM-Related Ecophenotype** (e.g., Teicher & Samson, 2013; Pechtel et al., 2022). Individuals sharing the same psychiatric diagnosis, with or without a history of CM, appear clinically and neurobiologically distinct. Those with CM histories often show altered HPA and CRF circuits, systemic inflammation, gene × environment interactions, and epigenetic changes. Clinically, they tend to present with an earlier disorder onset, higher comorbidity, greater symptom severity, and increased suicide risk. They also show reduced responsiveness to psychotherapy, pharmacological treatment, and combined treatment approaches, highlighting the need for tailored interventions to address unmet needs.
4. **Resilient Functioning Is Possible, but More Difficult to Achieve Following CM** (e.g., Ioannidis et al., 2020; McCrory et al., 2022). A range of resilience factors across individual, family, community, and neurobiological domains have been linked to "better-than-expected" outcomes following CM and can buffer against future stress. However, individuals exposed to CM are less likely to have these protective factors; for example, they often experience fewer supportive relationships (e.g., social thinning) and more frequent stressful interpersonal interactions (e.g., stress generation).
5. **Resilience Factor × Timing** (e.g., Filetti et al., 2024). Infancy and peripuberty are proposed as sensitive periods for the calibration and recalibration of stress-response systems, including the HPA axis and prefrontal-limbic circuitry. During these periods of heightened neuroplasticity, resilience factors (e.g., supportive caregiving, high-quality peer relationships, emotion regulation scaffolding) may become embedded in stress-regulatory processes and promote adaptive functioning.

TMCM: Principles and Actions

Research indicates that TMCM's guiding principles and actionable strategies must account for the complex effects of CM on the brain, behaviour, and clinical outcomes. Findings also support targeted, multidisciplinary interventions that take advantage of sensitive periods and help build resilience.

P1. Mechanism-Informed Practice: Address Complexity (Findings 1-4)

Focusing on underlying neurobiological and psychological processes, rather than only on symptoms, allows interventions to be more tailored and effective.

Actionable Strategies:

- Assess transdiagnostic mechanisms (e.g., emotion regulation, stress-response systems).
- Use clinical formulations to guide intervention selection, sequencing, and intensity.
- Implement multidisciplinary care (e.g., psychological, medical, community, and resource-based supports) to address broader needs arising from CM.
- Deliver integrated treatment that reduces psychopathology while promoting resilience across multiple domains (e.g., individual, family, community, school).

P2. Timing Optimization: Consider Sensitive Periods (Findings 2 & 5)

Neurodevelopmental stages matter both at the time of CM exposure and at the time of treatment delivery, due to windows of heightened neuroplasticity. Evidence of accelerated brain aging following CM underscores the importance of timely interventions that harness sensitive periods.

Actionable Strategies:

- Use formulation-based assessments that consider the timing of CM exposure and the child's developmental stage.
- Deliver timely interventions optimized for early childhood and peripuberty to harness neuroplasticity.
- Monitor and adjust support based on developmental stage and brain aging.
- Conduct clinical research trials to examine optimal timing for interventions.

P3. Integrated Approach: Address Psychopathology and Promote Resilience (Findings 1, 4 & 5)

An integrated approach addresses the psychological effects of CM while also promoting resilience across individual, family, and community levels.

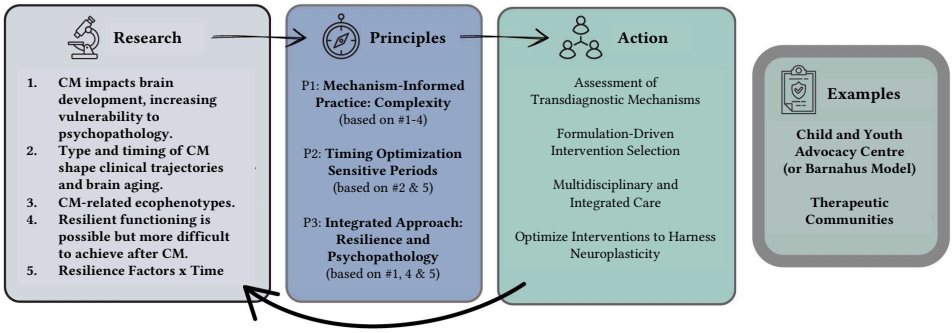
Actionable Strategies:

- Implement evidence-based interventions to address psychopathology (e.g., Trauma-Focused Cognitive Behavioural Therapy for PTSD) while promoting resilience (e.g., prosocial community activities that enhance social connectedness and belonging, positive parenting training to foster emotion regulation, rewarding experiences to buffer stress responses).
- Monitor symptoms, mechanisms, and resilience factors over time to guide formulation updates and multi-level interventions.
- Use formulation to coordinate support across care systems (e.g., social services, education, healthcare) to reduce systemic fragmentation.

Figure 1 illustrates how key research findings on childhood maltreatment (CM) can be translated into guiding principles that inform actionable strategies. It also provides examples of two clinical settings where TMCM has been applied, highlighting the translation from research to the clinical frontline.

Figure 1

Translational Model of Childhood Maltreatment (TMCM): Research-Principles-Action



Clinical Examples

Two clinical settings illustrate how the TMCM could translate into frontline practice.

Child and Youth Advocacy Centre (CYAC)

Originating in the US in the mid-1980's, CYACs now number over 1,000 centres across North America, with adapted models implemented across Europe. Their shared goal is to improve responses to CM through a multidisciplinary model that reduces systemic fragmentation and delivers integrated care. At the CYAC Kelowna in British Columbia, professionals from law enforcement, social services, victim support, education, healthcare, mental health, cultural services, and family advocacy all work together under one roof. Families receive formulation-based assessments to identify transdiagnostic mechanisms, followed by multi-level support tailored to the families' unique needs (P1: *Mechanism-Informed Practice*). Treatment plans equally address psychopathology through evidence-based practice (e.g., Trauma-Focused Cognitive Behavioural Therapy for PTSD) and connect youth and families to resilience-promoting factors (e.g., high-quality peer connection, supportive parenting groups, prosocial activities to increase self-esteem; P3: *Integrated Approach*). Importantly, children, youth, and families access the CYAC directly after reports to child protection authorities, ensuring timely support. Support is then adapted to developmental needs from childhood through to adulthood (P2: *Timing Optimization*). Finally, formulations are shared across care systems (e.g., social services, health care, education, victim services) to ensure continuity of care (P3: *Integrated Approach).*

Therapeutic Community (TC)

TCs (De Leon & Unterrainer, 2020) are structured, living-learning programs where the community itself fosters resilience through social connectedness and supportive relationships. Participants also receive real-time support targeting transdiagnostic mechanisms, such as emotion regulation (P1: *Mechanism-Informed Practice*), while developing skills that promote growth and long-term resilience, including life and social skills (P3: *Integrated Approach*). A key strength of TCs is their ability to provide intensive programs during early childhood (e.g., mother-infant) and adolescence, aligning with sensitive periods of neuroplasticity (P2: *Timing Optimization*). Next-generation TCs aim to formally integrate evidence-based practices to address psychopathology within the lived, resilience-promoting environment.

Concluding Thoughts

The TMCM provides a roadmap for translating research on CM into principle-driven, actionable strategies that guide clinical practice. Importantly, it does not replace the need to evaluate the effectiveness of these strategies across different contexts. In the TMCM framework, the evidence base serves as both the starting point and the end point, creating a system that evolves as knowledge grows. Incorporating new, robust findings ensures guiding principles remain actionable and scientifically grounded. Over time, this approach can shape policy and help ensure that children and families have access to the best possible support. The science is ready. The need is urgent. Now is the time to turn knowledge into action.

Funding: The author has no funding to report.

Acknowledgments: The author has no additional (i.e., non-financial) support to report.

Competing Interests: The author reports being the Clinical Director of the Child and Youth Advocacy Centre Kelowna and Co-Founder/Director of 3Trees Okanagan.

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Clinical Psychology in Europe (CPE) is the official journal of the European Association of Clinical Psychology and Psychological Treatment (EACLIPT).

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Research Articles

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Theoretical Orientations and the Stereotype Content Model – Are Prejudices Barriers to Psychotherapy Integration?

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Clinical Psychology in Europe, 2026, Vol. 8(1), Article e17975, https://doi.org/10.32872/cpe.17975

Received: 2025-05-09 • **Accepted:** 2025-10-02 • **Published (VoR):** 2026-02-27

Handling Editor: Winfried Rief, Philipps-University of Marburg, Marburg, Germany

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Supplementary Materials: Data, Materials, Preregistration [see Index of Supplementary Materials]

Abstract

Background: Despite efforts to integrate psychotherapy, the field remains fragmented into distinct theoretical orientations and practical approaches. Prejudices held by psychotherapists towards those from other theoretical orientations may hinder cooperation in research and clinical practice. This study examines stereotypes among psychotherapists from different theoretical orientations and practical approaches ('psychotherapy schools') towards their in-group and out-group colleagues.

Method: The cross-sectional online study assessed socially shared evaluations of 'warmth' and 'competence' from the stereotype content model in a sample of 586 German psychotherapists (60.9% licensed; 39.1% in training) from different psychotherapy schools (34.5% psychoanalytic and psychodynamic psychotherapists, 19.8% psychodynamic psychotherapists, 28.7% cognitive behavioural therapists, and 17.1% systemic therapists). Linear mixed-effects models were used to examine differences in evaluations based on the rater's and the rated psychotherapy school.

Results: The psychotherapists' assumed socially shared evaluations of 'warmth' and 'competence' varied depending on their psychotherapy school affiliation, with significantly higher evaluations assigned to their in-groups than to their out-groups.
Conclusion: The results indicate in-group biases in the social perception of psychotherapists with different theoretical orientations, representing potential barriers to inter-group contact and collaboration. Addressing prejudices is key to strengthening integrative competence in both research and clinical practice.

Keywords

psychotherapy integration, stereotype content model, theoretical orientation, in-group, prejudices

Highlights

- The discipline of psychotherapy is fragmented into different theoretical orientations.
- Psychotherapy integration approaches aim to strengthen effectiveness of psychotherapy.
- In-group biases affect social perceptions of psychotherapists regarding theoretical orientations.
- Addressing stereotypes may reduce prejudices and stimulate collaboration and integration.

In many countries, psychological interventions are considered a collection of independent treatment approaches, characterized by their own theoretical framework, concepts, and treatment foci (Rief et al., 2024). This division is not only evident in the way the different approaches are, in some countries, structured within health care systems, professional training programs, and licensing requirements, but also in the distinct terminologies or language used, which may hinder psychotherapists from recognizing similarities and points of complementarity (Goldfried, 2019; Rief et al., 2024). Ascribing to a specific theoretical orientation has long been an important identifying mark for many psychotherapists (Feixas & Botella, 2004). However, in the view of a growing group of researchers, this fragmentation keeps the discipline of psychotherapy in a pre-paradigmatic (Goldfried, 2019) or immature (Gaines et al., 2021) state. Decades ago, a movement for psychotherapy integration evolved, aiming "to reduce perpetuating the myth of separatism" (Halgin, 1985), and to develop a framework for dialogue among psychotherapy schools (Feixas & Botella, 2004), resulting in an evidence-informed framework of valuable elements in various theories (Wakefield et al., 2020). Several approaches have been proposed as pathways to psychotherapy integration (Norcross, 1992): a) technical eclecticism (i.e., selecting most appropriate interventions for a specific person and symptom), b) theoretical integration (i.e., combining theories and applying their associated techniques), c) assimilative integration (i.e., grounding therapy in one theory while incorporating techniques drawn from other theoretical orientations), d) the "common

factors" model (i.e., focusing on core elements contributing to effective psychotherapy, transcending specific theoretical orientations; Brown, 2015), and e) unification (i.e., applying coherent meta-theoretical frameworks for understanding how psychotherapy works; Marquis et al., 2021). Despite these efforts, fragmentation in the field of psychotherapy remains the rule rather than the exception, with Gaines et al. (2021) arguing that this lack of consensus is largely due to power struggles among competing psychotherapy schools. While other factors, such as historical development or institutional structures, may also contribute, it seems important to shed light on inter-group dynamics.

Social psychology provides a theory for understanding these dynamics: Research shows that individuals often rely on stereotypes, which are simplified and overgeneralized beliefs, about groups of individuals when evaluating them (Kanahara, 2006). According to Fiske (2012), stereotypes are patterns of perception linked to a group's societal interdependence and status. Negative stereotypes and, as a consequence, prejudices occur when individuals see themselves as belonging to one group, their in-group, which they perceive to be distinct from and superior to other groups, their out-groups (Dovidio & Gaertner, 1993; Tajfel & Turner, 1979). Stereotypes play a key role in reducing intergroup contact and cooperation (e.g., Stephan & Renfro, 2002). The stereotype content model (SCM; Fiske et al., 2002) provides a functional explanation for why stereotype content is organized into two dimensions: It suggests that the degree of 'warmth' and 'competence' is determined by societal status and perceived competitiveness. Along the warmth dimension, out-groups differ in the extent to which they are perceived as intending to harm or threaten the in-group. Along the competence dimension, out-groups differ in the extent to which they are perceived as capable of implementing their goals, e.g., to harm the in-group (Eckes, 2002). The in-group is typically seen as warm and competent, while out-groups are often perceived as lacking in either warmth or competence (Fiske et al., 2002). The mixed-stereotypes hypothesis proposes that many stereotypes combine low ratings on one dimension with high ratings on the other (Eckes, 2002). Building on social comparison-based and attributional models of emotion, the resulting stereotype clusters are associated with four unique emotional responses: admiration, contempt, envy, and pity (Cuddy et al., 2008; Fiske et al., 2002). Paternalistic stereotypes (high warmth, low competence) are associated with groups such as elderly or disabled people, envious stereotypes (low warmth, high competence) are associated with groups such as wealthy people, admiration stereotypes (high warmth, high competence) are applied to the in-group or close allies, and contemptuous stereotypes (low warmth, low competence) are associated with groups such as poor people or welfare recipients.

In many countries, professional training in psychotherapy remains largely focused on specific techniques from a single school (Rief, 2021). This training, which spans several years, includes theoretical and practical education, intervision, and supervision, fostering in-group socialization and strong identification with a particular theoretical orientation. In Germany, four psychotherapy schools are recognized by national health insurance,

each with distinct theoretical and practical approaches: Psychoanalytic Psychotherapy (PA) focuses on resolving unconscious processes stemming from early life experiences, alleviating patients' symptoms by helping to understand and transform unexplained emotional experiences (Rudolf et al., 2012). Psychodynamic Therapy (PDT) builds on the same etiological conception, although it applies a more structured approach, focusing on unconscious processes influencing current symptoms, aiming to increase self-awareness and promote emotional change (Leichsenring et al., 2023). Cognitive Behaviour Therapy (CBT) is a structured and goal-oriented approach aiming to identify and modify maladaptive thoughts and behaviors contributing to psychological distress (Davis et al., 2017), and to improve interpersonal, problem solving and emotion regulation skills (Ford, 2017). Systemic Therapy (ST) focuses on circular interaction patterns within social systems and systematically incorporates multi-person settings. It emphasizes a non-pathologizing approach, highlighting patients' resources and focusing on solutions rather than on problems (Lorås et al., 2017).

Grounded on the SCM, we hypothesize that psychotherapists trained in different psychotherapy schools (PA, PDT, CBT, ST) evaluate psychotherapists of their in-groups higher in 'warmth' (H1) and 'competence' (H2) than their three out-groups.

Method

Participants and Recruitment

The study included German psychotherapists with a psychotherapeutic practice license in PA, PDT, CBT, or ST or psychotherapists in training for one of these licenses. A power analysis for an independent *t*-test with Stata 15.1, based on a standardized mean difference between groups of $f^2 = .25$, resulted in a target sample size of 50 participants per group, totaling at least 200 participants, for ensuring that the 95% confidence interval would not include $f^2 = .05$, which we defined as the threshold for a meaningful difference. As the survey posed minimal risk and effort for the participants, we aimed to recruit the highest possible number of participants within a six-month time frame (January to June 2024) to enhance generalizability of the results. Participants were recruited through mailing lists of several German psychotherapy associations, inpatient and outpatient clinics, clinical psychology departments at universities, and psychotherapist training centers. As optional compensation, 20 vouchers à 50 € for a social online bookstore were offered, with a total value of 1,000 €.

Study Design, Procedure and Material

The current study used a descriptive cross-sectional design. The anonymous online study was programmed with unipark (Tivian XI GmbH, 2025). After giving informed consent to participate in the study, the participants started the online survey. They were

asked whether they are licensed or in training for a license in PA, PDT, CBT, or ST. Selecting "not applicable" violated the inclusion criterion and led to the termination of the online survey. The survey measured the participants' perceptions of consensual in-group evaluations of warmth and competence towards their own psychotherapy school (in-group) as well as their attributions of warmth and competence to the respective other three psychotherapy schools (out-groups). The wording of the question was: "How competent/warm do most psychotherapists of your psychotherapy school perceive psychotherapists of PA / PDT / CBT / ST?". The items were adapted from previous studies testing assumptions related to the SCM (e.g., Asbrock, 2010; Cuddy et al., 2009; Fiske et al., 2002). In line with these studies, we measured consensual stereotypes, referring to socially shared evaluations of warmth and competence rather than individual attitudes, to reduce social desirability bias (Kotzur et al., 2020). The response options of these items ranged from 1 – not at all, 2 – rather less, 3 – moderately, 4 – rather more, 5 – very much. Additionally, the survey included further questions regarding participants' professional practice and attitudes in the field of psychotherapy, which are related to other research questions (see study registration).

Data Analysis

In the data cleaning process, 19 cases were excluded from the dataset of 605 participants, as they reported being trained in multiple psychotherapy schools, resulting in a sample of $N = 586$. As most of the PA therapists were also trained in PDT ($n = 193$, 95.5%) and nine (4.5%) PA therapists were solely trained in PA, these groups were united in the group called PA, whereas the PDT group was solely trained in PDT. The dataset included 2,333 warmth ratings and 2,335 competence ratings at level one (intra-individual variance) and 586 subjects at level two (inter-individual variance). Eleven warmth ratings and nine competence ratings were missing due to unintended missing mandatory response settings in the online survey. In the analysis, missing data were handled by excluding rows with missing values from the model fitting process, ensuring that the dataset's structure is maintained for prediction and residual checks. Dummy variables were used to represent the categorical predictors (own school, rated school, and their interaction). To examine whether the evaluations of psychotherapy schools (independent variable; PA, PDT, CBT, ST) vary based on the rater's own psychotherapy school (independent variable; PA, PDT, CBT, ST), we conducted two linear mixed-effects models (LMM): one for 'warmth' evaluations and one for 'competence' evaluations (dependent variables). In both models, fixed effects were specified for the rated psychotherapy school and the rater's own psychotherapy school, each with four categories (PA, PDT, CBT, and ST). Although the pre-registered analysis plan aimed for MANOVAs, we adjusted the statistical approach favouring LMM. These changes were implemented to better align with the data and improve the robustness of the findings. We tested a random intercept model for each subject to account for possible within-subject correlations due to repeated ratings

and a model with a random slope for the rated psychotherapy school to capture possible individual differences in the perception of the psychotherapy schools. The inclusion of a random intercept and random slopes for the rated psychotherapy schools resulted in an improved model fit compared to simpler models. The LMMs were estimated using the lme4 package (Bates et al., 2015), and model fit was evaluated using marginal and conditional R^2 values calculated with the MuMIn package (Barton & Barton, 2015) in *R*. Model assumptions (e.g., normality, homoscedasticity) were checked visually using residual plots, and model fit was evaluated via the Akaike Information Criterion (AIC) and log-likelihood ratio tests. The Intraclass Correlation Coefficient (ICC) was calculated to assess the proportion of variance in the outcome variable attributable to differences between individuals. All statistical analyses were conducted with a significance threshold of $p = .05$.

Results

Sample Characteristics

Table 1 shows the sample characteristics of the participants in the current study.

Table 1

Sample Characteristics (N = 586)

Age in years		
M (*SD*), *Mdn*	42.3 (12.3)	39
Range	23 – 80	
Sex	***n***	**%**
Female	430	73.4
Male	154	26.3
Diverse	2	0.3
Professional status		
Licensed psychotherapist – *n*, %	357	60.9
Years with license – *M (SD), Mdn*	10.6 (9.4)	7
Psychotherapist in training – *n*, %	229	39.1
Years in training – *M (SD), Mdn*	3.2 (2.6)	3
Specialization[a]	***n***	**%**
Psychotherapy for adults	493	84.1
Psychotherapy for children and youths	132	22.5
Neuropsychological Psychotherapy	6	1.0

Field of university degree	***n***	**%**
Psychology	490	83.6
Medicine	35	6.0
Social pedagogy and social work	37	6.3
Pedagogy	32	5.5
School of psychotherapy	***n***	**%**
PA or PA & PDT	202	34.5
PDT (without PA)	116	19.8
CBT	168	28.7
ST	100	17.1
Professional focus[a]	***n***	**%**
Practicing psychotherapy	562	95.9
Research	72	12.3
Teaching	97	16.6
Work setting[a]	***n***	**%**
Private practice	302	51.5
Psychotherapy training center	146	24.9
Psychiatry and psychotherapy inpatient clinic	97	16.6
University	63	10.8
Inpatient clinic for psychosomatic medicine	39	6.7
Inpatient clinic for rehabilitation care	31	5.3
Psychotherapy outpatient clinic	31	5.3
Medical care center	15	2.6
Other setting	104	17.7

Note. *M* = Mean; *SD* = Standard Deviation; *Mdn* = Median; PA = Psychoanalytic Psychotherapy (PA: *n* = 193, PA and PDT: *n* = 9 combined); PDT = Psychodynamic Psychotherapy; CBT = Cognitive Behaviour Therapy; ST = Systemic Therapy.
[a]Multiple answers are possible.

Effects of Psychotherapy Schools on Socially Shared Evaluations of Warmth and Competence

Significant interaction effects between the rated psychotherapy school and the rater's psychotherapy school were found for all interaction terms regarding warmth as well as competence, with large effect sizes (see Table 2). This suggests that the assumed socially shared evaluations of warmth and competence toward out-groups were influenced by the participants' psychotherapy school affiliation, supporting the in-group bias proposed in H1 and H2.

Clinical Psychology in Europe
2026, Vol. 8(1), Article e17975
https://doi.org/10.32872/cpe.17975

Table 2

Results of Linear Mixed Model With the Rater's Psychotherapy School and the Rated Psychotherapy School as Fixed Effects and Warmth and Competence Ratings as Dependent Variables

	Warmth					Competence				
Fixed Effects	***B***	***SE***	**95% CI**	***t*(*df*)**	***p***	***B***	***SE***	**95% CI**	***t*(*df*)**	***p***
(Intercept)	3.693	0.064	[3.568, 3.817]	57.887 (1735)	< .001***	4.476	0.062	[4.356, 4.597]	72.642 (1737)	< .001***
Rated psychotherapy school PDT	0.172	0.064	[0.046, 0.298]	2.673 (1735)	.008**	-0.523	0.058	[-0.637, -0.410]	-9.019 (1737)	< .001***
Rated psychotherapy school CBT	-1.010	0.085	[-1.176, -0.843]	-11.857 (1735)	< .001***	-1.486	0.082	[-1.646, -1.325]	-18.093 (1737)	< .001***
Rated psychotherapy school ST	-0.364	0.085	[-0.529, -0.199]	-4.304 (1735)	< .001***	-1.214	0.074	[-1.358, -1.070]	-16.497 (1737)	< .001***
Rater's psychotherapy school PDT	-0.667	0.105	[-0.873, -0.461]	-6.339 (582)	< .001***	-0.373	0.102	[-0.572, -0.174]	-3.668 (582)	< .001***
Rater's psychotherapy school CBT	-1.669	0.094	[-1.853, -1.484]	-17.692 (582)	< .001***	-1.589	0.091	[-1.768, -1.411]	-17.438 (582)	< .001***
Rater's psychotherapy school ST	-1.513	0.110	[-1.729, -1.297]	-13.705 (582)	< .001***	-1.246	0.107	[-1.455, -1.037]	-11.685 (582)	< .001***
PDT-PDT	0.871	0.106	[0.663, 1.079]	8.197 (1735)	< .001***	0.592	0.096	[0.405, 0.779]	6.191 (1737)	< .001***
PDT-CBT	0.846	0.141	[0.571, 1.121]	6.013 (1735)	< .001***	0.658	0.136	[0.393, 0.923]	4.856 (1737)	< .001***
PDT-ST	0.848	0.140	[0.575, 1.121]	6.072 (1735)	< .001***	0.464	0.121	[0.227, 0.702]	3.826 (1737)	< .001***
CBT-PDT	1.161	0.095	[0.975, 1.347]	12.205 (1735)	< .001***	1.279	0.086	[1.112, 1.447]	14.908 (1737)	< .001***
CBT-CBT	2.597	0.126	[2.350, 2.844]	20.571 (1735)	< .001***	2.819	0.122	[2.582, 3.057]	23.191 (1737)	< .001***
CBT-ST	2.168	0.125	[1.923, 2.412]	17.319 (1735)	< .001***	2.104	0.109	[1.891, 2.316]	19.312 (1737)	< .001***
ST-PDT	0.898	0.111	[0.680, 1.115]	8.066 (1735)	< .001***	1.063	0.100	[0.867, 1.260]	10.591 (1737)	< .001***
ST-CBT	1.710	0.148	[1.421, 1.998]	11.583 (1735)	< .001***	1.936	0.142	[1.658, 2.214]	13.607 (1737)	< .001***
ST-ST	2.476	0.147	[2.189, 2.762]	16.884 (1735)	< .001***	2.231	0.128	[1.982, 2.480]	17.495 (1737)	< .001***

Note. By-subject and by rated psychotherapy school random slopes were included for all fixed effects. PA = Psychoanalytic Psychotherapy; PDT = Psychodynamic Psychotherapy; CBT = Cognitive Behaviour Therapy; ST = Systemic Therapy. In the last nine lines, the first-named school represents the rater's school and the second one the rated school. *SE* = Standard Error; CI = Confidence Interval. The intercept represents the average warmth/competence rating by PA psychotherapists to their in-group, as PA serves as the reference category for both fixed effects.

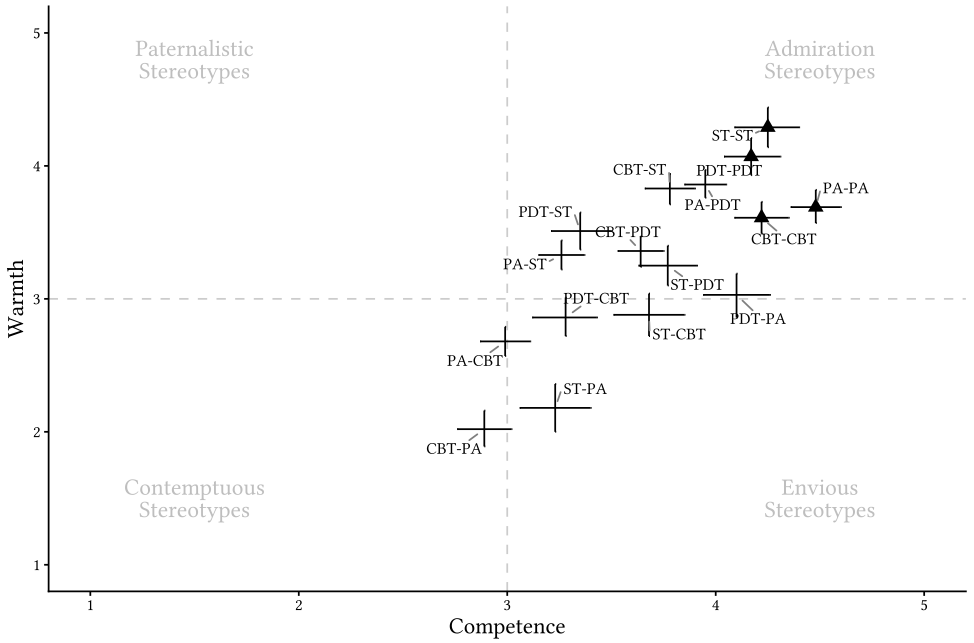
*p < .05. **p < .01. ***p < .001.

In the warmth model, the marginal R^2, which represents the proportion of variance explained by the fixed effects alone, was R^2_m = 0.360. The conditional R^2, representing the variance explained by both the fixed and random effects, was R^2_c = 0.865. The ICC was 0.583, suggesting that 58% of the total variance in the outcome variable is attributable to between-subject variability, while the remaining 42% is due to within-subject differences.

In the competence model, the marginal R^2, which represents the proportion of variance explained by the fixed effects alone, was R^2_m = 0.265. The conditional R^2, representing the variance explained by both the fixed and random effects, was R^2_c = 0.866. The ICC was 0.694, suggesting that 69% of the total variance in the outcome variable is attributable to between-subject variability, while the remaining 31% is due to within-subject differences.

Figure 1

Estimated Marginal Means and Confidence Intervals From a Linear Mixed Model Assessing Assumed Shared Evaluations of Warmth and Competence Between Four Psychotherapy Schools



Note. PA = Psychoanalytic Psychotherapy; PDT = Psychodynamic Psychotherapy; CBT = Cognitive Behaviour Therapy; ST = Systemic Therapy. The first-named school represents the rater's school and the second one the rated school. Paternalistic Stereotypes: high warmth, low competence; Envious Stereotypes: low warmth, high competence; Admiration Stereotypes: high warmth, high competence; Contemptuous Stereotypes: low warmth, low competence (Fiske et al., 2002).

Figure 1 illustrates the combined estimated marginal means (EMM) from both LMM, one using warmth ratings and the other using competence ratings as outcome variables. For the numeric details we refer to the Supplementary Materials (Schröder et al., 2026S-a). Most convergence points are concentrated in the 'admiration' quadrant. A pattern of 'envious' stereotypes is evident in PDT and ST's evaluations of CBT, as well as in ST's evaluations of PA. A pattern of 'contemptuous' stereotypes can be observed in PA's evaluations of CBT and CBT's evaluations of PA. The findings show no 'paternalistic' stereotypes among psychotherapy schools. Figure 2 illustrates the results grouped by in- and out-groups.

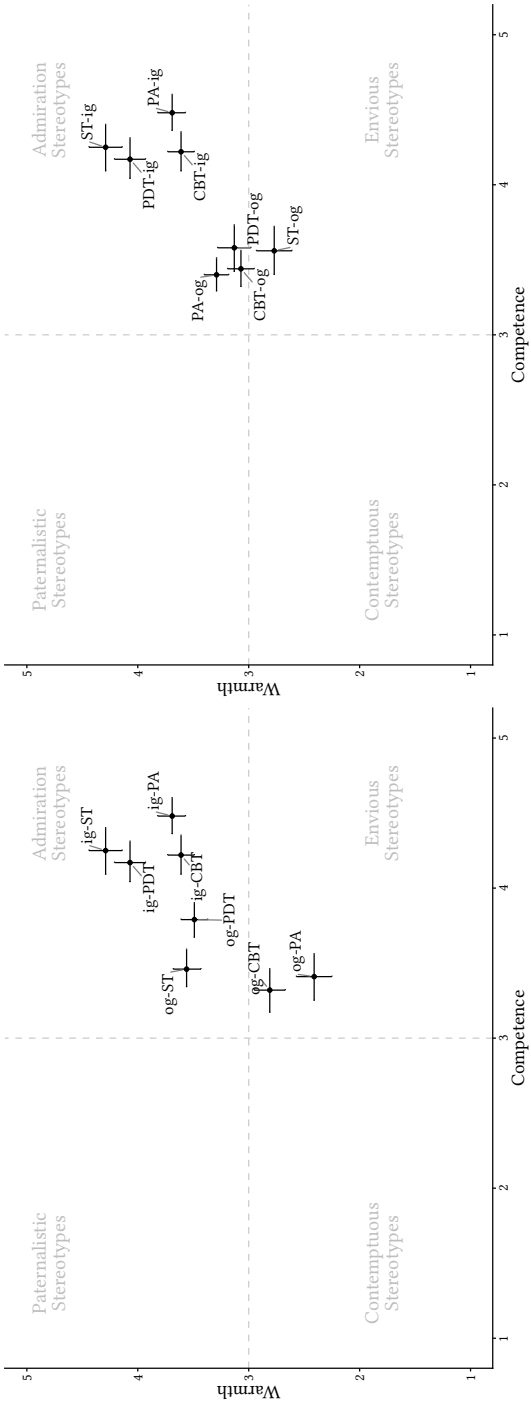
Discussion

The current study investigated in-group biases among psychotherapists from different theoretical orientations (PA, PDT, CBT, ST). The findings show that psychotherapists of all four schools rated their in-group significantly higher in warmth and competence than their out-groups, supporting both hypotheses. This in-group bias mirrors patterns observed in general populations, where in-groups are typically rated higher in both dimensions across various social categories, though such patterns have primarily been seen in Western cultures (Cuddy et al., 2009; Fiske et al., 2002). The results align with Larsson et al. (2013), who found that psychotherapists misjudge the attitudes of psychotherapists with other theoretical orientations.

The current study found reciprocal 'admiration' stereotypes in the evaluations between PA and PDT therapists, which can not only be explained by the shared epistemic framework, but also by the fact that most PA therapists were also licensed in PDT. ST therapists assumed shared 'envious' stereotypes towards their out-groups, which might be explained by their relatively recent approval for reimbursement within Germany's statutory health insurance system since 2019. While this official recognition underscores the growing status of ST, its training institutes and integration into university curricula are still limited compared to other psychotherapy schools. PA and CBT therapists tend to be associated with 'envious' stereotypes by their out-groups. This may be explained by the relatively high professional prestige of PA and CBT. The historic influence of PA extends beyond psychotherapy into philosophy and cultural discourse (Lear, 2003), while CBT is highly regarded for its strong empirical foundation (App & Dobson, 2010). The findings further indicate 'contemptuous' stereotypes between PA and CBT therapists. This can be explained by a "threat of otherness" (Govrin, 2016), which may be more pronounced between these two groups, compared to PDT or ST, when considering the pronounced distinctness in their theoretical orientations and practical approaches. However, drawing on prejudice research and a developmental approach based on attachment and identity theory (De Levita, 1965), a secure identity does not lead to higher scores of envy or prejudice towards "others", but would rather allow for openness towards differ-

Figure 2

EMM and Confidence Intervals From Linear Mixed Models Assessing Assumed Shared Evaluations of Warmth and Competence Between Four Psychotherapy Schools



Note. Left plot: Assumed shared in-group and out-group evaluations regarding the four psychotherapy schools. Right plot: Assumed shared evaluations by the psychotherapists of the four schools of their in-groups and their out-groups. PA = Psychoanalytic Psychotherapy; PDT = Psychodynamic Psychotherapy; CBT = Cognitive Behaviour Therapy; ST = Systemic Therapy. 'ig' represents the estimated marginal mean (EMM) of the respective ingroup, 'og' represents the average EMM of the respective outgroups. The first elements in the labels represent the *rater's* psychotherapy school, ingroup or outgroup and the second elements represent the *rated* psychotherapy school, in-group or out-group. Paternalistic Stereotypes: high warmth, low competence; Envious Stereotypes: low warmth, high competence; Admiration Stereotypes: high warmth, high competence; Contemptuous Stereotypes: low warmth, low competence (Fiske et al., 2002).

ences and pluralism. Thus, rigidity and envy towards other schools might be understood as potentially reflecting an insecure attachment and fragile identification, which could be pseudo-stabilized by devaluing other approaches instead of accepting or even appraising diversity for the sake of different groups of patients (see also Golec de Zavala et al., 2009). This interpretation remains speculative, and further empirical research would be needed to explore whether such dynamics occur within psychotherapy schools.

The current findings on stereotypes among psychotherapists from different theoretical orientations are relevant to approaches to psychotherapy integration, as in-group favoritism and prejudices towards out-groups may impede intergroup contact and collaboration. When aiming for cohesive frameworks for unified psychotherapy, advancing the discourse on common factors and developing reasonable integrative approaches, constructive cooperation between psychotherapists of different theoretical orientations is essential. Encouraging psychotherapists to adopt an open-minded and patient-oriented approach could help mitigate the limitations of rigid adherence to a single school and facilitate the development of efficient, personalized care. Discussing stereotypes among psychotherapists of different theoretical orientations in university teaching, professional training, interdisciplinary workshops, and conferences could provide opportunities for intergroup contact, enhancing mutual understanding. Dialogue about stereotypes may help to contextualize and deconstruct them, promoting a more nuanced perception of different therapeutic approaches. This could help focus on common grounds and goals, creating a shared professional identity as psychotherapists and paving the way for more effective psychotherapy integration. While psychotherapy integration offers promising avenues to further develop psychotherapy as an academic discipline, it also raises important challenges beyond in-group bias: In a study by Kaluzeviciute-Moreton and Lloyd (2024), psychotherapists expressed the belief that certain clinical techniques or modalities are theoretically and politically incompatible. For instance, some cognitive behavioural therapists view psychoanalysis as less adaptable, both to integrative approaches and to modern research. Conversely, psychoanalytic practitioners regard CBT as a dominant paradigm that is less open to integrating ideas and techniques from less evidence-based modalities. On a theoretical level, the interviewed psychotherapists highlighted the challenge of epistemic integration, noting the different philosophies underlying CBT and psychoanalysis. A unified framework, on the other hand, may risk oversimplifying theoretical differences, which are rooted in these distinct epistemic traditions. It becomes clear that integrative practice is disruptive, necessitating a broader understanding of various psychotherapeutic approaches to "find meaning and the right components" (Gordon et al., 2021). On another level, in some countries, like Germany, there are also concerns that psychotherapy integration could undermine the provision of psychotherapy under public health insurance schemes (Strauß, 2024). Additionally, a key obstacle may lie in misunderstandings surrounding the concept of psychotherapy integration or disagreements over which proposed pathways should be considered.

These challenges can only be overcome by trans-theoretical cooperation, constructive exchange, and critical reflection. At least, it should facilitate the recognition of the unique characteristics of each psychotherapy approach within its own underlying epistemic framework. Ultimately, acknowledging the diversity of approaches can, from a dialectic perspective, also be appreciated as a rich cultural resource that can be beneficial for the diversity of individuals in need of psychotherapy.

Several limitations should be considered when interpreting the results of the current study. First, the sample was not representative of the psychotherapist population in Germany or internationally, limiting generalizability. Further, the sample might be biased due to online assessment, although the sample shows great variance, especially regarding age and working years. As all authors were psychologists, recruitment resulted in a sample with only a few psychotherapists holding medical university degrees or being psychiatrists. Second, the SCM was originally developed as a universal measure of 'shared cultural' stereotypes, i.e., participants' perceptions of what most individuals in a society think about a given target group. One experimental study suggests that response instruction (shared cultural perspective vs. individual perspective, i.e., what individuals personally think about the target group) does not significantly influence stereotype scale outcomes (Findor et al., 2020). However, this effect may depend on the specific target group and has not been evaluated for the population at hand. Consequently, using the shared cultural perspective in the current study may have led to an exaggeration of stereotypes, which should be considered in the interpretation of the results. On the other hand, the shared cultural perspective may have helped reduce a social desirability bias, potentially preventing the understatement of stereotypes. It would be worthwhile to incorporate both perspectives in future studies. The use of multilevel modeling has proven to be crucial in capturing the variability in psychotherapists' evaluations at both the individual and group levels. The high ICC values underscore the significant between-individual variability, and substantial differences between marginal and conditional R^2 underscore the importance of accounting for individual differences, captured by the random effects structure in the model. This suggests that personal experiences or individual biases may play a significant role in stereotype formation and expression.

The study results raise important questions for future research. First, including further theoretical orientations in international contexts, such as humanistic psychotherapy (Schneider & Leitner, 2002), could provide a broader understanding of how stereotypes vary across cultural and educational contexts. Second, investigating how stereotypes of psychotherapists with different therapeutic orientations relate to other dimensions of stereotype content, e.g., the Agency, Beliefs, Communion (ABC) model (Koch et al., 2016), may yield valuable insights. Third, investigating the role of individual factors such as gender, clinical experience, academic background, and experiences with interdisciplinary work could shed light on the mechanisms underlying stereotype formation. Fourth, for a better understanding of the origin of latent stereotypes in psychotherapists, it would

be worth examining the quality and security of affiliation and the processes of attaining a (specific) psychotherapeutic identity. Moreover, it could be valuable to investigate the role of perceived intergroup threat in stereotype formation (Stephan et al., 2009) – particularly the influence of realistic threats (e.g., concerns about losing resources to another psychotherapy approach) and symbolic threats (e.g., concerns about losing normative dominance).

The study findings demonstrate a stereotype-associated in-group bias between psychotherapists of different theoretical orientations. Addressing these stereotypes could help reduce prejudices and stimulate collaboration among psychotherapists of different theoretical orientations, allowing the discipline of psychotherapy to move toward a more integrative paradigm, while still valuing the diversity of established approaches.

Funding: This research received no external funding.

Acknowledgments: The authors have no additional (i.e., non-financial) support to report.

Competing Interests: The following authors are professionally trained in different theoretical orientations: Psychoanalytic Psychotherapy: NFT; Psychodynamic Psychotherapy: NFT, KS; Cognitive Behaviour Therapy: JS, ST, MSM, JAR; Systemic Therapy: BEH. The authors have no financial or personal relationships to report that could inappropriately influence the work.

Ethics Statement: This research was approved by the local ethics committee of the Medical School Hamburg (reference number MSH-2023/294). All subjects gave written informed consent in accordance with the Declaration of Helsinki (2013).

Preregistration: The study was preregistered in the Open Science Framework (https://osf.io/px96t).

Reporting Guidelines: The manuscript was written according to the JARS-Quant reporting standards.

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Data Availability: The data is available in the Supplementary Materials (Schröder et al., 2026S-b).

Supplementary Materials

The Supplementary Materials contain the following items:

- *Preregistration* (Schröder et al., 2024S)
- *Supplementary File 1* (Schröder et al., 2026S-a): This supplement includes a table summarizing the estimated marginal means of the results of the linear mixed models assessing warmth and competence evaluations between psychotherapists of four psychotherapy approaches. The plots in Figures 1 and 2 are based on the statistics presented in this table.
- *Supplementary File 2* (Schröder et al., 2026S-b): This supplement contains the data file.

Index of Supplementary Materials

Schröder, J., Shedden Mora, M., Kauff, M., Hermans, B. E., Schweizer, K., Töpfer, N. F., & Trautmann, S. (2024S). *Attitudes towards different theoretical orientations among psychotherapists* [Preregistration]. OSF Registries. https://osf.io/px96t

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EACLIPT

Clinical Psychology in Europe (CPE) is the official journal of the European Association of Clinical Psychology and Psychological Treatment (EACLIPT).

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Mental Health Professionals' Attitudes Towards the Network Theory of Mental Disorders

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Clinical Psychology in Europe, 2026, Vol. 8(1), Article e17941, https://doi.org/10.32872/cpe.17941

Received: 2025-05-08 • **Accepted:** 2025-09-18 • **Published (VoR):** 2026-02-27

Handling Editor: Cornelia Weise, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany

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Supplementary Materials: Code, Data, Materials, Preregistration [see Index of Supplementary Materials]

Abstract

Background: The network theory describes mental disorders as a network of interacting symptoms. While most research on the network theory is based on network analyses of symptom data, little is known about mental health professionals´ attitudes towards this theory. Clinical expertise could offer a valuable additional perspective on the validity of the theory and its applications to clinical practice.

Method: Mental health professionals rated their agreement with propositions of the network theory regarding the phenomenology, aetiology, and treatment of mental disorders in an online survey. Further, the acceptability and appropriateness of possible applications were evaluated. We calculated descriptive statistics and examined associated factors with regression analyses.

Results: The participating psychotherapists (n = 183), specialized physicians (n = 45), and clinical psychologists (n = 29, total n = 257) largely agreed with the network theory's propositions regarding the phenomenology of mental disorders and treatment effects. Appraisal of the network theory regarding the aetiology of mental disorders, regarding important treatment targets, and regarding acceptability and appropriateness of possible applications was mixed. A theoretical background in cognitive behavioural therapy and previous knowledge of the network theory were associated with a stronger agreement in most domains.

Conclusions: The fundamental assumptions of the network approach seem to resonate with mental health professionals, while the consequences for the diagnosis and treatment of mental disorders were questioned. Our findings indicate that the general conceptualization of mental disorders as symptom networks seems to align with mental health professionals' perceptions but,

at the same time, emphasizes the novelty and limited specificity of the theory's implications for clinical practice.

Keywords

network theory of mental disorders, mental health professionals, models of psychopathology, attitudes, survey

Highlights

- Clinicians could provide a novel perspective on the validity of the network theory.
- Most clinicians supported the conceptualization of mental disorders as symptom networks.
- The implications of the network approach regarding treatment targets were considered more critical.
- Core claims of the network theory were supported, but consequences for treatment were questioned.

With accumulating critique for traditional classification systems of mental disorders, the field of clinical psychology and psychiatry has been experiencing a movement towards reconsidering the conceptualization and classification of psychopathology (Eaton et al., 2023; Leucht et al., 2024; Rief et al., 2023). Various new models and frameworks were proposed (e.g., Insel et al., 2010; Kotov et al., 2017; Scheffer et al., 2024b). One prominent new approach, the network approach, describes mental disorders as a network of mutually interacting symptoms (Borsboom, 2017; Borsboom & Cramer, 2013; Scheffer et al., 2024b). Specifically, the network theory proposes that mental health problems develop and persist through causal relations between individual symptoms. While the occurrence of a specific symptom might be originally caused by "external" factors such as stressful life events or neurological problems, reciprocal interactions and feedback loops between symptoms are thought to lead to the persistence of mental disorders (Borsboom, 2017; Cramer et al., 2016; Scheffer et al., 2024b). This conceptualization contrasts to the disease model of mental disorders which posits that symptoms co-occur because of a common underlying cause (Borsboom & Cramer, 2013).

The number of empirical studies that investigate mental disorders from a network perspective is rapidly rising (Fried et al., 2017; Robinaugh et al., 2020; Schumacher et al., 2024) and applications of this approach to clinical practice have been frequently discussed (Blanchard & Heeren, 2022; McNally, 2016; Rodebaugh et al., 2020; Westhoff et al., 2024). It is often suggested that symptom networks can be used for personalized treatment planning, for example, by integrating it in case conceptualization (Burger, Ralph-Nearman, et al., 2022; von Klipstein et al., 2020) or by choosing a treatment target for the individual person (Levinson et al., 2021). According to the network theory, treatment should target 1) external factors that cause specific symptoms, 2) specific symptoms that relate to many other symptoms, i.e., are central in a given network or

3) strong symptom interactions so that the occurrence of individual symptoms ceases to cause other symptoms (Borsboom, 2017).

Empirical evidence for the claims of the network theory is so far rather mixed. For example, empirical evidence for the importance of strongly connected symptoms or for the proposition that symptom networks become less connected through successful treatment is still lacking (Lee et al., 2024; Rodebaugh et al., 2018; Schumacher et al., 2023; Spiller et al., 2020). Further, network analysis faces several methodological challenges, which make the explicit testing of this theory through modelling symptom data difficult (Bastiaansen et al., 2020; Bringmann et al., 2022; Schumacher et al., 2024; Siepe et al., 2025). An important source of evidence that could support, refine, or challenge the network theory of mental disorder is the clinical expertise of mental health professionals. Mental health professionals accumulate information on symptoms of their patients in their daily practice and are, thus, a potential source of information about the phenomenology, aetiology, and treatment of mental disorders. Further, while the network approach to psychopathology is extensively discussed within the scientific community, exchange between clinicians and researchers allows knowledge transfer in both directions and could provide valuable information on how the network approach could be successfully applied to clinical practice (Rodebaugh et al., 2020).

A few studies evaluated mental health professionals' assessments of the feasibility, acceptability and utility of the network approach in clinical practice. The data collection necessary for constructing a personalized symptom network was rated as feasible and acceptable by therapists and patients and therapists stated that symptom networks were helpful and provided new insights (Frumkin et al., 2021; Kroeze et al., 2017; Scholten et al., 2022, 2025). In another study, therapists indicated interest in using personalized symptom networks for case conceptualization and psychoeducation, but few discussed the provided symptom networks with their patients (Hall et al., 2023). Further, the network's interpretation was perceived as challenging (Scholten et al., 2022) and some therapists did not agree that networks would provide additional information for their clinical work (Frumkin et al., 2021). While these studies provide initial insights, they were based on interviews with less than 30 therapists per study. Additionally, they mainly focussed on the application of the network approach to clinical practice, i.e. did not assess attitudes towards the theory. Therefore, a large scale, systematic assessment of the attitudes of mental health professionals regarding the network theory of mental disorders is needed. In the present study, we aimed to investigate (a) to which degree mental health professionals agree with propositions of the network theory regarding the phenomenology, aetiology and treatment of mental disorders, and (b) how acceptable and appropriate they rate potential applications of the network approach in clinical practice.

Method

Procedure

We created an online survey to assess attitudes towards the network theory of mental disorders. The target respondents were mental health professionals, including clinical psychologists (persons with a university degree in psychology without additional training, but working in the field of mental health), psychotherapists (either graduated or in training), and physicians specialized in psychiatry and psychotherapy, psychosomatic medicine, neurology, or child and adolescent psychiatry (either graduated or in training). In Germany, mental health treatments are mostly provided by these professions. All three professions require a university degree in psychology or medicine, and psychotherapists and specialized physicians additionally receive extensive training in psychotherapy and/or their respective field of specialization.

The survey was made available online in English and in German using LimeSurvey (LimeSurvey GmbH, 2024). It was distributed by reaching out to 111 international mental health related associations (e.g. all national organizations of the *International Association for Analytical Psychology* and of the *European Association for Behavioural and Cognitive Therapies*), to 137 German mental health related associations (e.g., all regional chambers of psychotherapists and regional and national psychotherapeutic and psychiatric organizations), and to 77 large European psychiatry clinics. Further, the survey was shared on social media (X, LinkedIn, Instagram) and by reaching out to colleagues. Previous knowledge of the network theory was not required and participants received no incentives.

Before proceeding with the survey, it was pointed out that participation is voluntary and the survey would take a maximum of 20 minutes. All participants had to consent to the privacy statement (only personally non-identifiable data were collected) and to take part in this study. The data collection started in October 2023, and the last included response was recorded in June 2024. We aimed to achieve a sample size of 250 respondents, as simulations indicated that sufficient precision for descriptive analyses can be achieved with this sample size. The study design was preregistered on the open science framework: https://osf.io/g7zy3. We did not specify specific hypotheses. The study was approved by the local psychological ethics committee of the centre of psychological medicine at the University Medical Centre Hamburg Eppendorf (LPEK-0607).

Questionnaire

The questionnaire was based on previously published presentations of the network theory by Borsboom and Cramer (Borsboom, 2017; Borsboom & Cramer, 2013). It was first developed in English and then translated to German with the help of ChatGPT (OpenAI, 2023). The first version was tested and adjusted for better comprehensibility with the help of two psychotherapists. Several clinical researchers assessed the final implemented version for mistakes and intelligibility.

The survey included 48 questions in total. Eight questions assessed demographic variables. Subsequently, a description of the network theory of mental disorders was shown. It was described how the network theory explains the development and persistence of psychological symptoms and what consequences this has for the treatment of mental disorders. The network approach was contrasted with the disease model of psychopathology, which states that symptoms share a common underlying disorder. Both models were described using the example of depression and depicted with corresponding diagrams (see Supplementary Materials [Schumacher & Kriston, 2025S] for the full description). Participants were asked if they knew about the network theory and if they had knowingly used a treatment planning tool or an intervention based on the network approach before. Then, participants were asked how strongly they agree or disagree with specific propositions of this theory. These propositions related to three domains: the phenomenology, the aetiology, and the treatment of mental disorders. All items referred to mental disorders or symptoms in general and not to a specific mental health problem or disorder. One statement related to the overall agreement with the network theory and four statements relating to the disease model were also incorporated.

Additionally, we were interested in the acceptability and appropriateness of possible applications of the network approach to clinical practice. Acceptability and appropriateness were defined as important outcomes for successful implementation of new practices (Proctor et al., 2011). We asked for the level of agreement with the acceptability and appropriateness of specific applications, mainly relating to the use of symptom networks for treatment planning and outcome monitoring. Wording was inspired by a validated measure of acceptability ("I would like to use...") and appropriateness ("It seems fitting to use…", Weiner et al., 2017). Finally, we assessed the extent that mental health professionals already implicitly implemented the network approach in their practice, i.e. if they previously considered symptom interactions in their practice. The level of agreement for each proposition could be answered on a seven-point Likert scale from "strongly disagree" (-3) to "strongly agree" (3).

Participants could also indicate if they would like to use tools or techniques based on the network approach in any other way in their practice and give any other comment in two open text questions. Two questions were included to test for automated responding. The complete questionnaire can be found in the Supplementary Materials.

Measurement Properties of the Questionnaire

To evaluate if mean scores for the agreement in each domain can be calculated, we assessed the measurement properties of the questionnaire. More specifically, we used confirmatory factor analyses to assess the fit of one-factor models for measuring agreement with the network theory regarding the phenomenology, aetiology, and treatment of mental disorders and the acceptability and appropriateness of possible applications. An acceptable to good fit was shown for measuring agreement with the network theory's

propositions on the phenomenology and aetiology of mental disorders and for measuring acceptability and appropriateness. The one-factor model for agreement with the network theory's propositions regarding the treatment of mental disorders showed poor fit. Here, a two-factor model showed good fit. One factor indicated agreement with the network theory regarding treatment effects, e.g. that effective treatment leads to a reduction in symptom interactions, and the other factor measured agreement with treatment targets as proposed by the theory, e.g. that treatment should target individual symptoms and their interaction. Thus, a mean score was computed for agreement with the network theory's propositions regarding the phenomenology and aetiology of mental disorders, treatment targets, treatment effects, and for the acceptability and appropriateness of possible applications. Previous considerations of symptom interactions in practice can be interpreted as formative indicators of a composite latent variable, thus, a mean score was also computed for this domain. The mean score was also computed when the response was missing for one item of the respective domain. The complete psychometric evaluation of the questionnaire is reported in the Supplementary Materials.

Statistical Analysis

Data from all respondents that answered at least one question regarding the network theory of mental disorders were included. Data were excluded if the respondent indicated no mental health profession or answered both attentiveness checks wrong. The main outcome was descriptive statistics for the agreement with propositions of the network theory and the acceptability and appropriateness of possible applications. For each statement, we evaluated the level of agreement using mean scores, standard deviations, and ranges. Further, we used Bayesian linear regression analyses to assess which variables were associated with agreement in each domain of the network theory, the acceptability, appropriateness of its application, and previous considerations of symptom interactions in practice. First, age, being in training, mental health profession, work experience, and theoretical background were entered as predictors. Second, we added previous knowledge of the network theory and previous use of a treatment planning tool or intervention based on the network approach as predictors. We used Markow-Chain-Monte-Carlo sampling with weakly informative priors and 40,000 iterations to estimate the regression model with brms (Bürkner, 2017) in R 4.3.3 (R Core Team, 2013). Data is openly available (https://osf.io/zan2q/files).

Results

Sample Description

While the online survey was accessed 356 times, 265 persons answered at least one question regarding the network theory. Data was excluded for five persons who answered

both attentiveness checks wrong, for one person who answered "neither agree nor disagree" for all questions, and for two persons who indicated that they only work as scientists. Demographic information of all 257 included participants is displayed in Table 1.

Table 1

Demographic Information

Variable	*N* (relative frequency)
Gender	
female	185 (72.0%)
male	67 (26.1%)
non-binary	1 (0.4%)
rather not say	4 (1.6%)
Age	
18-30 years	42 (16.3%)
31-50 years	126 (49.0%)
51-70 years	76 (29.6%)
> 70 years	12 (4.7%)
rather not say	1 (0.4%)
Profession[a]	
Clinical psychologist	29 (11.3%)
Specialized physician	45 (17.5%)
Psychotherapist	183 (71.2%)
Training Status	
No	180 (70.0%)
Yes	77 (30.0%)
Proportion Completed Training	
1-20%	10 (13.0%)
21-40%	10 (13.0%)
41-60%	13 (16.9%)
61-80%	18 (23.4%)
81-100%	26 (33.8%)
Theoretical Background[b]	
Cognitive behavioural	177 (68.9%)
Psychodynamic / psychoanalytic	83 (32.3%)
Other	50 (19.5%)

[a]Data missing for two respondents. [b]48 participants indicate several theoretical backgrounds.

Most participants were female, between 31 and 50 years old, and from Germany. About one third of the sample was currently in training, and of these, the majority had completed at least 60% of their training. Nearly three-quarters of the sample were psychotherapists, 17.5% specialized physicians (specialization in child and adolescent psychiatry, psychiatry, psychosomatic medicine, and/or neurology) and 11.3% clinical

psychologists. Nearly 70% of the mental health professionals indicated a background in cognitive behavioural therapy, 32.3% in psychodynamic or psychoanalytic treatment, and about 20% indicated a different theoretical background (48 participants indicated multiple theoretical backgrounds). The mental health professionals had a mean of 16 years of work experience, ranging from one to 50 years.

The majority of the sample did not hear about the network theory before (70.8%), never used this approach for treatment planning (93.0%) and never knowingly administered an interventions based on the network approach (84.8%). The majority of the participants filled out the survey in German (93.0%) and the mean completion time was 15.8 minutes. All questions related to the phenomenology, aetiology, and treatment of mental disorders were answered completely by 245 participants, and 236 participants also answered all questions regarding the acceptability and appropriateness of possible applications, i.e., finished the complete survey.

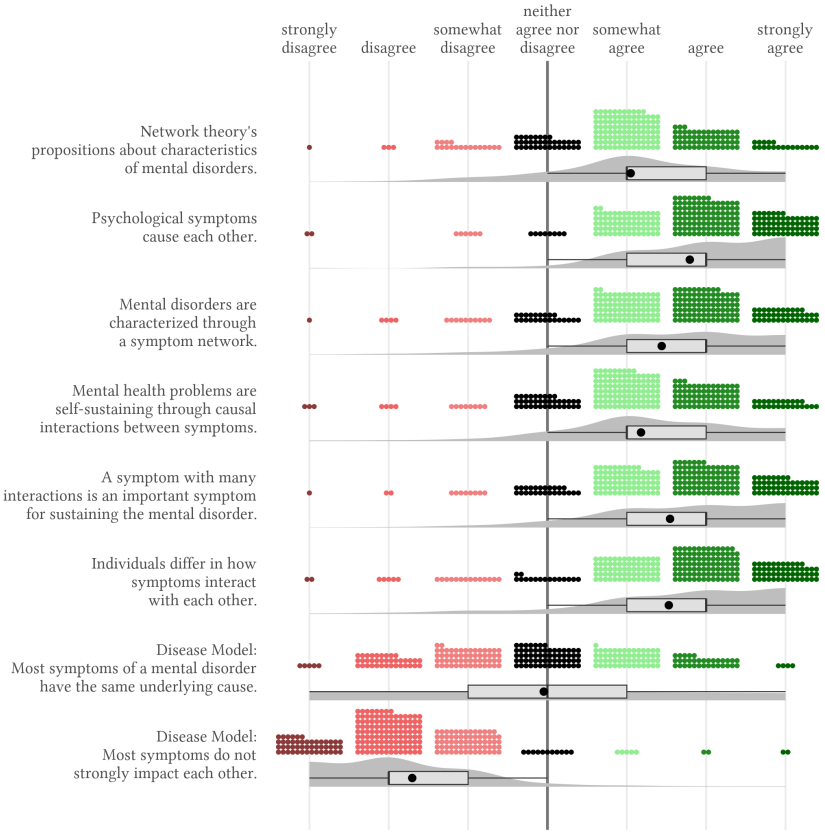
Agreement With the Network Theory

We found consistent agreement with propositions of the network theory regarding the phenomenology of mental disorders (Figure 1). The vast majority of participants rated all network theory's propositions on the phenomenology at least moderately positively. The mean score for the agreement in this domain was 1.4, SD = 0.8 (scale ranges between -3 indicating strong disagreement, to 3 indicating strong agreement). Propositions of the disease model, this means the statements that most symptoms do not strongly impact each other and that most symptoms have the same underlying cause were, on average, evaluated negatively, M = -1.7, SD = 1.0 and M = -0.1, SD = 1.4. Participants strongly differed in their ratings of the network theory's propositions regarding the aetiology of mental disorders, with a mean level of 0.7, SD = 1.1 (Figure 2). Still, we found that participants rated the proposition that strong symptom interactions pose a risk for the development of mental disorders moderately positively, M = 1.1, SD = 1.1.

Attitudes towards propositions of network theory regarding the treatment of mental disorders differed between two aspects of treatment (Figure 3). The evaluation of statements proposing that treatment targets should be selected according to the network theory was very mixed, M = 0.5, SD = 1.2. On the other hand, we found strong support for propositions regarding treatment effects, i.e., that treatment changes the activation of specific symptoms and symptom interactions, M = 1.5, SD = 0.8. Finally, we found strong agreement for the disease model's proposition that treatment should target the underlying cause of the mental disorder and that effective treatment leads to global improvements across all symptoms, M = 1.5, SD = 1.1 and M = 1.41, SD = 1.09.

Figure 1

Agreement With Propositions of the Network Theory on the Phenomenology of Mental Disorders

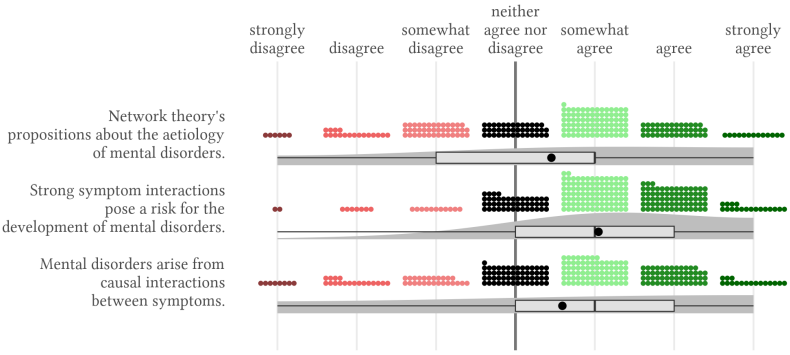


Note. The small coloured dots represent each response and the grey shaded area represents the estimated distribution of responses. The light grey box represents the interquartile range containing the middle 50% of the data. The black vertical line and the black dot show the median and the mean response for each statement.

Agreement with the network theory's propositions regarding the phenomenology and aetiology of mental disorders, treatment targets, and treatment effects correlated moderately with each other (see Table S1 in the Supplementary Materials).

Figure 2

Agreement With Propositions of the Network Theory on the Aetiology of Mental Disorders



Note. The small, coloured dots represent each response and the dark grey shaded area represents the estimated distribution of responses. The box represents the interquartile range containing the middle 50% of the data. The vertical black line and the black dot show the median and the mean response for each statement.

Variables Associated With Agreement With the Network Theory

Detailed results of the Bayesian linear regression analyses are presented in Table S2 in the Supplementary Materials. Age, gender, being in training, work experience, mental health profession, and theoretical background could explain agreement to the network theory's propositions regarding the phenomenology, aetiology, treatment targets and treatment effects only to a limited extend as indicated by the Bayesian R^2 ranging between .01 and .28. Still, a background in cognitive behavioural therapy was related to a more positive evaluation of the network theory regarding the phenomenology of mental disorders and treatment targets, b = 0.40 [95% credibility interval: 0.01 − 0.79] and b = 0.69 [0.20 − 1.18]. Having heard about the network theory and having used an intervention based on the network approach was related to stronger agreement with the network approach regarding the phenomenology of mental disorders, b = 0.36 [0.13, 0.60] and b = 0.43 [0.10, 0.76], and regarding important treatment targets, b = 0.33 [0.03, 0.64] and b = 0.55 [0.11, 0.98].

Agreement With Possible Applications

We found that applications of the network approach to clinical practice were rated, on average, somewhat appropriate and slightly less acceptable, M = 1.2, SD = 1.1 and M = 0.9, SD = 1.3, respectively (see Figure S1 and S2 in the Supplementary Materials). However, especially the evaluation of acceptability varied to a large extend between the participants. Further, most participants considered symptom interactions in their clinical practice in general, M = 1.1, SD = 1.3, but few have used the symptom interactions

to plan or monitor treatment, M = 0.1, SD = 1.7, and M = -0.1, SD = 1.7, respectively. While previous consideration of symptom interactions correlated moderately with the other domains, the correlation of appropriateness and acceptability with agreement in the other domains was rather high (see Table S1 in the Supplementary Materials).

Figure 3

Agreement With Propositions of the Network Theory on the Treatment of Mental Disorders

Note. The small, coloured dots represent each response and the dark grey shaded area represents the estimated distribution of responses. The box represents the interquartile range containing the middle 50% of the data. The vertical black line and the black dot show the median and the mean response for each statement.

Variables Associated With Agreement With Possible Applications

Detailed results of the Bayesian linear regression analyses on associated factors for the acceptability and appropriateness of possible applications and the previous consideration of symptom interactions are displayed in Table S3 in the Supplementary Materials. Age, gender, being in training, work experience, mental health profession, and the theoretical background of the participants could explain 28.2 and 26.4% of the variance in the acceptability and appropriateness ratings of possible applications. Being a physician (in comparison to psychotherapists) and having a background in cognitive behavioural therapy was associated to a stronger agreement with the acceptability and appropriateness of possible applications of the network approach. Being between 31 years and 50 years old (compared to being 18 to 30 years old) and having a background in psychodynamic or psychoanalytic therapy was related to lower ratings of the acceptability and appropriateness. Additionally, we found that physicians (in comparison to psychotherapists) and participants with a background in cognitive behavioural therapy more strongly agreed to have considered symptom interactions in their work before.

Additional Comments

Thirty-six participants (14.0%) provided additional comments on how the network approach could be used in clinical practice and 66 participants (25.7%) provided general additional comments. Most comments indicated a negative evaluation of the network theory. First, it was emphasized that the theory does not provide new insights, because considering symptom associations is already an established clinical practice. Second, it was commented that the focus on symptoms and their interactions is too superficial and disregards the underlying (biological) cause. Some participants also commented positively that the network approach provides a useful framework for an intuitive clinical practice.

Discussion

To consider clinical expertise in evaluating the validity of the network theory of mental disorders and to assess the acceptability and appropriateness of possible applications, we conducted an online survey with mental health professionals. The participants largely agreed with the network theory in regard to the phenomenology of mental disorders, e.g., that mental disorders are characterized through a symptom network, and in regard to treatment effects, e.g., that symptom interactions change through treatment. The level of agreement was very mixed for the network theory's propositions regarding the aetiology of mental disorders and treatment targets. While possible applications of the network approach to clinical practice were rated, on average, somewhat acceptable and appropriate, participants varied largely in their ratings. A theoretical background in

cognitive behavioural therapy, being a specialized physician, and previous knowledge or experience with the network theory were associated with more positive ratings of the theory and its application. While many mental health professionals considered symptom interactions in their practice, few used them for treatment planning or monitoring. Further comments showed that some participants did not see any novelty in the network approach, and some note that the network theory disregards the underlying cause of symptoms.

The current study provides a new perspective on the validity of the network theory: the expertise of practicing mental health professionals. Interestingly, our findings align rather well with previous findings based on network analyses with symptom data. The general conceptualization of mental disorders as symptom networks and its meaning for treatment effects was supported, similar to studies on symptom data showing that symptoms are associated with each other, and that symptom interactions seem to change through treatment (Cramer et al., 2016; Fried et al., 2017; Fried & Nesse, 2015; Schumacher et al., 2023). At the same time, specific implications of the network conceptualization for treatment, i.e. defining specific symptoms or symptom interactions as treatment targets, were seen more critical. This aligns with findings based on cross-sectional network analyses indicating that network connectivity and change in central symptoms may not relate to treatment response (Lee et al., 2024; Rodebaugh et al., 2018; Spiller et al., 2020).

The inconsistency of agreeing with the importance of causal symptom interactions and disagreeing with consequences of this assumption for treatment, i.e. targeting these interactions, might reflect the novelty of the network approach. Up until now, major classification systems define symptoms as merely passive agents, indicative of an underlying disorder, and treatment guidelines hardly focus on specific symptoms and their interactions (American Psychiatric Association, 2013; Hofmann & Hayes, 2019; Kendler, 2019). This is in line with the strong agreement of mental health professionals for targeting the underlying cause of mental disorders, found in this study. While the network theory does not disregard "external" causes for individual symptoms, it shifts the attention to the problem-maintaining process, i.e. symptom interactions. For a person with strong positive symptom interactions, a small external trigger can lead to the occurrence of many additional symptoms (Cramer et al., 2016; Lunansky et al., 2025; Scheffer et al., 2024a, 2024b). If we assume that symptoms cause each other and that there is no common underlying cause for *all* symptoms, treatment has to address symptom interactions to lead to a resilient, healthy state (Lunansky et al., 2025; Scheffer et al., 2024a). Currently, the field might be transitioning away from the previously dominant paradigm of the disease model towards new approaches to the classification and conceptualization of mental disorders, possibly causing conflicting theoretical models and observations (Eaton et al., 2023; Kuhn, 1996; Rief et al., 2023).

Additionally, our somewhat contradicting findings might be related to the limited specificity of the network theory. While it describes a general framework for conceptualizing and treating mental disorders, specific consequences for diagnosis and treatment of (specific) mental disorders remain vague. Similarly, the network conceptualization might be suitable for some mental disorders but not for other disorders (Fried & Cramer, 2017).

Application of the Network Theory

The network approach could potentially provide a framework for systematically considering symptom interactions in the diagnosis and treatment of mental disorders (von Klipstein et al., 2020). Person-specific symptom networks could provide a standardized basis for case conceptualization (Burger, Epskamp, et al., 2022; Vogel et al., 2025; von Klipstein et al., 2020) and might be used for psychoeducation and selection of treatment targets (Levinson et al., 2022; Meier et al., 2022). Further, the network approach is reflected in calls for process-based therapy, which focuses on targeting symptom maintaining processes (Hofmann & Hayes, 2019). However, similar to previous studies, we found rather mixed agreement with the acceptability and appropriateness of possible applications of the network approach. Methodological challenges for person-specific networks based on empirical symptom data remain, and guidelines for network construction are only slowly emerging (Mansueto et al., 2023; Schumacher et al., 2024; Vogel et al., 2025). Given the currently available methods, the interpretation of person-specific networks should be seen as mainly hypothesis generating (von Klipstein et al., 2020). It also remains difficult to derive direct treatment applications from a person-specific symptom network (Levinson et al., 2021). Given the juvenile state of current applications, mixed findings in regard to mental health professionals ratings of the acceptability and appropriateness of possible applications are not surprising. Before applications of the network theory should be established, more knowledge on the theory itself and on the specific methodologies to derive symptom networks is indispensable.

Limitations and Future Research

Our results might not generalize to mental health professionals working in other countries, as the majority of the sample was living in Germany. Second, due to privacy reasons, we did not collect data on racial/ethnic identification, measures of income, and socioeconomic status; thus, the impact of these variables could not be assessed. Similarly, we did not assess which problems were typically treated by the included mental health professionals. Although all survey items related to mental disorders or symptoms in general, participants might have considered a specific disorder when answering the questions, possibly influencing their answers. Finally, mental health professionals rated the acceptability and appropriateness of hypothetical applications of the approach. Rat-

ings might have differed for actual implementations, i.e., if mental health professionals would have actually used tools based on the network approach in their practice.

Future research needs to further assess the validity of the network theory of mental disorders. On the one hand, studies might analyse empirical symptom data, for example assessing how certain network structures relate to mental health (problems). Hereby, methodological challenges for network analyses and a match between theoretical assumptions and the statistical model should be considered. On the other hand, existing clinical expertise could be further considered, for example by conducting interviews with experienced mental health professionals. Existing clinical theories might be mapped onto the network conceptualization. It needs to be considered to what extent a thorough understanding of the network theory is needed to evaluate its validity and usefulness for clinical practice and if the network approach is applicable to all kinds of different mental health problems. Combining various sources of information, i.e. empirical symptom data and clinical expertise, will hopefully lead to a better understanding of mental disorders.

Conclusion

We showed that mental health professionals agree with central claims of the network theory, however, most of them were hesitant in regard to the applications of this approach. Mixed results for the appropriateness and acceptability of possible applications in clinical practice might reflect the early state of these applications. The theory itself, methods for network construction, and the consequences of the network theory for treatment planning and evaluation must be better understood before this approach can be responsibly applied to clinical practice. Still, the conceptualization of mental disorders as symptom networks seems to resonate with mental health professionals and might be an important component of a potential new paradigm for the diagnosis and treatment of psychopathology.

Funding: The authors received no funding from an external source.

Acknowledgments: We would like to thank Claudia Glissmann and Judit Ralbovszki for their help in implementing and distributing this online survey and Verena Paul and Viola Loew for their feedback on earlier versions of the survey.

Competing Interests: The authors declare none.

Author Contributions: *Lea Schumacher*: Conceptualization, Methodology, Formal Analysis, Investigation, Data Curation, Visualization, Writing - Original Draft; *Levente Kriston*: Conceptualization, Methodology, Supervision, Writing - Review & Editing.

Ethics Statement: The study was approved by the local psychological ethics committee of the centre of psychological medicine at the University Medical Centre Hamburg Eppendorf (LPEK-0607).

Preregistration: The study design was preregistered on the open science framework: https://osf.io/g7zy3. We did not specify specific hypotheses for the outcome.

Reporting Guidelines: We followed the JARS–Quant reporting guidelines for empirical research.

Related Versions: The original (not peer-reviewed) version of this manuscript has been uploaded as a preprint on PsyArXiv: https://osf.io/preprints/psyarxiv/462cs

Data Availability: The supplementary materials, the code, and the analysed data is openly available on the Open Science Framework: https://osf.io/zan2q/files

Supplementary Materials

The Supplementary Materials contain the following items:

- Preregistration (Schumacher & Kriston, 2023S)
- Research data, code, and additional materials (Schumacher & Kriston, 2025S)

Index of Supplementary Materials

Schumacher, L., & Kriston, L. (2023S). *A clinical perspective on the network theory of mental disorders* [Preregistration]. OSF Registries. https://osf.io/g7zy3

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Insufficient Quality of Mental Health Information on German-Speaking TikTok: A Content Analysis

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Clinical Psychology in Europe, 2026, Vol. 8(1), Article e17279, https://doi.org/10.32872/cpe.17279

Received: 2025-03-10 • **Accepted:** 2025-10-19 • **Published (VoR):** 2026-02-27

Handling Editor: Winfried Rief, Philipps-University of Marburg, Marburg, Germany

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Supplementary Materials: Materials [see Index of Supplementary Materials]

Abstract

Background: The increasing popularity of mental-health information on social media platforms such as TikTok is raising concerns regarding misinformation. Previous research is limited to single disorders and videos in the English language only. Our objective was to investigate the quality of mental health information on German-language TikTok for a broader spectrum of disorders.

Method: Thirty German-language TikTok-videos of each of the six most viewed hashtags on mental disorders (attention-deficit and hyperactivity disorder (ADHD), depression, autism, anxiety disorder, narcissism and post-traumatic stress disorder (PTSD)) were classified regarding authorship and rated either as “correct”, “overgeneralized”, “incorrect” or “subjective experience”. The modified DISCERN (mDISCERN) and the Global Quality Scale (GQS) were used to rate reliability and quality of information for patients.

Results: The 177 videos finally included in this study gathered a total of 94,348,220 views and 19.2% (n = 34) of the videos were rated as correct, 33.3% (n = 59) as incorrect, 18.1% (n = 32) as

overgeneralized and 29.4% (n = 52) as personal experience. Chi-Square tests and Kruskal-Wallis tests showed significant relationships between either authorship or diagnosis and quality and reliability. Videos on PTSD and videos by expert authors showed the best and videos on narcissism and videos by laypeople the worst overall results.

Conclusion: With around half of the analyzed videos supplying incorrect information, the quality of German-language TikTok mental health content is insufficient. Differences in the quality of content seem to be influenced by the topic and the authorship. Healthcare institutions and clinicians should be aware of this, educate patients accordingly, and could improve the quality of information by participating in online discourses.

Keywords

TikTok, misinformation, ADHD, ASD, depression, anxiety, narcissism, PTSD

Highlights

- Videos on mental disorders are a viral topic on TikTok.
- Over 50% of the screened videos include incorrect or misleading information.
- Healthcare institutions, experts and therapists should educate patients accordingly.

"Narcissist do not love" or "people with ADHD love chaos" – statements like these fill countless videos on mental health topics on social media platforms such as TikTok. As one of the most downloaded and fastest growing social media platforms, TikTok is mostly used by younger people (ARD & ZDF, 2023; BBC News, 2021). Characterized by mainly self-produced, short video clips, TikTok is increasingly gaining public attention as a (dubious) source of information regarding (mental) health issues (Altrock & Kruckenhauser, 2022; Basch et al., 2022; Bonnen, 2024; Chochol et al., 2023; Clark, 2021; Haddadian, 2023; Kong et al., 2021; Lukić & Petrović, 2023; Sun et al., 2023).

The presentation of mental health on TikTok might lead to potential problems ranging from self-diagnosing to the glorification of mental disorders (Ahuja & Fichadia, 2024; Gilmore et al., 2022; Haltigan et al., 2023; Harness & Getzen, 2022; Monteith et al., 2024; Rettew, 2024). Even cases of a suspected social media-induced mass hysteria with tic-like symptoms have been reported (Giedinghagen, 2023; Müller-Vahl et al., 2022). Mental and public health information on TikTok yields potential advantages reaching young viewers but raises the question of whether viewers can distinguish between professional, correct information and misinformation (McCashin & Murphy, 2023). Further, the quality of information about mental disorders on TikTok is, itself, a cause for concern as studies on English language TikTok videos imply that the information in at least half of the videos on attention deficit and hyperactivity disorder (ADHD) and autism spectrum disorder (ASD) is misleading or just plain wrong (Aragon-Guevara et al., 2025; Karasavva et al., 2025; Yeung et al., 2022). Some studies even report around 90% of videos to be

misleading (Verma & Sinha, 2025). Numbers that high can be a reason for concern. For other disorders, no systematic evaluation is available yet.

With mostly young viewers, these videos potentially reach an audience that has already been distressed by the COVID-19 pandemic (Blackwell et al., 2022; Jones et al., 2021; Panchal et al., 2023). This might be especially problematic for those who experience symptoms like attention deficits, anxiety, sleep problems or depressive mood, as they have already been shown to exhibit excessive social media use or a higher risk of social media misuse (Bickham et al., 2015; Bozzola et al., 2022; Hoge et al., 2017; Montag & Markett, 2024).

Thus, it is plausible to assume that this group might also turn to social media in an attempt to make sense of their symptoms but might then be faced with incorrect and misleading information, potentially leading to adverse effects. It is important to note that medical misinformation might lead to delayed or ineffective treatment, potentially prolonging and enhancing individual suffering and leading to chronification. As an example, a teenager who mistakes their symptoms of generalized anxiety disorder for ADHD symptoms might not seek appropriate therapeutic support. As Basch et al. (2022) argue, it is crucial to further examine prevalence and quality of mental health content on social media to understand possible effects on young people. Potential misassessment of disorders or symptoms by TikTok users could have important consequences for practitioners and their therapeutic interventions that need to be understood as well. For example, patients might adopt the incorrect use of professional jargon from social media (Chevalier, 2024), making mutual understanding between patient and practitioner more difficult.

To our knowledge, there has not yet been a study that has investigated the quality and possible differences of mental health information on TikTok for a broader spectrum of diagnoses, allowing a sufficient evaluation of content quality. However, as disorders differ in their social perception and theoretical complexity, it is likely that videos concerning these disorders also differ in accuracy. Compared to the complex scientific theories on ADHD, the origin of a post-traumatic stress disorder (PTSD), might be much easier to explain in a short video as, for example, a result of something specific that happened to someone. With only English videos having been analyzed to date, the situation for other languages and cultural areas remains unknown. Thus, our aim for this study was to examine the quality of information on the most popular mental health topics on German-speaking TikTok. In contrast to previous research, we expanded the analysis to a broader number of different disorders. Similar to previous studies, we expected a large proportion of videos with incorrect content. In addition, we expected differences in the quality of information between different disorders. We also investigated whether authorship might influence the quality of content (e.g., videos by mental health experts being more correct than those made by laypeople).

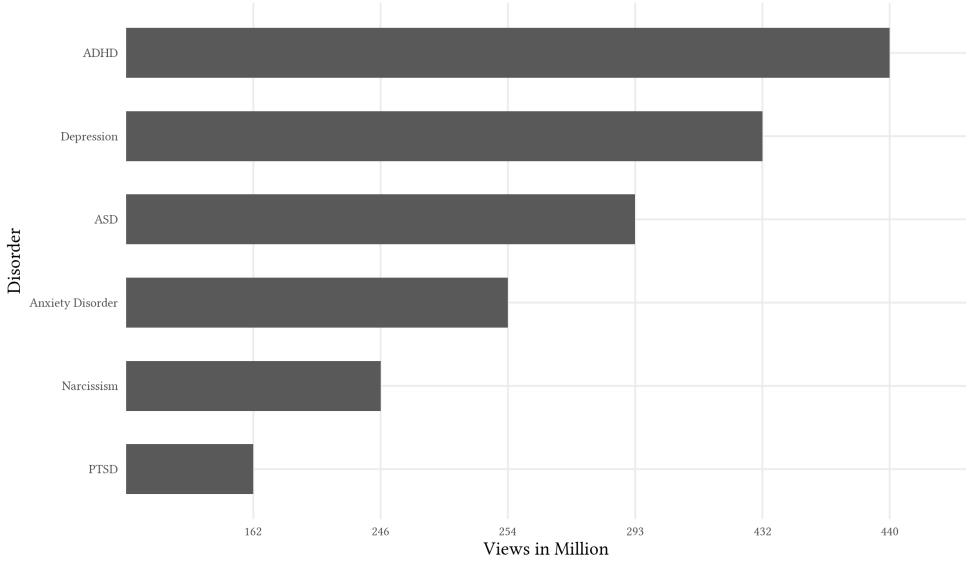
Method

Sample

To achieve a comprehensive overview of viral mental health topics on TikTok, a TikTok account was created to follow the six German-language hashtags about mental disorders that have the highest overall views (see Figure 1).

Figure 1

Overview of German-Language Hashtags Related to Mental Health on TikTok With the Highest Cumulative View Counts



Note. The six most viewed hashtags on mental disorders on German-language TikTok on January 4th, 2024. Original German hashtags were: #ADHS; #Depression; #Autismus; #Angststörung; #Narzissmus; #PTBS.

For each disorder, the first 30 German videos were included, sorted by the proprietary TikTok app algorithm. Exclusion criteria were languages other than German, videos unrelated to the disorder, and videos not including information about the disorder that could, accordingly, not be evaluated by the rating criteria used in this study. From January 4th, 2024, to February 14th, 2024, a total of 180 videos were downloaded for assessment via a free online tool (https://ssstik.io/). Three videos were excluded, resulting in 177 included videos. Videos were excluded as not ratable with reference to diagnostic criteria for the following reasons: one video was only comprised of motivational speech such as "you are valuable", one gave advice on how to behave towards depressed individuals, and one gave information about genetic predisposition of ASD. No intended sample

size was calculated but we conducted a sensitivity analysis in G*Power (Faul et al., 2007) revealing that the current sample was sufficiently powered (1-β = .80, α = .05) to detect small to medium effects (w = .277). Meta data was extracted as visible on the TikTok app, supplying rounded-up numbers for views, likes and comments. The procedure was chosen to be representative of the experience a user might have searching for a diagnosis on TikTok.

Rating Procedure

Ratings to assess the quality of the content were independently conducted by two clinical psychologists with diagnosis experience in both in- and outpatient settings (AM, BL). In keeping with previous, comparable research (Aragon-Guevara et al., 2025; Yeung et al., 2022), videos were rated as (a) correct, (b) overgeneralized, (c) incorrect or describing (d) subjective experience, to allow comparability of results. Videos that contained both incorrect information as well as subjective descriptions were rated as incorrect. Authorship of the video was rated as (a) expert, (b) affected individual or (c) layperson, according to the information given in the videos. For detailed information on the categories, see Table 1.

Table 1

Explanation of the Rating Levels Used in This Study

Category	Explanation
Correct	Presents core symptoms of and information on the disorder correctly
Overgeneralized	Presents symptoms and information that are typical for mental disorders but do not belong to core symptoms of the disorder or describes undifferentiated and overgeneralized symptoms
Incorrect	Presents symptoms that are not symptoms of the disorder or common phenomena of daily life or wrong information
Subjective experience	Subjective and personal experience by affected individuals
Expert	An expert who (by self-declaration) underwent an officially regulated education or attended an official healthcare institution regulated by German social law (e.g. psychologist or psychotherapist, medical doctor, psychiatric nurse)
Affected person	A person who received the diagnosis by an official healthcare institution/expert
Layperson	A person who is neither of the above. This includes alternative practitioners and coaches, who by German law do not have to undergo professional and regulated education or training

Differences in the ratings were later discussed by the two mentioned raters, and a final rating was conducted by mutual consent. The Kappa statistic of the initial quality ratings was .813 ($p < .001$), indicating very good inter-rater reliability. A decision by mutual consent was required for 19 videos, 17 of which differed by just one rating level (e.g. misinformation – overgeneralized).

Standardized Assessments

For a quantitative assessment of the quality of the information for patients, videos were rated by the same two raters on the Global Quality Scale (GQS; Steeb et al., 2022; Uzun, 2023), a five-point Likert scale ranging from "very poor quality" to "excellent quality" based on video quality, flow of information (e.g. comprehensible sequence of information, no abrupt changes in topic) and usefulness of information. Reliability of the information provided in the videos was assessed using the modified DISCERN (mDISCERN), a shortened version of the DISCERN (Charnock et al., 1999; Singh et al., 2012; Uzun, 2023), supplying a five-point Likert scale ranging from "unreliable" to "very reliable". The mDISCERN consists of five yes/no-questions, leading to a maximum of five points on the scale (with higher values corresponding to better quality). Questions referred to understandability, validity of cited sources, unbiased/balanced content, additional sources, and mention of uncertainty (for both GQS and mDISCERN, see the Supplementary Materials). Both scales were chosen to allow future research to achieve comparability and are already frequently used in similar research on medical information. Furthermore, we think that a more viewer-focused scale (GQS) combined with a more science-focused measure (mDISCERN) covers two important aspects of mental-health information on social media.

Statistic Procedure

Statistical analyses were performed in SPSS v29. For the inter-rater reliability, Cohen's Kappa was calculated on the initial independent ratings. To examine if the quality of the content was associated with authorship and disorder, non-parametric chi-square contingency analyses with Cramér's V were calculated as a measure for strength of the association. Chi-square tests allow a calculation of an association between two categorial variables via a comparison of the found distribution with the theoretically expected one. Kruskal-Wallis-Tests with Bonferroni-corrected significance levels were used to examine the associations with the GQS and mDISCERN, assuming non-normally distributed data. Effect sizes for the Kruskal-Wallis-Tests were reported according to Cohen (2009). Kruskal-Wallis is a nonparametric test that can be used to calculate differences between two or more groups when the data is not normally distributed and, thus, criteria for an ANOVA are not met.

Ethical Consideration

With only publicly available material being included and consistent with previous comparable research (Yeung et al., 2022; Zea Vera et al., 2022) as well as in accordance with the German law, no ethics approval was obtained. No identifiable information or personal data is included in this manuscript.

Results

Basic Video Characteristics

The 177 rated videos had a total amount of 94,348,220 views with an average of 533,040 (range 569 – 15,300,000) per video and 7,401,638 likes in total with an average of 41,817 (range 116 – 1,100,000) per video. Thirty-two (18.1%) of the videos were uploaded by experts, 88 (49.7%) by affected persons and 57 (32.2%) by laypeople. Of the 177 Videos, 19.2% (n = 34) were rated as correct, 33.3% (n = 59) as incorrect, 18.1% (n = 32) as overgeneralized and 29.4% (n = 52) as personal experience. The videos showed an average GQS of 1.82 (SD = .966, range 1 – 5) and mDISCERN of 1.34 (SD = .655, range 1 – 4). The detailed video characteristics by authorship and diagnosis are listed in Table 2. No statistically significant correlations between views and likes for authorship, rating or diagnosis were found.

Table 2

Detailed Video Characteristics by Diagnosis and Authorship

	View		Likes		GQS		mDISCERN	
Variable	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
Expert	321,434.59	520,054.03	29,438.06	616,607.76	2.37	1.04	1.66	.75
Affected	517,502.63	1,691,093.59	43,950.55	128,422.65	1.94	1	1.35	.64
Layperson	675,826.00	977,509.45	45,473.19	97,989.21	1.33	.58	1.15	.56
ADHD	1,037,291.30	2,781,738.19	82,927.27	209,378.81	1.60	.76	1.24	.52
Anxiety	781,654.45	1,065,755.75	81,498.52	127,779.59	1.52	.75	1	0
ASD	395,728.90	584,023.51	23,520.28	30,548.51	1.81	.88	1.37	.74
Depression	236,367.90	481,821.85	27,457.86	64,463.19	1.90	.98	1.52	.83
Narcissism	634,197.23	857,910.16	26,257.67	45,173.47	1.17	.38	1	0
PTSD	106,825.93	222,304.63	9,475.57	23,038.96	2.93	1.03	1.93	.70

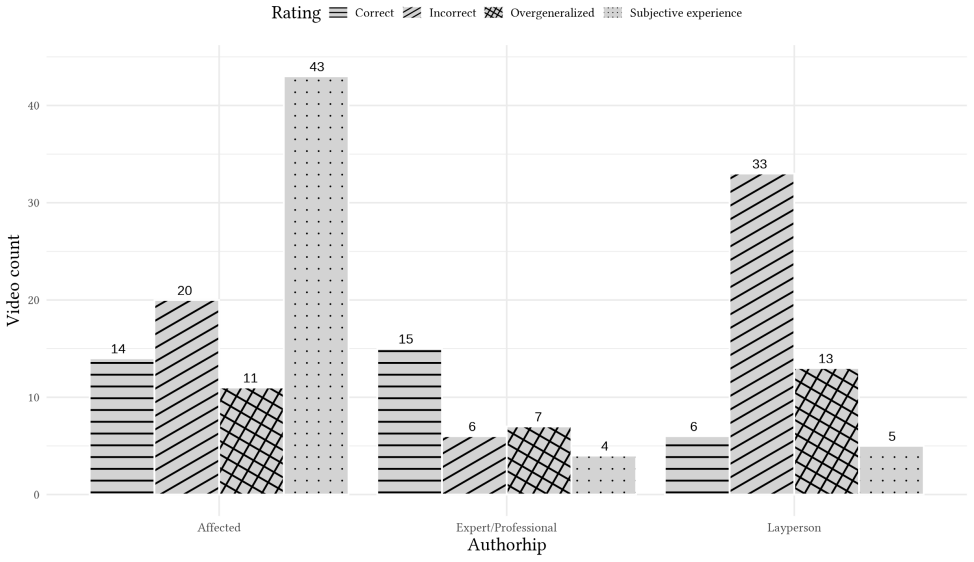
Note. PTSD = post-traumatic stress disorder; ADHD = Attention-Deficit and Hyperactivity Disorder; ASD = Autism-Spectrum-Disorder; Anxiety = includes anxiety disorders such as social anxiety, panic disorder and generalized anxiety disorder from the DSM-5; Depression = includes all depressive disorders from the DSM-5.

Association of Quality of Content and Authorship

The differences in quality of content based on authorship can be seen in Figure 2. A Chi-square test of independence revealed that the rated quality of information differed statistically significantly by authorship ($\chi^2(6, n = 177) = 57.618$, $p = .001$), showing medium associations ($CC = .496$, $p < .001$; Cramér's V = .403, $p < .001$). The GQS differed significantly dependent on authorship (H(2) = 26.789; $p < .001$). Post-hoc Dunn-Bonferroni-Tests showed statistically significant differences between Layperson and Expert ($z = 4.913$, $p < .001$) with a medium effect $r = .378$ as well as between Layperson and Affected ($z = 3.743$, $p = .001$) with a small effect $r = .288$. Differences between Expert and Affected remained insignificant for the GQS. The mDISCERN differed statistically significantly depending on authorship as well (H(2) = 18.419; $p < .001$). Post-hoc Dunn-Bonferroni-Tests showed significant differences between all groups (Layperson and Expert ($z = 4.261$, $p < .001$), $r = .328$; Layperson and Affected ($z = 2.510$, $p = .036$), $r = .193$; Affected and Expert ($z = 2.446$, $p = .043$), $r = .188$) showing only small effects except for Layperson and Expert.

Figure 2

Ratings of the Videos by Authorship, Count in Number of Videos



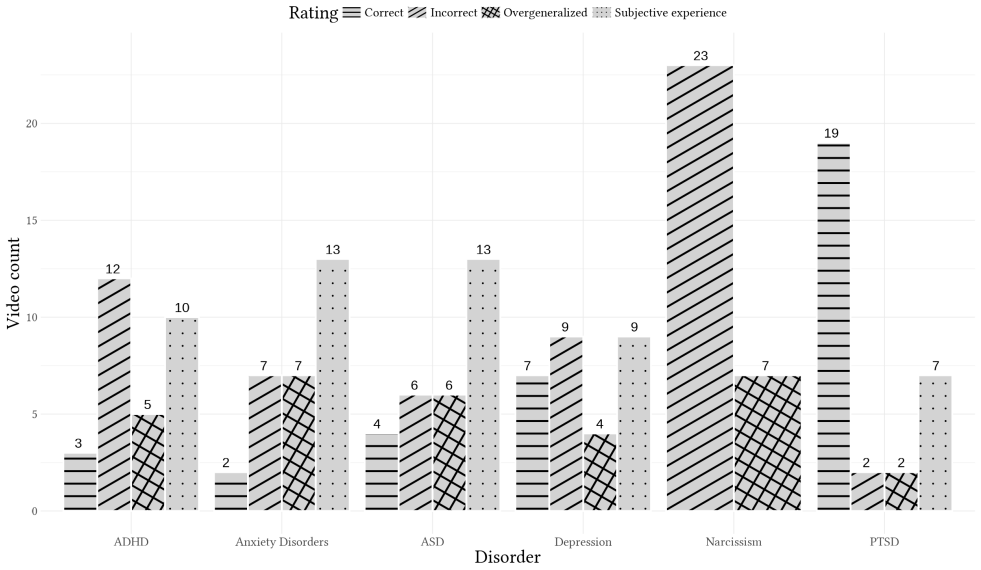
Association of Quality of Content and Disorder

The differences in quality of content for different disorders can be seen in Figure 3. A Chi-square test of independence revealed that the rated quality of content differed

statistically significantly by diagnosis ($\chi^2(15, n = 177) = 78.679$, $p = .001$), showing a medium association ($CC = .555$, $p < .001$; Cramér's V = .385, $p < .001$). The GQS differed significantly dependent on diagnosis (H(5) = 48.795; $p < .001$). Post-hoc Dunn-Bonferroni-Tests showed significant differences between Narcissism and Depression ($z = 3.107$, $p = .028$) with a small effect $r = .239$, Narcissism and PTSD ($z = -6.699$, $p < .001$) with a strong effect $r = .515$, Anxiety Disorders and PTSD ($z = -4.809$, $p < .001$) with a medium effect $r = .370$, ADHD and PTSD ($z = -4.443$, $p < .001$) with a medium effect $r = .342$, ASD and PTSD ($z = -3.694$, $p = .003$) with a small effect $r = .284$ and between Depression and PTSD ($z = -3.562$, $p = .006$) with a small effect $r = .274$. The mDISCERN differed statistically significantly dependent on diagnosis (H(5) = 48.795; $p <. 001$). Post-hoc Dunn-Bonferroni-Tests showed significant differences between Narcissism and Depression ($z = 3.087$, $p = .030$) with a small effect $r = .237$, Narcissism and PTSD ($z = -6.259$, $p < .001$) with a medium effect $r = .481$, Anxiety Disorders and Depression ($z = -3.061$, $p = .033$) with a small effect $r = .235$, Anxiety Disorders and PTSD ($z = -6.207$, $p < .001$) with a medium effect $r = .477$, ADHD and PTSD ($z = -4.357$, $p < .001$) with a medium effect $r = .335$, ASD and PTSD ($z = -3.889$, $p = .002$) with a small effect $r = .299$ and between Depression and PTSD ($z = -3.146$, $p = .025$) with a small effect $r = .242$.

Figure 3

Ratings of the Videos by Disorder, Count in Numbers of Videos



Note. ADHD = Attention-Deficit and Hyperactivity Disorder; ASD = Autism-Spectrum-Disorder; PTSD = post-traumatic stress disorder.

Discussion

In this study, a total of 177 TikTok videos about mental disorders were analyzed regarding content quality and reliability. This study was the first to cover videos on six different disorders, gathering a total of almost 100,000,000 views. Our results show that more than half of the videos were incorrect or overgeneralized, raising concerns about the general quality of mental health information on social media. The ratings showed differences depending on authorship, with layperson being more strongly associated with incorrect videos, lower quality for patients and less reliability.

The percentage of incorrect videos also varied between different disorders, with videos on PTSD being substantially more correct than those on any other disorder investigated. Then again, every single video on narcissism contained misinformation. This study is the first to report differences in quality and reliability between videos on different disorders on social media. Furthermore, it is the first study showing the insufficient quality of information on mental disorders on TikTok in a non-English-speaking sample. The results are in line with previous research on mental health TikTok videos (Aragon-Guevara et al., 2025; Karasavva et al., 2025; Verma & Sinha, 2025; Yeung et al., 2022) and other medical topics (Chochol et al., 2023; Kong et al., 2021; Lukić & Petrović, 2023; Sun et al., 2023) in English.

Our results also show that mental illness is a viral topic on social media, largely driven by affected persons themselves: they not only produce most of the videos rated as subjective experience, but also just short of half of all the videos in this study. It seems as if social media platforms such as TikTok are vastly used by affected individuals to share their knowledge and experiences. Indeed, patients might benefit from a virtual space to share experiences and offer mutual support. On the other hand, this creates a new social sphere where (mis)information about mental health topics can circulate without any professional or scientific curation. Without guidance, it is hard to differentiate between valid, useful information and incorrect, possibly harmful information (see Table 3). This could be further complicated when some disorders are predominantly presented using correct information, while others are not. In our sample, videos on PTSD showed significantly better ratings of quality compared to all other disorders, also registering the most experts as authors. On the other hand, videos on narcissism were almost exclusively produced by laypeople, showing exclusively incorrect or overgeneralized information.

It can be assumed that affected people with stigmatized disorders are less likely to present themselves and supply information publicly. These differences in authorship seem to be resulting in a skewed representation of information for certain disorders. For example, PTSD can be seen as a hardship that happens to a person or is done to them. Thus, a person with PTSD might (quite correctly) portray themselves as the victim of objectively negative circumstances. On the other hand, the videos in our sample often insinuated that those affected by a narcissistic personality disorder are lacking good morals and ethics and are incapable of love and positive emotions (in stark contrast

Table 3

Example Sentences From Videos Including Misinformation

ADHD	"Trigger points for people with ADHD: tangled cables, slow technical devices, things that don't work immediately, getting told what to do." "ADHD is not a curse – it is a superpower."
Anxiety	"Symptoms of an anxiety disorder that most people don't understand: eating too much or too little … "
ASD	"Things I do that are autistic: I have no sense of orientation and struggle to find my way around new places … "
Depression	"Men with depression" – video showing famous male movie characters smiling "It is extremely difficult [for a depressed person] to feel and show love."
Narcissism	"Narcissist do not love.", "They only want to use [people]" "Narcissists have a very limited vocabulary."

Note. ADHD = Attention-Deficit and Hyperactivity Disorder; ASD = Autism-Spectrum-Disorder.

to the fact that individuals with a narcissistic personality disorder have often been victims of abuse themselves (Bertele et al., 2022; Clemens et al., 2022; Gao et al., 2024)). Identifying with the latter disorder online might thus be less appealing and results, in general, in fewer videos produced by people affected by stigmatized disorders.

Another potential explanation why videos on PTSD are more reliable could be the nature of its symptoms. Experiencing a traumatic event and having flashbacks is a relatively easy-to-grasp and clearly defined symptom. With other disorders, symptoms might sometimes be more vaguely defined (e.g., "deficits in reciprocal social communication and social interaction" (APA, 2013) in ASD) or seem to resemble everyday phenomena more strongly: many people will know what it is like to be easily distracted, even if they do not have a diagnosis of ADHD.

It can only be speculated why such a large amount of information on TikTok is relatively untrustworthy. One potential reason could be the misunderstanding of scientific facts. For example, "object permanence" was falsely interpreted as an ADHD symptom to explain difficulties with remembering objects or appointments. It turned into a viral talking point on social media (Chevalier, 2024) and was widely presented as a symptom of ADHD, when it is actually describing the ability of a child to understand that objects or persons continue to exist even if they cannot be seen or perceived (Barrett, 2001). Similarly, someone could self-diagnose with a disorder after referring to information online and then present their own, maybe unrelated symptoms as part of that disorder. When

such information is then spread, cited and repetitively linked to a disorder, new concepts of psychiatric terms and disorders could emerge without science being involved, at all.

The effects on patients and professionals remain unclear. The most obvious consequences could be patients in need of therapy not seeking help after being convinced that, e.g., "ADHD is a superpower". Others could seek (and possibly receive) therapy of an incorrectly self-diagnosed disorder. With over 90% of TikTok videos referring to tests on ADHD consisting of misleading and incorrect tests and information (Verma & Sinha, 2025), viewers might easily be misled into self-diagnosing a serious mental disorder. If an individual has already received a diagnosis and is then presented with highly negative, conflicting content online, this could have adverse effects on their self-image as well. One can imagine how someone suffering from a narcissistic personality disorder would feel about themself, being characterized as "unable to love" and wanting "to use people". Further, disorders that are presented as more favorable, popular, or less severe in certain online communities could put additional stress on affected individuals when they do not fit into popular narratives on social media or suffer from a disorder that is presented as less acceptable. Someone suffering from obsessive-compulsive disorder might be presented with information about routines or repetitive behavior in ASD with a focus on self-acceptance and suddenly feel conflicted about their own diagnoses or symptoms. As a result, there could be a (possibly unintentional) attempt to fit into a certain social-media narrative, despite it not representing real-life experience.

Further, as the design of social media platforms increases the risk of problematic social media use, linked to traits such as neuroticism and impulsivity (Sindermann et al., 2022). In some cases, there might be a vicious circle between social media use and psychopathological symptoms. The possible extent and impact of this can be observed in the cases of functional tics and tic-like behaviors (Giedinghagen, 2023; Müller-Vahl et al., 2022; Olvera et al., 2021). All these examples could lead to unnecessarily prolonged suffering or even worsening of symptoms over time as a consequence of incorrect social-media information on mental health.

Conclusion

Overall, this study supplies a detailed overview of the quality and reliability of information on mental disorders on (German-language) TikTok, indicating important differences between authors and disorders. Research needs to focus more on why such large amounts of misinformation are viral and how this affects potential viewers. Practitioners need to be made aware of the content available online and be open to talk about misinformation with their patients, also providing help in how to identify "correct" content. As only one of the videos we rated was produced by an official institution, healthcare institutions could take the initiative and supply professional information on mental health topics on social media to enhance the chances for education, self-support, and (actually helpful) social exchange on mental disorders on platforms such as TikTok.

It is crucial, though, that professional producers of mental health content on TikTok are familiar with how to create videos that lead to engagement with their content on this specific platform to not fall short of its potential (McCashin & Murphy, 2023), even more so as there seems to be interest in professional mental health information (Karasavva et al., 2025) by the target audience.

Limitations

Up to this point, there is no widely accepted procedure to evaluate short videos on social media. We tried to increase comparability by combining previously created ratings (Aragon-Guevara et al., 2025; Yeung et al., 2022) and standardized measures. Still, we think that a time-efficient measurement of reliability is crucial to evaluating and further promoting scientifically valid information online. While our study evaluated a total of almost 180 videos, one might argue that 30 videos per mental disorder will naturally only cover a fraction of what is to be found online.

As to the selection of diagnoses, it could be argued that the narcissistic personality disorder is not as clearly defined as other disorders since it is not officially classified in the ICD, for example. "Narcissism" is, however, one of the most popular mental-health hashtags on German-speaking TikTok. Since it is safe to assume that a layperson browsing TikTok would not know whether they are dealing with an official diagnosis or not and the aim in this study was to reflect the experience of the average TikTok user as closely as possible, the term was included nevertheless.

Finally, even though our study expands previous knowledge by analyzing the German-speaking TikTok, this might not be representative of other languages and cultures. Thus, our results should be replicated in other languages and potentially with other disorders.

Funding: There is no funding to be reported.

Acknowledgments: We would like to thank Alexa Trost for her language editing service and all our colleagues who sparked the idea in many discussions around this topic.

Competing Interests: There are no competing interests to declare.

Ethics Statement: With only publicly available material being included and consistent with previous comparable research (Yeung et al., 2022; Zea Vera et al., 2022) as well as in accordance with the German law, no ethics approval was obtained. No identifiable information or personal data is included in this manuscript.

Preregistration: The study was not preregistered.

Reporting Guidelines: The article follows the APA JARS-Quant reporting guidelines.

Data Availability: The videos and data sets generated or analyzed during this study are not publicly available but are made available for researchers upon reasonable request to the corresponding author. The rating manual is available as supplementary material.

Supplementary Materials

The Supplementary Materials contain the following items (for access, see Mross et al., 2025S):

TikTok Study Rating Guideline: the rating guideline used by the two raters during the process of the study; including the specifically rating of correctness, mDISCERN and GQS.

Index of Supplementary Materials

Mross, A. L., Takahashi, H., Koelkebeck, K., & Langenbach, B. P. (2025S). *Supplementary materials to "Insufficient quality of mental health information on German-speaking TikTok: A content analysis"* [Rating guideline]. PsychOpen GOLD. https://doi.org/10.23668/psycharchives.21394

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Clinical Psychology in Europe (CPE) is the official journal of the European Association of Clinical Psychology and Psychological Treatment (EACLIPT).

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The Relationship Between Body Dysmorphic Symptoms, Depressive Symptoms and Suicidality – A Mediation Analysis

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Clinical Psychology in Europe, 2026, Vol. 8(1), Article e17121, https://doi.org/10.32872/cpe.17121

Received: 2025-02-25 • **Accepted:** 2025-09-09 • **Published (VoR):** 2026-02-27

Handling Editor: Tina In-Albon, University of Mannheim, Mannheim, Germany

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Supplementary Materials: Code, Data, Materials [see Index of Supplementary Materials]

Abstract

Background: Body dysmorphic disorder (BDD) is characterized by an excessive preoccupation with perceived appearance flaws, often accompanied by repetitive behaviors such as frequent mirror checking. It is further associated with severe occupational and social impairments, depression, and high levels of suicidality, including suicidal thoughts, suicide attempts and completed suicide. Given the high rates of depression and suicidality found in BDD, this study aimed to examine whether BDD symptoms may also be directly linked to suicidality, independent of depressive symptoms.

Method: A mediation analysis was conducted to investigate the relationships between BDD symptoms, depression, and suicidality. Cross-sectional data were collected through an online self-test for BDD, assessing BDD symptoms, depression and suicidality. A total of 1,256 participants (aged 18–71; 72% female) met DSM-5 criteria for BDD (based on self-report).

Results: Depressive symptoms partially mediated the relationship between BDD symptoms and suicidality. However, a direct association between BDD symptoms and suicidality was also observed, indicating that suicidality in individuals with BDD is not solely attributable to comorbid depressive symptoms.

Conclusion: The findings underscore the need for thorough suicidality assessments in individuals with BDD, regardless of the presence of depressive symptoms. This further highlights the importance of targeted interventions to address suicidality in this population.

Keywords

body dysmorphic disorder, suicidality, depression, mediation

Highlights

- BDD is associated with high suicidality.
- More severe BDD symptoms predict higher levels of depression.
- Depressive symptoms can only partly explain the relationship between BDD symptoms and suicidality.
- BDD symptoms directly contribute to increased suicidality after controlling for depressive symptoms.

Body dysmorphic disorder (BDD) is characterized by an excessive preoccupation with perceived physical defects that are not (or only slightly) visible to others (e.g., facial flaws regarding the size or shape of the nose or eyes; American Psychiatric Association [APA], 2013). The appearance concerns often trigger intense negative emotions such as guilt, shame, and anxiety (e.g., Phillips, 2014). Engaging in repetitive actions, both mentally and observably, is also common in BDD, and the disorder is associated with significant impairments, ranging from avoidance of social interactions, and difficulty concentrating at work to the inability to maintain relationships, work, or even leave the house (Phillips et al., 2007a). The point prevalence of BDD is estimated to be around 2%, surpassing the rates of disorders like schizophrenia and anorexia nervosa (APA, 2013). Surprisingly, despite its prevalence and impact, BDD is still often under-recognized in clinical settings (Veale et al., 2016).

Associations Between BDD, Depression and Suicidality

Individuals with BDD face elevated risks of suicidal ideation and attempts, as outlined in a meta-analysis by Angelakis et al. (2016). Moreover, BDD often coexists with major depressive disorder (MDD; Gunstad & Phillips, 2003), which is itself strongly associated with suicidality (Brown et al., 2000; Cai et al., 2021; Dong et al., 2018). While MDD is the most common comorbidity of BDD (Phillips et al., 2007a), most individuals with MDD do not concurrently experience BDD (Brawman-Mintzer et al., 1995). Previous findings suggest that BDD and comorbid major depression are associated with increased suicidality (e.g., Phillips et al., 2005c). Specifically, in their longitudinal study of 200 individuals with BDD, lifetime suicidal ideation, suicide attempts, comorbidities and functional impairment were assessed using structured interviews. Logistic regression

analyses showed high lifetime rates of suicidal ideation (78%) and attempts (27.5%). Functional impairment due to BDD predicted suicidal ideation and attempts. Comorbid MDD was linked specifically to suicidal ideation. These results suggest that multiple factors, including MDD, contribute to suicidality in BDD. However, a mediation model was not tested in the study by Phillips et al. (2005c). Shaw et al. (2016) investigated potential mediators of the relationship between BDD symptoms and suicidality based on Joiner's (2005) Interpersonal Theory of Suicide (IPTS). According to IPTS, suicidal desire emerges primarily from two psychological states: *thwarted belongingness,* the feeling of not being meaningfully connected to others and *perceived burdensomeness,* the belief that one is a burden to others. In their cross-sectional mediation model, Shaw and colleagues (2016) found that the association between BDD symptom severity and both key constructs was fully mediated by depressive symptoms. These findings imply that BDD symptoms may contribute to suicidality indirectly via increased depressive symptomatology, which in turn amplifies feelings of social disconnection and burden. In other words, based on their results, no direct link between BDD symptoms and suicidality would be expected once depression is accounted for. In contrast to this finding, several studies found a significant association between BDD symptoms and suicidality even after controlling for depressive symptoms, suggesting that BDD symptoms may independently contribute to heightened suicidality (Krebs et al., 2022; Snorrason et al., 2019).

Research Relevance and Significance of the Project

While previous research has provided initial insights into the relationship between BDD, depressive symptoms and suicidality, findings remain inconsistent. Phillips et al. (2005c) identified MDD and functional impairment as significant independent predictors of suicidal ideation in BDD. Notably, their design and analyses did not assess mediation directly, leaving it unclear whether depressive symptoms explain the association between BDD severity and suicidality. Extending this line of research, Shaw et al. (2016) found evidence that the association between BDD symptoms and thwarted belongingness and perceived burdensomeness was fully mediated by depressive symptoms, suggesting an indirect pathway from BDD severity via depression to suicidal ideation. However, suicidality was not assessed directly in their study, limiting the conclusions regarding actual suicidal thoughts or behaviors. In contrast, other studies (e.g., Krebs et al., 2022; Snorrason et al., 2019) demonstrated that the association between BDD and suicidality persists even after controlling for depressive symptoms, pointing toward the existence of a direct effect in addition to any potential mediation through depression. These methodological and conceptual differences across studies likely contributed to the varying effects observed, highlighting the need for further research to clarify the interplay between BDD, depression, and suicidality. Thus, the present study seeks to clarify whether the association between BDD symptoms and suicidality is fully or only partially mediated by depressive symptoms. To address this, the total effect of BDD symptoms on suicidality will be

decomposed into its direct and indirect components (via depressive symptoms), allowing for a more precise estimation of the magnitude of each effect. In contrast to Shaw et al. (2016), who examined risk factors for suicidality (thwarted belongingness and perceived burdensomeness), the aim of our study was to investigate suicidality, including suicidal thoughts and attempts. This deliberate distinction is essential for gaining a clearer understanding of the relationships between BDD symptomatology, depressive symptoms, and suicidality. Furthermore, these findings may hold clinical relevance by informing whether depressive symptoms should be a primary treatment target in reducing suicide risk in individuals with BDD — or whether BDD symptomatology itself constitutes an independent risk factor that requires direct therapeutic attention. To further explore the relationship between the three variables the following hypotheses are formulated:

> H1: Depressive symptoms mediate the positive association between BDD symptoms and suicidality.
>
> H2: There is a direct association between BDD symptoms and suicidality independent of depressive symptoms.

Method

The cross-sectional study utilized an anonymous online survey format administered through Unipark (Questback GmbH, 2017), with a self-test for appearance concerns available online via the BDD Outpatient Clinic at the University of Münster (see Schulte et al., 2020). The study was approved by the responsible Ethics Committee at the University of Münster: 2017-32-JSch. Data and analysis code are available at the Open Science Framework (OSF; https://doi.org/10.17605/OSF.IO/AB8X4). Participants received instructions emphasizing voluntary participation, anonymity, and privacy. Informed consent was obtained both before and after data entry. Moreover, individualized feedback was provided after the completion of the survey, offering insights into potential BDD signs, comorbid diagnoses, and information on support services, including a telephone counseling service for individuals reporting suicidal ideation. The average completion time was 18 minutes (*SD* = 13 minutes).

Sample

Between February 2016 and May 2018, and from March 2019 to June 2021, a total of 15,273 individuals accessed the self-test, with 3,452 completing it. Exclusions were made for individuals who did not consent to data use (n = 808), participated repeatedly (n = 89), lacked sufficient language skills (n = 5), were under 18 years old (n = 78), or did not meet the diagnostic criteria for BDD (n = 1,216) according to the self-report measure BDD-5 (Möllmann & Buhlmann, 2024), which is based on DSM-5 criteria (APA, 2013). To differentiate BDD from eating disorder (ED) symptoms, participants completed the

SCOFF questionnaire (Morgan et al., 1999). It consists of five yes/no items assessing disordered eating behaviors (e.g., "Do you worry you have lost control over how much you eat?"). A cut-off of two or more affirmative responses has shown good diagnostic accuracy, with pooled sensitivity of .80 and specificity of .93 (Botella et al., 2013). Participants who scored above this cut-off were excluded from the analyses. Consequently, the final sample size was n = 1,256, ranging from 18 to 71 years of age (M = 30.1, SD = 9.9). The majority of participants (72.3%, n = 908) were female (see Table 1). Participants' appearance concerns referred to: Skin (55.6%, n = 698), nose (48.3%, n = 607), hair (41.9%, n = 526), breast (31.0%, n = 389), mouth (23.6%, n = 296), genitals (22.2%, n = 279), eyes (22.1%, n = 278), hands (12.9%, n = 162), muscles (12.3%, n = 155), ears (8.3%, n = 104), body characteristics related to ethnicity (3.0%, n = 38), and other (18.5%, n = 232). The five most prevalent diagnoses reported, based on prior reported clinical professional assessments, were depressive disorders (43.6%, n = 547), social anxiety disorder (17.4%, n = 219), BDD (12.4%, n = 156), generalized anxiety disorder (10.8%, n = 136), and ED (11.9%, n = 149). Nearly two-thirds (63.6%, n = 799) reported having received at least one diagnosis of a mental disorder.

Instruments/Measures

Demographic data were collected on the variables age, gender, place of residence (country), highest educational degree, current occupation, and marital status (see Table 1).

BDD Symptoms

Although this study did not include clinical interviews, we carefully assessed BDD using the BDD-5 (Möllmann & Buhlmann, 2024), a well-developed self-report questionnaire based on DSM-5 criteria, consisting of six dichotomous items (agree/disagree). It should be noted though that while this allows for an approximation of diagnostic criteria, it does not replace a formal clinical diagnosis. The severity of BDD symptoms within the past week was assessed using the Body Dysmorphic Symptoms Questionnaire (Fragebogen körperdysmorpher Symptome: FKS) developed by Buhlmann et al. (2009). It comprises two subscales: Item 1 and Items 4-15, which queries the extent of BDD symptoms and BDD-related dysfunctional behaviors, and Items 16-18, which includes items regarding aesthetic surgeries and suicidality. Items 2 and 3 do not contribute to the total score, and were therefore not considered in further analyses, as Item 2 assesses body areas relevant to the symptoms and Item 3 serves to differentiate BDD from EDs (Buhlmann et al., 2009). The remaining items refer to symptoms within the past week and are rated on a 5-point Likert scale from 0 (not at all/never/don't think about it at all) to 4 (very much/more than 5 times/more than 8 hours per day).[1] A maximum score of 64 points can be achieved, with a cut-off score of 23 points for a positive screening for BDD recently established by Meier et al. (2025). The FKS demonstrates good validity (sensitivity = .87

and specificity = .93; Buhlmann et al., 2009). The internal consistency of these items in this study was α = .80.

Table 1

Demographic Data

Demographic Variable	%	*n*
Country		
Germany	88.5	1112
Austria	4.9	62
Switzerland	5.4	68
Other	1.1	14
Highest Educational Degree		
None	0.9	11
10 Years of School	26.7	335
11-13 Years of School	38.5	484
University/College	32.8	412
Other	1.1	14
Occupation		
Education/Study	39.8	499
Full-time	30.9	388
Part-time	23.3	292
Unemployed	5.5	69
Parents/Parental leave	5.1	64
Unable to work	2.0	25
Other	7.3	91
Marital Status		
Single	51.7	649
In a relationship	31.4	395
Married	11.7	147
Separated/Divorced	4.8	60
Widowed	0.4	5

Note. N = 1,256. Multiple selections were possible for the variable occupation.

1) Furthermore, to assess BDD symptoms in our sample, Items FKS 17 and 18, which measure suicidality, were included in the total score. For the mediation analyses, however, these items were excluded to avoid confounding effects on the dependent variable Suicidality. Similarly, to assess depressive symptoms, PHQ Item 9, which measures suicidality, was excluded in the mediation analyses.

Depression

The Patient Health Questionnaire (PHQ-9; Löwe et al., 2002; Spitzer et al., 1999) measures depressive symptoms over the past two weeks. The scale consists of nine items that assess depressive symptoms over the past two weeks on a 4-point Likert scale (0 = not at all, 1 = several days, 2 = more than half the days, 3 = nearly every day). The PHQ-9 serves as a screening tool for MDD and is based on the criteria for a major depressive episode according to DSM-5 (APA, 2013; sensitivity = .95 and specificity = .86; Gräfe et al., 2004). The criteria for MDD are considered met if at least five of the Items 1-9, including either Item 1 or 2, are rated as occurring more than half of the days. In the present study, only Items 1-8 of the PHQ-9 were used to measure depressive symptoms[1]. Internal consistency of the PHQ-9 in the current sample was $\alpha = .86$.

Suicidality

Suicidal thoughts and actions were assessed using FKS Items 17 ("Have you ever thought about ending your life because you find parts of your physical appearance so ugly?"), and 18 ("Have you ever attempted suicide because you find parts of your physical appearance so ugly?"), as well as PHQ-9 Item 9 ("How often have you been bothered by the following problems over the past two weeks: Thoughts that you would be better off dead or of hurting yourself?"; (hereinafter referred to as FKS_17, FKS_18, and PHQ_9).

Statistical Analyses

The data was analyzed using IBM SPSS Statistics (Version 29.0; IBM Corporation, 2022) for descriptive data analyses, and MPlus, version 8.7 (Muthén & Muthén, 2017) for factor analyses and structural equation modeling (SEM). These analyses were conducted using Item Response Theory (IRT) models for categorial items with a robust weighted least squares mean and variance (WLSMV) adjusted estimator (Brown, 2006). To test the factorial structure of the FKS and the PHQ-9 after extracting the items measuring suicidality, exploratory factor analyses (EFA) were conducted. To determine the number of factors, the Kaiser criterion (Guttman, 1954; Kaiser & Dickmann, 1959), and the interpretability of factor structure were considered. The model quality was assessed using the Root Mean Square Error of Approximation (RMSEA; Steiger, 1980), Comparative Fit Index (CFI; Bentler, 1990) and Tucker-Lewis Index (TLI; Tucker & Lewis, 1973). A RMSEA < .05 indicates a good model fit, < .08 an acceptable model fit, and > .10 a poor model fit (Browne & Cudeck, 1992). For CFI and TLI, acceptable model fit criteria were set as ≥ .95 (Hu & Bentler, 1999). Confirmatory factor analyses (CFA) were subsequently estimated for scale adjustment. First, items with factor-loading < .35 were excluded. Then, modification indices (MI) were inspected to detect model misspecifications (starting with the MI indicating the highest change in Chi-square-statistic). Suggested residual correlations were stepwise freely estimated only if they could be interpreted meaningfully in terms

of content. Another CFA was performed to examine whether the three extracted items asking for suicidality (FKS_17, FKS_18, and PHQ_9) could also be represent as latent construct, considering the variable suicidality in mediation analyses both as manifest items, and as a latent construct.

Mediation Analyses

Four structural equation models (SEMs; Models 1a, 2a, 3a, 4a) were estimated (Geiser, 2011; Haider et al., 2023) to test a possible mediation between BDD symptoms and suicidality through depressive symptoms. Suicidality was operationalized differently: By using the manifest items FKS_17 (Model 1a with FKS_17), FKS_18 (Model 2a with FKS_18), and PHQ_9 Model 3a with PHQ_9), and by using the latent factor suicidality, represented by the three items (Model 4a with SUI).

In a second step, all four models were re-estimated including gender and age as covariates to address potential confounding influences (Models 1b, 2b, 3b, 4b). Direct, indirect, and total effects were computed using the WLSMV estimation statistic via the Sobel test (Kleinke et al., 2017). Standardized effect sizes and model quality measures were reported. Bias-corrected bootstrap method with $m = 10000$ were employed to calculate confidence intervals for effects without assuming normal distribution (Kleinke et al., 2017; MacKinnon, 2012). A significance level of $\alpha = .05$ was set for all analyses.

Results

Sample Characteristics

The average sum score of the FKS was $M = 37.3$ ($SD = 8.7$). Almost all participants achieved the cut-off value of 23 (94.7%, $n = 1{,}189$). The mean sum score of the PHQ-9 was $M = 13.4$ ($SD = 6.2$). Almost half (49.8%, $n = 625$) of the sample met the criteria for a current MDD according to the PHQ-9. Two thirds of the participants (67.0%, $n = 842$) reported appearance-related suicidal thoughts (FKS_17). Of these, 23.0% had strong suicidal thoughts, and 17.0% had very strong suicidal thoughts. In our sample, general suicidal thoughts occurred in 59.6% ($n = 748$) of the people (PHQ_9). Of these people, 15.2% suffered from suicidal thoughts on more than half of the days, and 17.1% almost every day. Every twelfth person (8.5%, $n = 107$) stated that they had attempted suicide in the past at least once because of their appearance (FKS_18; see Table 2 for the response frequencies of the items on suicidality).

Table 2

Frequencies of Suicidality Items

Item and Response	%	*n*
FKS_17		
Have you ever thought about taking your own life because you find parts of your physical appearance so ugly?		
Not at all	33.0	414
A little	24.4	307
Moderate	15.8	198
Strong	15.4	194
Very strong	11.4	143
FKS_18		
Have you ever attempted to take your own life because you find parts of your physical appearance so ugly?		
Never	91.5	1149
Once	6.1	76
Twice	1.2	15
3 to 5 times	0.6	8
More than 5 times	0.6	8
PHQ_9		
Over the last 2 weeks, how often have you been bothered by: Thoughts that you would be better off dead or of hurting yourself in some way?		
Not at all	40.4	508
On some days	40.3	506
On more than half of the days	9.1	114
Almost every day	10.2	128

Note. N = 1,256. FKS_17 = Item 17 of the FKS = Body Dysmorphic Symptoms Questionnaire; FKS_18 = Item 18 of the FKS = Body Dysmorphic Symptoms Questionnaire; PHQ_9 = Item 9 of the Patient Health Questionnaire.

Measurement Models

BDD Symptoms

The exploratory factor analysis of the FKS items revealed four eigenvalues greater than one (Guttman, 1954; Kaiser & Dickmann, 1959). The two-factor solution did not exhibit a clear loading structure. Items FKS 11, FKS 13, FKS 15, and FKS 16 could not be assigned to any factor. All items showed sufficient positive loadings on both factors, and the difference in loadings of these items between the two factors was less than .20. Only Items FKS 9 and FKS 14, which pertained to verbal expressions of appearance concerns, could be clearly assigned to the second factor. Thus, a meaningful interpretation of the two-factor solution was not possible. The interpretability of a three- and four-factor

solution was also not possible. Subsequently, a single-factor model was selected, but it demonstrated poor fit indices ($\chi^2(77, N = 1{,}256) = 2{,}041.25$, $p < .001$; RMSEA = .14; CFI = .85; TLI = .83; Hu & Bentler, 1999). From this model two items were excluded due to low factor loadings (FKS 12, FKS 16). Based on modification indices three residual correlations were freely estimated (FKS 9 with FKS 14; FKS 6 with FKS 7; FKS 8 with FKS 15), resulting in a final model with satisfactory fit indices ($\chi^2(51, N = 1{,}256) = 512.16$, $p < .001$; RMSEA = .09; CFI = .96; TLI = .95). Detailed tables listing the loadings for each individual questionnaire item can be found in the Supplementary Materials, Appendix 1.

Depression

An exploratory factor analysis (EFA) was conducted for the PHQ-items. The Kaiser criterion indicated a single-factor solution, as only the first factor had an eigenvalue > 1 (cf. Cattell, 1966; Guttman, 1954). Therefore, a multifactorial solution was rejected. All item-to-factor-loadings were sufficiently high (> .50; cf. Moosbrugger & Kelava, 2012). Two residual correlations were freely estimated (PHQ 1 with PHQ 2; PHQ 3 with PHQ 4). For this model, fit indices indicated a good model fit ($\chi^2(19, N = 1{,}256) = 79.92$, $p < .001$; RMSEA = .05; CFI = .99; TLI = .99). Comprehensive tables with item-level loadings are provided in the Supplementary Materials, Appendix 2.

Suicidality

Since the confirmatory factor analysis with the Items FKS_17, FKS_18, and PHQ_9 was a saturated model with zero degrees of freedom, the model had a perfect fit ($\chi^2(0, N = 1{,}256) = .00$, $p < .001$; RMSEA = .00; CFI = 1.00; TLI = 1.00; cf. Geiser, 2011). The exact factor loadings for each individual questionnaire item can be found in the Supplementary Materials, Appendix 3.

Structural Equation Models

The computed models are reported below (see Table 3 and in the Supplementary Materials, Appendix 4). The most comprehensive model, including the latent variable suicidality with gender and age as covariates, is shown in Figure 1.

Model 1a With FKS_17

The model fit of Model 1a was acceptable ($\chi^2(182, N = 1{,}256) = 1{,}290.26$, $p < .001$; RMSEA = .07; CFI = .95; TLI = .94). The relationship between BDD symptoms and appearance-related suicidal thoughts (FKS_17) could be partially explained by an indirect effect via depression ($\beta = .20$, $p < .001$). The direct effect of BDD symptoms on Item FKS_17 was also significant ($\beta = .42$, $p < .001$; see Table 3 for more details).

Model 2a With FKS_18

The fit indices indicated acceptable model fit ($\chi^2(182, N = 1{,}256) = 1{,}189.75$, $p < .001$; RMSEA = .07; CFI = .96; TLI = .95). The indirect effect via depression explained part of the association between BDD symptoms and appearance-related suicide attempts (FKS_18), ($\beta = .20$, $p < .01$). In addition, there was a direct effect between BDD symptoms and the Item FKS_18 ($\beta = .28$, $p < .01$; see Table 3).

Table 3

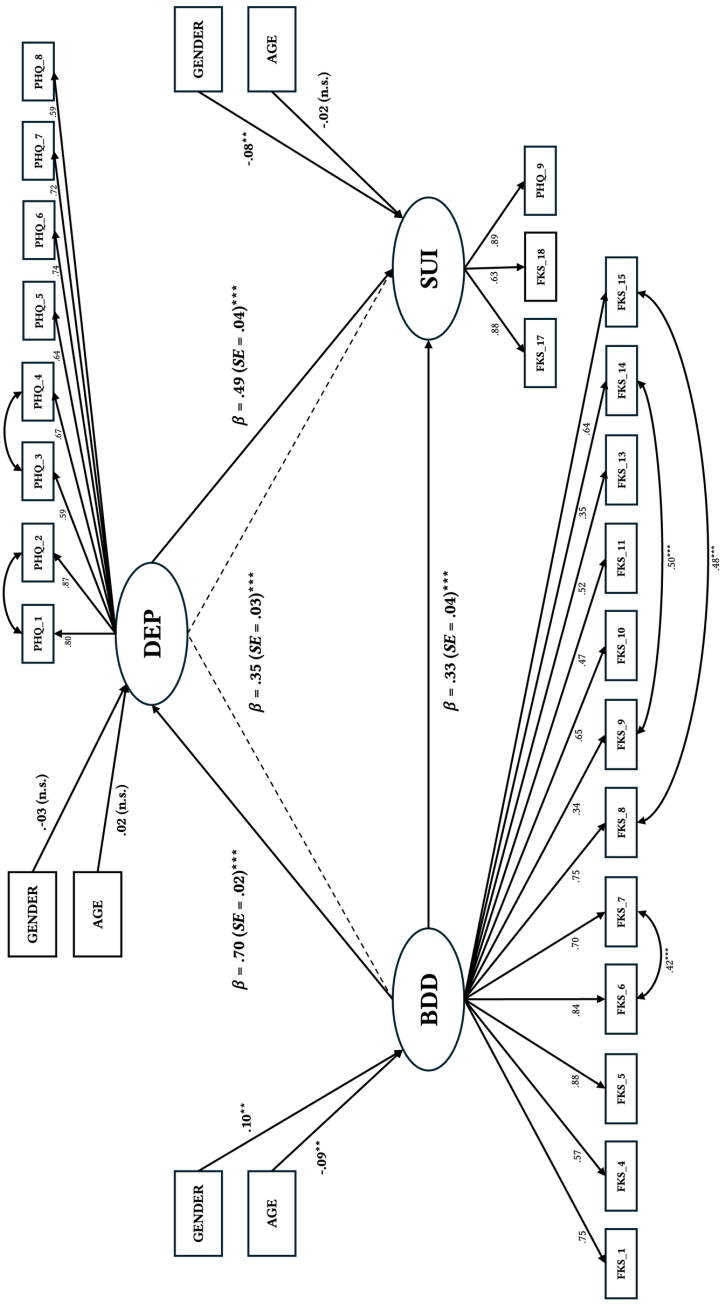
Structural Equation Models: Mediation of Depressive Symptoms in the BDD–Suicidality Link

Model	Effect	Predictor → Outcome	Effect size	*SE*	95% CI	*p*
1a	Total effect	BDD → FKS_17	.62***	.02		
	Direct effects	BDD → DEP	.70***	.02	[.65, .75]	< .001
		DEP → FKS_17	.28***	.04	[.17, .39]	< .001
		BDD → FKS_17	.42***	.04	[.31, .53]	< .001
	Indirect effect	BDD → DEP → FKS_17	.20***	.03	[.12, .28]	< .001
2a	Total effect	BDD → FKS_18	.44***	.04		
	Direct effects	BDD → DEP	.70***	.02	[.65, .75]	< .001
		DEP → FKS_18	.28**	.09	[.05, .51]	.002
		BDD → FKS_18	.25**	.09	[.03, .47]	.004
	Indirect effect	BDD → DEP → FKS_18	.20**	.06	[.04, .36]	.002
3a	Total effect	BDD → PHQ_9	.54***	.03		
	Direct effects	BDD → DEP	.70***	.02	[.65, .75]	< .001
		DEP → PHQ_9	.62***	.04	[.52, .72]	< .001
		BDD → PHQ_9	.10*	.04	[-.01, .22]	.019
	Indirect effect	BDD → DEP → PHQ_9	.43*	.03	[.35, .52]	< .001
4a	Total effect	BDD → SUI	.66***	.02		
	Direct effects	BDD → DEP	.70***	.02	[.65, .75]	< .001
		DEP → SUI	.50***	.04	[.39, .60]	< .001
		BDD → SUI	.31***	.04	[.21, .42]	< .001
	Indirect effect	BDD → DEP → SUI	.35***	.04	[.27, .43]	< .001

Note. Structural equation models tested depressive symptoms as a mediator of the association between BDD symptoms and suicidality. Suicidality operationalised as: (1a) appearance-related suicidal thoughts (FKS_17); (2a) appearance-related suicide attempts (FKS_18); (3a) general suicidal thoughts (PHQ_9); (4a) latent factor suicidality (FKS_17, FKS_18, PHQ_9). Standardized effects with bias-corrected bootstrap 95% CIs are reported. CI = confidence interval; BDD = BDD symptoms; DEP = depressive symptoms; SUI = suicidality; FKS_17 = Item 17 of the Body Dysmorphic Symptoms Questionnaire; FKS_18 = Item 18 of the Body Dysmorphic Symptoms Questionnaire; PHQ_9 = Item 9 of the Patient Health Questionnaire.
*$p < .05$. **$p < .01$. ***$p < .001$.

Figure 1

Structural Equation Model (4b): Mediation of Depressive Symptoms in the BDD-Suicidality Link



Note. All paths in the structural equation model were adjusted for age and gender. Statistics are standardized regression coefficients (β) with standard errors (*SE*) in parenthesis, and standardized factor loadings from structural equation. Solid lines represent direct effects; dashed lines indicate the indirect effect; standardized residual correlations are depicted as solid double-headed arrows. All factor loadings were statistically significant ($p < .001$). BDD = BDD symptoms; DEP = depressive symptoms; SUI = suicidality; FKS_17 = Item 17 of the Body Dysmorphic Symptoms Questionnaire; FKS_18 = Item 18 of the Body Dysmorphic Symptoms Questionnaire; PHQ_9 = Item 9 of the Patient Health Questionnaire; n.s. = not significant.

** $p < .01$. *** $p < .001$.

Model 3a With PHQ_9

The fit of the model was acceptable ($\chi^2(182, N = 1{,}256) = 1{,}248.04$, $p < .001$; RMSEA = .07; CFI = .95; TLI = .95). There was both a direct effect ($\beta = .10$, $p < .05$) and an indirect effect ($\beta = .43$, $p < .001$) via depression between BDD symptoms and general suicidal thoughts (PHQ_9; see Table 3).

Model 4a With SUI

The model fit was acceptable ($\chi^2(222, N = 1{,}256) = 1{,}418.53$, $p < .001$; RMSEA = .07; CFI = .95; TLI = .95). The relationship between BDD symptoms and the latent variable suicidality could be partially explained by an indirect effect via depression ($\beta = .35$, $p < .001$). There was also a direct correlation between BDD symptoms and suicidality ($\beta = .32$, $p < .001$; see Table 3).

Model 1b, 2b, 3b, 4b Including Gender and Age as Covariates

All effects described in the previous models remained significant even when controlling for gender and age. See in the Supplementary Materials, Appendix 4 for specific total, direct, indirect effects, and bootstrapping-confidence intervals for Model 1b, 2b, 3b, 4b and Figure 1 for Model 4b specifically.

Discussion

The aim of the present study was to explore the relationships between BDD symptoms, depression, and suicidality among an online sample of individuals with BDD (based on self-report measures). Specifically, participants reported high levels of BDD symptoms, even slightly exceeding those found in clinical samples diagnosed with BDD (e.g., Buhlmann et al., 2011; Hübner et al., 2016), with skin, nose, and hair being the most frequently mentioned areas of concern, which is very similar to those areas found in other clinical samples (e.g., Phillips et al., 2005a). Almost half of our sample (49.8%) met the criteria for MDD (based on self-report), which was slightly lower than in Gunstad and Phillips (2003; 61% phenomenological study, 54% treatment study). Moreover, two thirds (67%) of the participants reported appearance-related suicidal thoughts, which is comparable with the findings of Angelakis et al. (2016; 19.1 to 69.7%). 59.6% of our sample reported experiencing general suicidal thoughts within the past two weeks. This rate is considerably higher than the average prevalence of current suicidal thoughts (37.2%) found in clinical BDD populations, as reported in a meta-analysis by Pellegrini et al. (2021). Moreover, consistent with previous research (e.g., Angelakis et al., 2016) 8.5% of participants in this study disclosed a previous suicide attempt specifically attributed to BDD symptoms. The elevated frequency of suicide attempts in BDD is particularly

concerning, as past suicide attempts constitute a significant risk factor for completed suicide (Bostwick et al., 2016).

Depressive Symptoms as a Potential Mediator in the Relationship Between BDD and Suicidality

The hypothesis that depression mediates the relationship between BDD symptoms and suicidality was supported by our data. Specifically, BDD symptoms were consistently positively associated with depressive symptoms across all models (β = .70), aligning with prior research linking BDD severity to increased depression (Phillips et al., 2007a) as well as with epidemiological evidence documenting the high prevalence of MDD among individuals with BDD (Gunstad & Phillips, 2003; Phillips et al., 2005a; 2007b). In turn, depressive symptoms showed a significant direct effect on suicidality, consistent with previous findings indicating that depression is a key correlate of suicidal ideation and behavior (Brown et al., 2000; Snorrason et al., 2019) and that there are elevated rates of suicidality in MDD (Cai et al., 2021; Dong et al., 2018). The association between depression and suicidality varied depending on the suicidality measure (Model 1a with FKS_17, Model 2a with FKS_18, Model 3a with PHQ_9, Model 4a with SUI), with the strongest effect observed for general suicidal thoughts (Model 3a, β = .62), comparable to the finding by Shaw et al. (2016). Regarding the mediation hypothesis, small indirect effects via depression were found between BDD symptoms and appearance-related suicidal thoughts (Model 1a, β = .20) and between BDD symptoms and appearance-related suicide attempts (Model 2a, β = .20). Interestingly, a moderate indirect effect via depression was found between BDD symptoms and general suicidal thoughts (Model 3a, β = .43). The finding of small indirect effects for appearance-related suicidality and a moderate indirect effect for general suicidality may point to the potential importance of distinguishing between appearance-related and general suicidal thoughts in individuals with BDD. However, it should be noted that a potential confounding factor is that the items used as dependent variables (FKS_17, FKS_18, PHQ_9) were extracted from questionnaires (FKS, PHQ-9) that also contributed to the independent variables or mediators in the models. This could potentially inflate effects between the affected constructs due to methodological artifacts. To address this, we constructed a composite suicidality variable (SUI; see Models 4a/4b in Figure 1, Table 3, and in the Supplementary Materials, Appendix 4) by combining the indicators of both questionnaires into a latent construct to reduces potential bias from item-level overlap by capturing the shared variance among the three indicators. This model revealed a moderate indirect effect of BDD symptoms on the latent variable suicidality (Model 4a, β = .35).

In sum, our results are partly consistent with prior research indicating that depressive symptoms partially (but not fully) mediate the association between BDD and suicidality, as reported by Shaw et al. (2016). However, unlike Shaw et al. (2016), who recruited participants based on self-reported appearance-related concerns without formally estab-

lishing a clinical diagnosis of BDD and investigated constructs theoretically linked to suicidal desire rather than suicidality directly, our study included individuals based on a validated self-report screening tool assessing established diagnostic criteria for BDD and employed latent measures of suicidality.

Direct Associations Between BDD Symptoms and Suicidality

The second hypothesis was statistically supported, showing a direct association of BDD symptoms on suicidality across all eight models, consistent with previous research (Krebs et al., 2022; Phillips et al., 2005c; Snorrason et al., 2019). A strength of our study was that we estimated the magnitude of the total effects, as well as the direct and indirect effects. The direct association between BDD symptoms on appearance-related suicidal thoughts was stronger (Model 1a, $\beta = .42$) than the association with appearance-related suicide attempts (Model 2a, $\beta = .28$). This discrepancy might reflect the general difficulty in predicting suicide attempts compared to suicidal thoughts (Glenn & Nock, 2014; Ribeiro et al., 2019). Remarkably, a small but significant direct association was found between BDD symptoms and general suicidal thoughts (Model 3a, $\beta = .10$), diverging from findings by Shaw et al. (2016), who reported a full mediation via depression. However, Shaw et al. (2016) only examined the relationship between BDD symptoms and perceived burdensomeness and thwarted belongingness. These constructs may be more closely linked to depression than direct assessments of suicidality, potentially resulting in stronger predictability by depression. Overall, these findings suggest that depressive symptoms may not entirely account for suicidality in BDD.

Influence of Gender and Age on BDD Symptoms and Suicidality

Across all adjusted models (Models 1b–4b), adding gender and age as covariates did not substantially alter the size or significance of the direct and indirect effects (see Supplementary Materials, Appendix 4 and Figure 1).

Clinical Implications

BDD is characterized by perceived defects of one's own physical appearance (Veale et al., 2016), which is often accompanied by rigid and sometimes delusional appearance beliefs. Affected individuals often feel misunderstood because they perceive something in a way that others do not (Brito et al., 2014). This may lead to increased hopelessness or increased risk of suicidality. Based on our findings, suicidality should be assessed in patients with BDD, regardless of comorbid depressive symptoms. In terms of clinical interventions, it is important to address BDD-typical risk factors (e.g., social withdrawal due to feelings of negative evaluation by others, not belonging to a social group or being a burden to others) into the treatment. General depression-focused interventions might not sufficiently capture the risk factors associated with suicidality in BDD.

Limitations and Directions for Future Research

This study has several limitations. First, BDD symptoms were assessed using self-report measures. This limits diagnostic accuracy and raises the risk of overlap with related disorders such as social anxiety disorder or obsessive-compulsive disorder (Schulte et al., 2020). Thus, future studies should incorporate structured clinical interviews to ensure more accurate diagnostic BDD assessment, including the assessment of possible comorbidities. It should be noted though that our sample had very comparable levels of BDD symptom severity and suicidality to those found in diagnosed clinical samples, which supports the idea that online studies can be a useful tool to particularly reach those individuals with BDD who might otherwise not be able to be reached (e.g., due to treatment barriers, being housebound). Second, the operationalization of suicidality was limited in parts of the study. In Models 1a/b, 2a/b, and 3a/b, suicidality was assessed using single items (FKS_17, FKS_18, PHQ_9), which may have led to skewed response distributions, potentially affecting the reliability and sensitivity of the measure. Moreover, single-item measurement is generally considered less reliable and more vulnerable to method effects, as items from the same questionnaire may correlate more strongly with each other than with conceptually similar items from different sources (Nunnally & Bernstein, 1994). However, in the SUI Model (4a/b), suicidality was modeled as a latent variable based on three indicators (FKS_17, FKS_18, PHQ_9), which partially reduces these limitations by allowing for more robust construct modeling. To further improve measurement precision, future studies should implement validated multi-item scales such as the Suicidal Ideation and Behavior Scale (SSEV; Teismann et al., 2021), which offer a more differentiated assessment of suicidal thoughts and behaviors. Third, the cross-sectional design of our study precludes conclusions about temporal or causal relations. Longitudinal research is needed to determine the directionality and potential bidirectionality of the relationships between BDD symptoms, depression, and suicidality. Lastly, the sample was predominantly female, limiting generalizability to male or gender-diverse individuals. To increase external validity, future studies should aim for more gender balanced samples.

Nonetheless, the present study includes a substantially larger sample size compared to earlier research (e.g., Phillips et al., 2005c, $N = 200$; Shaw et al., 2016, $N = 235$ participants), which enhances the statistical power and generalizability of our findings.

With respect to future research, additional psychosocial risk factors such as self-esteem (Kuck et al., 2021; Soto-Sanz et al., 2019), bullying and childhood trauma (e.g. abuse and neglect; Rück et al., 2024), or reduced quality of life (de Freitas Melo et al., 2022; Phillips et al., 2005b) should be considered as further explanatory variables in future models to better understand the complex mechanisms underlying suicidality in BDD.

Conclusion

The study underscores the elevated risk of suicidality among individuals with BDD, emphasizing the importance for clinical professionals to carefully assess suicidality when encountering signs of BDD. While depressive symptoms partially mediate the relationship between BDD symptoms and suicidality, the study suggests that BDD symptoms are associated with increased suicidality irrespective of depressive symptoms. This highlights the need for simultaneous treatment of both BDD-related symptoms and suicidality (Dozois & Rnic, 2015; Wilhelm et al., 2012). However, due to the cross-sectional design, causal conclusions cannot be drawn. Future research is needed to examine the association of BDD and suicidality using different methods and designs including clinician-administered assessment methods and longitudinal designs.

Funding: This study received no funding from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgments: The authors thank all participants for their contribution to this study and report no additional (i.e., non-financial) support.

Competing Interests: The authors declare no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Previously Presented: A preliminary version of this study was presented as a poster at the 58th Annual Convention of the Association for Behavioral and Cognitive Therapies (ABCT), November 2024, Philadelphia, PA. The current manuscript expands upon those initial findings with the full study protocol, additional analyses and an extended discussion.

Ethics Statement: The Ethics Committee of Faculty 7 at the University of Münster confirms compliance with recognized ethical standards and local guidelines for the application "Self-Test for Concerns about Appearance" (Reference Number: 2017-32-JSch) submitted by Johanna Schulte on July 28, 2017.

Preregistration: There is no preregistration for this study or analysis plan.

Reporting Guidelines: This article is written according to the JARS-QUANT guidelines.

Data Availability: To support transparency and openness in science, data and analysis code is provided on the Open Science Framework (OSF; https://doi.org/10.17605/OSF.IO/AB8X4).

Supplementary Materials

The Supplementary Materials contain the following items:

- Research data and analysis code (Vogel, 2025S)
- Online appendices (Vogel et al., 2026S):

- *Appendix 1* presents the results of an exploratory factor analysis for FKS Items 1 and 4–16 (One-Factor Model).
- *Appendix 2* presents the results of an exploratory factor analysis for PHQ-9 Items 1–8 (One-Factor Model).
- *Appendix 3* presents the results of an exploratory factor analysis for the latent factor of suicidality.
- *Appendix 4* presents the structural equation models testing the mediation of depressive symptoms in the association between BDD symptoms and suicidality.

Index of Supplementary Materials

Vogel, H. (2025S). *The relationship between body dysmorphic symptoms, depressive symptoms, and suicidality: A mediation analysis* [Research data and analysis code]. OSF. https://doi.org/10.17605/OSF.IO/AB8X4

Vogel, H., Barenbrügge, J., Jenisch, J., Schulte, J., & Buhlmann, U. (2026S). *Supplementary materials to "The relationship between body dysmorphic symptoms, depressive symptoms and suicidality – A mediation analysis"* [Online appendices]. PsychOpen GOLD. https://doi.org/10.23668/psycharchives.21629

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EACLIPT

Clinical Psychology in Europe (CPE) is the official journal of the European Association of Clinical Psychology and Psychological Treatment (EACLIPT).

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Research Articles

Does Body Checking Regulate Emotions? An Experimental Study on Appearance- and Health-Related Body Checking

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Clinical Psychology in Europe, 2026, Vol. 8(1), Article e15691, https://doi.org/10.32872/cpe.15691

Received: 2024-10-06 • **Accepted:** 2025-07-08 • **Published (VoR):** 2026-02-27

Handling Editors: Cornelia Weise, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany; Nadine Messerli-Bürgy, University of Lausanne, Lausanne, Switzerland

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Supplementary Materials: Preregistration [see Index of Supplementary Materials]

Abstract

Background: Body checking (BC) is widespread among healthy populations and in individuals with eating disorders (EDs), body dysmorphic disorder (BDD), and illness anxiety disorder (IAD). Etiological models of these three disorders originate from research on obsessive-compulsive disorder and propose a short-term reduction of negative affect after BC. However, as empirical evidence shows a heterogenous pattern regarding the reduction of negative affect, the primary objective of this study was to test the etiological models in a cross-over laboratory experiment.
Method: After induction of negative affect, $N = 102$ healthy females underwent a 10-min BC task, in which they were randomly assigned to perform ED-, BDD-, or IAD-related BC, and a 10-min control checking condition of checking the characteristics of two vases. Before and after each task, participants completed state questionnaires on affect and disorder-specific pathology.
Results: The results revealed increased negative affect and disorder-specific pathology from before to after BC, but a reduction of these variables after the control checking condition.
Conclusion: Thus, contrary to expectation, the theory explaining reduced negative affect in compulsive checking may not directly be applicable to ED-, BDD-, and IAD-related BC in healthy populations, thus providing evidence of the dysfunctionality of BC in the short term.

Keywords

body checking, safety behavior, eating disorder, body dysmorphic disorder, illness anxiety

Highlights

- Cognitive-behavioral models propose a short-term reduction of negative affect after body checking.
- Empirical evidence challenges those assumptions for appearance- and health-related body checking.
- In our study, negative affect increased post-checking, highlighting its short-term adverse effect.
- The study highlights the overall dysfunctionality of body checking behaviors.
- Findings suggest current theories on body checking reinforcement mechanisms may require reevaluation.

When faced with a bodily change (e.g., weight gain, skin irregularities, signs of illness), many people inspect their body in order to prevent, avoid, or escape an unpleasant outcome (Helbig-Lang & Petermann, 2010). Although this behavior, termed *body checking* (BC), is widespread and common among nonclinical populations (cf. Baptista et al., 2021; Wilver et al., 2020), the critical, repeated evaluation of one's body is also a transdiagnostic feature among individuals with various mental disorders such as eating disorders (EDs; e.g., Shafran et al., 2007), body dysmorphic disorder (BDD; e.g., Veale & Riley, 2001), or illness anxiety disorder (IAD; e.g., Abramowitz & Moore, 2007).

Shafran et al. (2004) reported that 92% of women with EDs engage in BC to monitor their body regarding weight (gain) and shape. In ED-related BC, the focus of attention typically lies on weight and the shape of the individual's most disliked body parts, as well as generally broader body areas, primarily the abdomen and thighs (Shafran et al., 2004). Furthermore, about 80% of women diagnosed with BDD regularly check their bodies (e.g., Buhlmann & Winter, 2011). In contrast to weight and shape, which are focal areas of ED-related BC (Shafran et al., 2004), BC in BDD most often focuses on specific body parts that are self-characterized as flawed (Buhlmann & Winter, 2011), such as facial skin or the nose (Phillips et al., 2005). Unlike appearance-related BC (e.g., as in EDs and BDD), BC in IAD appears to be health-related. So far, no study has analyzed precisely what proportion of patients with IAD perform BC, but it is assumed that persons with IAD frequently check their bodies for signs of illness. In contrast to ED- and BDD-related BC, which tend to focus on appearance (Oakes et al., 2017; Shafran et al., 2004), IAD-related BC might focus less on appearance and more on bodily signs of severe illnesses (Abramowitz & Moore, 2007). Therefore, IAD-related BC encompasses a detailed examination of disease-related symptoms such as noticeable moles or palpitations (Olatunji et al., 2011). Notably, performing BC may therefore vary according to disorder-specific characteristics (e.g., focus on appearance or health). Nevertheless, common

to ED-, BDD-, and IAD-related BC is that in all three checking types, individuals might engage in one and the same behavior (e.g., looking in the mirror), albeit with different intentions, e.g., inspecting one's shape in EDs, looking at flaws in BDD, or examining potentially conspicuous moles in IAD.

As a further commonality, cognitive behavioral models of all three disorders (i.e., EDs, BDD, and IAD) postulate a similar mechanism of BC, that is an initial short-lived relief from unpleasant emotions (cf. EDs: Fairburn et al., 2003; Williamson et al., 2004; BDD: Rosen et al., 1995; Wilhelm et al., 2014: IAD: Bleichhardt & Rief, 2014; Salkovskis & Warwick, 1986) but a subsequent longer-term maintenance of these emotions (Fairburn et al., 2003; Rachman et al., 1976; Rosen et al., 1995). It is assumed that individuals with EDs, BDD, or IAD, or individuals at risk of these disorders, mainly show BC in situations characterized by negative affect, presumably triggered by dysfunctional information processing (Warwick & Salkovskis, 1990; Wilhelm & Neziroglu, 2002; Williamson et al., 2004). By engaging in BC, the individual purportedly aims to reduce (or undo) this negative affect, and this reduction is negatively reinforced over time (Bleichhardt & Rief, 2014; Wilhelm et al., 2014; Williamson et al., 2004). Thus, in the short term, i.e., directly after a BC episode (cf. Opladen et al., 2022), the individual may feel reassured by BC, as performing the behavior may regulate overwhelming emotions (Veale, 2004).

In contrast to the theories (Bleichhardt & Rief, 2014; Wilhelm et al., 2014; Williamson et al., 2004), studies on the short-term emotion regulation function of BC have revealed an ambiguous picture. Regarding clinical populations of EDs, BDD, and IAD, only some studies found indications of the proposed short-term reduction of negative affect (Abramowitz & Moore, 2007; Hartmann et al., 2019; Kostopoulou et al., 2013), while others observed higher negative affect after BC (EDs: Suda et al., 2013; BDD: Veale et al., 2016; IAD: Doherty-Torstrick et al., 2016). Moreover, the existing studies examining ED-, BDD-, and IAD-related BC in nonclinical populations mostly did not confirm the model assumptions of a short-term reduction of negative affect. Indeed, with regard to ED-related BC, some studies even found a short-term increase – instead of the proposed decrease – in negative affect (Kraus et al., 2015; Pak et al., 2018; Suda et al., 2013; Tanck et al., 2019) and body dissatisfaction (Blechert et al., 2009; Smeets et al., 2011; Walker et al., 2021; Wilson et al., 2020). Similarly, regarding BDD-related BC, several studies have reported an increase in distress (Veale & Riley, 2001) and body dissatisfaction (Barnier & Collison, 2019; Veale et al., 2016; Windheim et al., 2011). In a study examining IAD-related BC, Hadjistavropoulos and Lawrence (2007) found that women with high health anxiety showed greater concern about their health following a stimulus to trigger illness anxiety compared to women with low health anxiety. The reasons for the discrepant results in studies analyzing the proposed short-term reduction of negative affect after BC remain unclear. The limited findings in support of the theory are complicated by the inherent association between engaging in the disorder-specific BC behavior on the one hand and the existence of the disorder itself on the other hand, thus casting uncertainty

on the short-term effects of disorder-specific BC (e.g., appearance- or health-related) and in the absence of the psychopathology. Moreover, although theories propose that BC is predominantly performed in situations that are characterized by negative affect (e.g., Williamson et al., 2004), no research has experimentally induced negative affect before BC is performed.

The present study aimed to examine the theoretically proposed short-term consequences of BC (Bleichhardt & Rief, 2014; Wilhelm et al., 2014; Williamson et al., 2004) by comparing and disentangling disorder-specific BC features from the psychopathology of the various disorders themselves. Hence, we conducted a laboratory experiment with healthy females in which negative affect was induced in all participants before participants were randomized to one of three conditions and engaged in either ED-, BDD-, or IAD-related BC. To control for the effects on BC, we further applied a control checking condition (i.e., checking the characteristics of two vases). Following theoretical assumptions of a short-term reduction of negative affect by BC, we hypothesized that from the beginning to the end of each BC episode, all participants would show a short-term decrease in self-reported negative affect, with a stronger decrease in the BC groups (i.e., ED-related BC, BDD-related BC, IAD-related BC) compared to the control checking condition. Finally, from an exploratory perspective, we examined potential differences between ED-related, BDD-related, and IAD-related BC in terms of affective and cognitive reactions.

Materials and Method

The present study is part of a larger project that is funded by the German Research Foundation (DFG), preregistered at the German Clinical Trials Register (ID: DRKS00025780) and at the Open Science Framework (ID: OSF: https://osf.io/rbvk4), and was approved by the first author's institutional ethics committee (51/2019)

Participants

Inclusion criteria were self-identifying as female, age between 18 and 65 years, the absence of a current mental disorder, and no past ED, BDD, or IAD, according to the Diagnostic Interview for Mental Disorders (Diagnostisches Interview bei psychischen Störungen, DIPS; Margraf et al., 2021). Exclusion criteria were underweight, defined as a body mass index (BMI) below 18.5 kg/m^2 (WHO, 1995), current suicidal tendencies, self-harm behavior, and drug or substance abuse. We only included female participants as they have been found to show, on average, higher body dissatisfaction (Quittkat et al., 2019) and illness anxiety tendencies (Bleichhardt & Hiller, 2007) compared to a mixed-gender sample. During a telephone screening and the first appointment, $n = 9$ participants were screened out after the first interview as they showed an eating disorder

in partial remission, current substance abuse, or had no further wish to continue the study. Therefore, a total of $N = 102$ women was eligible to participate in the study and were randomized to the three groups: $n = 38$ in the ED-related BC group, $n = 32$ in the BDD-related BC group, and $n = 32$ in the IAD-related BC group. As reimbursement, participants received course credits or a €10 gift voucher per hour of participation.

Self-Report Measures

Screening Measures

Diagnostic Interview for Mental Disorders (DIPS) — During the first session, we applied the DIPS (*Diagnostisches Interview bei psychischen Störungen*; Margraf et al., 2021), a structured interview of approximately 60 – 120 minutes duration. It is adapted to the DSM-5 criteria, covering the most clinically significant mental disorders in adults. During the telephone interview, we screened for the absence of mental disorders, focusing in particular on the Mini-DIPS (Margraf & Cwik, 2017) questions relating to EDs, BDD, and IAD.

State Measures

Self-Assessment Manikin (SAM) — The SAM (Bradley & Lang, 1994) is a figure-rating self-report measure in which participants rate current emotional Valence on a nine-point Likert scale from 1 = *positive* to 5 = *negative*. Both dimensions showed excellent Cronbach's α values in the present study (α = .85 for *Arousal;* α = .89 for *Valence*).

Positive and Negative Affect Schedule (PANAS) — In the present study, we used five specific items of the PANAS (Grühn et al., 2010), taken from the dimension Negative Affect, to assess the specific state emotions that occur during a BC episode, i.e., disgust, shame, anxiety, depressiveness, insecurity. These items were chosen by a team of experts, who, based on clinical experience, also added the emotion of helplessness as a potentially predominant emotion which has not yet been assessed in the context of BC. Items were rated on a five-point Likert scale from 1 = *not at all* to 5 = *extremely*. The subscale Negative Affect showed adequate internal consistency in a validation study (Thompson, 2007) and excellent internal consistency in the present study (α = .93).

Disorder-Specific Items — To assess the severity of psychopathology, we utilized a single item capturing the main preoccupation experienced by individuals with EDs, BDD, and IAD, with each group (i.e., ED-, BDD-, and IAD-related BC) completing only the item relevant for their assigned BC type. Specifically, for EDs, we assessed current dissatisfaction with one's body size and shape (adapted from the Body Image States Scale; Cash et al., 2002); for BDD, we assessed the current conviction of having bodily flaws (adapted from the Fragebogen Körperdysmorpher Symptome, engl. Body Dysmorphic Symptoms Inventory; Buhlmann, Wilhelm, et al., 2010), and for IAD, we examined the current fear

of having a serious illness (adapted from the modified Short Health Anxiety Inventory; Bailer et al., 2013). The items were rated on a scale from 1 = *I completely disagree* to 5 = *I completely agree*. The items showed excellent internal consistency in the present study (α = .97).

Procedure

Diagnostic Assessment

Participants completed the study across two sessions encompassing a diagnostic assessment and a laboratory experiment. After providing informed consent, prospective participants underwent a structured telephone interview in which they were briefly screened for the predefined inclusion and exclusion criteria using the Mini-DIPS. If participants showed no signs of a mental disorder, they were invited to attend the first session, where they received information about the voluntary nature of participation and the anonymized data storage. Subsequently, they underwent a more in-depth interview to confirm the absence of a current mental disorder (i.e., using the DIPS). Following the interview, eligible participants were randomly assigned to one of the three BC groups (i.e., ED-, BDD-, or IAD-related BC) and were then provided with a general definition of BC and informed about the typical BC behavior/strategies exhibited by women with either EDs, BDD, or IAD.

Laboratory Experiment

The second session comprised the laboratory experiment, which lasted for approximately 2.5 h and was set up as a cross-over design. Participants performed the experiment by clicking through the instructions shown on the computer screen. All six blocks of the experiment lasted for 10 minutes, and participants completed the state questionnaire battery before and after each block. The first block consisted of a baseline of neutral mood induction (cf. Opladen et al., 2022). In the second block, all participants were exposed to a negative affect induction in a disorder-specific manner through an audio-guided imagery task simulating the experience of stepping out of the shower on a Saturday morning and feeling either too fat (ED-related), with a bodily flaw (BDD-related) or physically unwell (IAD-related). In the third block, participants either performed the group-specific BC task or the control checking condition, depending on the randomized assignment of sequence (i.e., BC first or control checking condition first). In the BC task, participants followed an audio guide tailored to the characteristics of the respective group: In the ED-related BC task, participants were guided through an imagery exercise in which they were asked to place selective attention on their upper thighs and stomach; in the BDD-related BC task, the objective was to attentively regard their nose and facial skin, and in the IAD-related BC task, participants were instructed to concentrate on the functioning of the cardiovascular system and their moles. In the control checking condition, all participants heard the same audio recording, in which they were asked

to check the features (e.g., colors, haptics, shapes) of two vases. In the fourth block, a neutral mood was again induced by a second neutral landscape movie (cf. Opladen et al., 2022). Subsequently, the disorder-specific negative affect from the second block was again induced in the fifth block, and in the sixth block, participants were guided to engage in the other respective condition which they had not experienced during the third block (i.e., either the BC or control checking condition).

Data Analysis

The statistical analyses were performed using the software IBM Statistical Package for the Social Sciences (version 29). To ensure a proper manipulation, we tested for differences between the two conditions regarding sequence (i.e., Sequence 1: BC condition first or Sequence 2: control checking condition first). For this purpose, we used separate 2 × 2 analyses of variance (ANOVA) with the dependent variable mood (i.e., PANAS, $SAM_{Valence}$) and the between-subjects factor Sequence. In this analysis, we increased the α towards .10 to avoid alpha error accumulation (cf. Verhoeven et al., 2005). For all other analyses, the significance level was set at α = .05. As a second manipulation check, we tested whether the induction of negative mood was effective in all groups. For this purpose, we conducted a mixed 2 × 3 ANOVA with Greenhouse-Geisser correction with the within-subjects factor Time (i.e., pre-, post-mood induction) and the between-subjects factor Group (i.e., ED-related, BDD-related, and IAD-related checking). The successful induction of neutral mood was tested in a preliminary study (cf. Opladen et al., 2022). To test the hypothesized influence of BC on affect and pathology, we used mixed ANOVAs in a 2 × 2 × 3 design with the within-subjects factors Time and Condition (i.e., BC condition, control checking condition) and the between-subjects factor Group for the dependent variables. Post-hoc Bonferroni-corrected pairwise comparisons were employed. Effect sizes were classified into small (η_p^2 = 0.01), medium (η_p^2 = 0.09), and large (η_p^2 = 0.25; Lakens, 2013). The Shapiro-Wilk test was conducted to test the approximate normal distribution of the dependent variables, which was mostly met. As ANOVAs can be seen as generally robust to violations of normality (cf. Tabachnick & Fidell, 2007), we proceeded with the analysis even in cases in which variables were not normally distributed. The assumption of sphericity was assessed using Mauchly's test of sphericity, and Greenhouse-Geisser correction was applied in the case of violation.

Results

Participant Characteristics and Manipulation Checks

Participants had a mean age in the early twenties (*M* = 23.01, *SD* = 4.07, Range = 18 – 51 years) and their mean BMI lay in the normal range (*M* = 22.60, *SD* = 3.43, Range = 18.07 – 37.66 kg/m^2). First, as shown in Table 1, the results for all groups showed no

effects of Sequence for any of the dependent variables. Moreover, further shown in Table 2, the second manipulation of an increase in negative affect from before to after mood induction was found in all groups as post-hoc pairwise comparisons revealed a negative difference between pre- and post-mood induction (Sequence 1: $\Delta_{\text{pre-post}}$ = -.19, p < .001; Sequence 2: -.24, p < .001), indicating an increase in negative affect in all groups in both sequences. This was also demonstrated by $\text{SAM}_{\text{Valence}}$ as post-hoc pairwise comparisons revealed the increase in negative valence (Sequence 1: $\Delta_{\text{pre-post}}$ = -.733, p < .001; Sequence 2: $\Delta_{\text{pre-post}}$ = -.538, p < .001).

Table 1

ANOVAs for Manipulation Check for Sequence

Variable	Time Point	Body Checking Condition	Control Checking Condition
PANAS[a]	pre	F(5,67) = 1.69, p = .150, η_p^2 = .11	F(8,81) = 1.84, p = .182, η_p^2 = .15
	post	F(9,67) = 1.21, p = .305, η_p^2 = .14	F(3,81) = 1.07, p = .367, η_p^2 = .04
$\text{SAM}_{\text{Valence}}$[b]	pre	F(3,90) = .12, p = .949, η_p^2 = .11	F(3,88) = 1.50, p = .224, η_p^2 = .05
	post	F(4,90) = 5.16, p = .724, η_p^2 = .02	F(3,88) = .85, p = .469, η_p^2 = .03
Pathology[c]	pre	F(4,87) = 1.46, p = .220, η_p^2 = .06	F(4,88) = .50, p = .736, η_p^2 = .02
	post	F(4,87) = 1.80, p = .137, η_p^2 = .08	F(4,88) = 1.19, p = .320, η_p^2 = .05

Note. Effect of Sequence: Body checking condition first vs. control checking condition first. Time Point refers to measurements before and after the respective condition.
[a]Specific items of the Positive and Negative Affect Schedule. Items were rated on a five-point Likert scale from 1 = *not at all* to 5 = *extremely*. [b]Self-Assessment Manikin. Items were rated on a nine-point Likert scale from 1 = *aroused/positive* to 5 = *calm/negative*. [c]Disorder-Specific Pathology. The items were rated on a scale from 1 = *I completely disagree* to 5 = *I completely agree*.

Table 2

ANOVAs for Manipulation Check for Negative Affect

Variable	Time Point	Sequence	Negative Mood Induction
PANAS[a]	pre – post	1	F(1, 99) = 26.75, p < .001, η_p^2 = .21
	pre – post	2	F(1, 99) = 36.80, p < .001, η_p^2 = .27
$\text{SAM}_{\text{Valence}}$[b]	pre – post	1	F(1, 99) = 70.30, p < .001, η_p^2 = .42
	pre – post	2	F(1, 99) = 43.19, p < .001, η_p^2 = .30

Note. Effect of negative mood induction: Increase in negative affect before and after the mood induction. Time Point refers to measurements before and after the respective condition.
[a]Specific items of the Positive and Negative Affect Schedule. Items were rated on a five-point Likert scale from 1 = *not at all* to 5 = *extremely*. [b]Self-Assessment Manikin. Items were rated on a nine-point Likert scale from 1 = *aroused/positive* to 5 = *calm/negative*.

Effects of Body Checking

Negative Affect

Table 3 presents the *M* and *SD* for the dependent state variables for each group, condition, and time point, indicating generally low values for psychopathology in the sample. Numerical results of the ANOVAs are presented in Table 4.

Table 3

Means and Standard Deviations of All Dependent Variables for Each Group, Condition, and Time Point

	ED (n = 38)				BDD (n = 32)				IAD (n = 32)			
	BC		Non-BC		BC		Non-BC		BC		Non-BC	
M* / *SD	**pre**	**post**	**pre**	**post**	**pre**	**post**	**pre**	**post**	**pre**	**post**	**pre**	**post**
						PANAS[a]						
M	1.23	1.30	1.24	1.06	1.35	1.53	1.29	1.04	1.22	1.42	1.37	1.12
SD	0.46	0.59	0.53	0.20	0.55	0.60	0.38	0.11	0.41	0.50	0.58	0.39
						$SAM_{Valence}$[b]						
M	2.42	2.37	2.34	2.16	2.78	2.75	2.59	2.22	2.56	2.66	2.63	2.25
SD	0.83	0.85	0.97	0.82	0.91	1.02	0.91	0.66	0.67	0.79	0.71	0.76
						Disorder-Specific Items						
M	2.03	2.34	2.00	1.58	1.97	2.34	1.81	1.41	1.28	1.50	1.34	1.22
SD	1.13	1.19	1.14	0.89	1.00	1.18	0.86	0.67	0.81	0.95	0.79	0.79

Note. pre / post refers to measurements before and after the respective condition. ED = Eating Disorder-Related Body Checking group; BDD = Body Dysmorphic Disorder-Related Body Checking group; IAD = Illness Anxiety Disorder-Related Body Checking group; BC = Body Checking Condition; Non-BC = Control Checking Condition.

First, regarding negative affect assessed using the PANAS, we found a significant main effect of Condition and significant interactions of Condition × Time and Group × Condition. Regarding Condition, post-hoc pairwise comparisons revealed a higher negative affect in the BC condition than in the control checking condition ($\Delta_{\text{BC-control checking}}$ = .155, p < .001). The interaction Group × Condition indicated that the ED-related and the BDD-related BC groups experienced a decrease in negative affect after the BC compared to the control checking condition (ED-related BC: $\Delta_{\text{BC-control checking}}$ = .116, p = .018, BDD-related BC: $\Delta_{\text{BC–control checking}}$ = .276, p < .001). Pairwise comparisons for the interaction Time × Condition indicated higher values after the BC condition ($\Delta_{\text{pre-post}}$ = -.150, p < .001) and lower values after the control condition ($\Delta_{\text{pre-post}}$ = .225 p < .001). For $SAM_{Valence}$, the results revealed main effects of Time and Condition and a significant interaction of Time × Condition. Post-hoc, the main effect of Time indicated a higher value before than after each condition ($\Delta_{\text{pre–post}}$ = .154, p = .003). The main effect of

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https://doi.org/10.32872/cpe.15691

Table 4

Analysis of Variance on the Effects of Body Checking

Outcome	PANAS[a]	$SAM_{Valence}$[b]	Disorder-Specific Items
Main Effect			
Time	$\Lambda = .97$, $F(1, 99) = 2.78$, $p = .089$, $\eta_p^2 = .03$	$\Lambda = .92$, $F(1, 99) = 9.07$, $p = .003$, $\eta_p^2 = .08$	$\Lambda = .01$, $F(1, 99) = .02$, $p = .885$, $\eta_p^2 = .00$
Group	$F(2, 99) = .54$, $p = 0.587$, $\eta_p^2 = .11$	$F(2, 99) = 1.32$, $p = .271$, $\eta_p^2 = .03$	$F(2, 99) = 5.66$, $p = .004$, $\eta_p^2 = .10$
Condition	$\Lambda = .78$, $F(1, 99) = 27.49$ $p < .001$, $\eta_p^2 = .22$	$\Lambda = .82$, $F(1, 99) = 22.67$, $p < .001$, $\eta_p^2 = .18$	$\Lambda = .72$, $F(1, 99) = 37.74$, $p < .001$, $\eta_p^2 = .28$
Interaction			
Time × Group	$\Lambda = .97$, $F(2, 99) = .20$, $p = .820$, $\eta_p^2 = .00$	$\Lambda = .96$, $F(2, 99) = .43$, $p = .782$, $\eta_p^2 = .01$	$\Lambda = .99$, $F(2, 99) = .35$, $p = .703$, $\eta_p^2 = .01$
Condition × Time	$\Lambda = .63$, $F(1, 99) = 57.83$, $p < .001$, $\eta_p^2 = .37$	$\Lambda = .91$, $F(1, 99) = 10.40$, $p = .002$, $\eta_p^2 = .96$	$\Lambda = .76$, $F(1, 99) = 30.63$, $p < .001$, $\eta_p^2 = .24$
Group × Condition	$\Lambda = .92$, $F(2, 99) = 4.18$, $p = .018$, $\eta_p^2 = .08$	$\Lambda = .96$, $F(2, 99) = 1.97$, $p = .145$, $\eta_p^2 = .04$	$\Lambda = .91$, $F(2, 99) = 4.81$, $p = .010$, $\eta_p^2 = .09$
Time × Group × Condition	$\Lambda = .97$, $F(2, 99) = 1.72$ $p = .185$, $\eta_p^2 = .03$	$\Lambda = .98$, $F(2, 99) = 1.06$. $p = .350$, $\eta_p^2 = .02$	$\Lambda = .97$, $F(2, 99) = 1.84$, $p = .231$, $\eta_p^2 = .03$

Note. Time: Measurements before and after the respective condition; Group: Eating Disorder, Body Dysmorphic Disorder, and Illness Anxiety Disorder-Related Body Checking; Condition: Body Checking, Control Checking.

[a]Specific items of the Positive and Negative Affect Schedule. [b]Self-Assessment Manikin.

Condition showed that negative valence was higher in the BC condition than in the control checking condition ($\Delta_{\text{BC–control checking}} = .225$, $p < .001$). Regarding the interaction Time × Condition, negative valence was lower (i.e., more positive affect) after the control checking condition ($\Delta_{\text{pre–post}} = .311$, $p < .001$).

Disorder-Specific Pathology

Regarding the disorder-specific ED, BDD, and IAD items, the analyses revealed main effects of Condition, Group, and an interaction of Time × Condition. Post-hoc comparisons for Condition revealed that participants undergoing the BC condition exhibited a higher level of disorder-specific pathology compared to those undergoing the control checking condition ($\Delta_{\text{BC–control checking}} = .350$, $p < .001$). Regarding Group, pairwise comparisons revealed that the ED-related checking and BDD-related checking groups did not differ from each other, but that both groups differed from the IAD-related checking group, insofar as the latter group generally showed lower worry about their body in the current moment ($\Delta_{\text{IAD–ED}} = -.651$, $p = .006$; $\Delta_{\text{IAD–BDD}} = -.547$, $p = .035$). The interaction of Time × Condition revealed higher values after the checking in the BC condition and lower values in the control checking condition (BC condition: $\Delta_{\text{pre–post}} = -.303$, $p < .001$; control checking $\Delta_{\text{pre–post}} = .317$, $p < .001$).

Discussion

The present laboratory experiment examined the short-term consequences of ED-related, BDD-related, and IAD-related BC with the goal of analyzing the assumption of negative reinforcement of BC, as proposed in etiological models of EDs (Williamson et al., 2004), BDD (Wilhelm et al., 2014), and IAD (Bleichhardt & Rief, 2014). To disentangle the BC behavior from the respective psychopathology, we compared the effects of disorder-specific types of BC in nonclinical women. In contrast to the model assumptions of a reduction of negative affect (Bleichhardt & Rief, 2014; Wilhelm et al., 2014; Williamson et al., 2004) from immediately before to after the BC condition, we found an increase in negative affect and disorder-specific pathology. Although the lack of short-term reduction of negative affect contradicts theoretical postulates, it is in line with the limited body of empirical research in nonclinical persons in the area of EDs, BDD, and IAD, which likewise did not observe a decrease in negative affect directly after a BC episode (e.g., Hadjistavropoulos & Lawrence, 2007; Kraus et al., 2015; Veale & Riley, 2001). These unexpected findings direct attention to the proposed root of checking behavior, which originates in the field of obsessive-compulsive disorder (OCD; Carr, 1974; Hodgson & Rachman, 1977). Our result of increased negative affect might be explained by potential differences in information processing between checking one's own body, as is the case in ED-, BDD-, or IAD-related BC, and compulsive checking, as is typically performed by persons with OCD. During BC that is focused on negative evaluations of one's own

body (e.g., looking at generally unappreciated areas of the body), existing dysfunctional processing of body-related stimuli (Leonidou & Panayiotou, 2018; Neziroglu et al., 2008) and already developed body-related schemata (Williamson et al., 2004; Yan et al., 2019) may be activated. These schemata may in turn lead to an attentional bias towards disliked (Cordes et al., 2015) or potentially endangered (Witthöft et al., 2013) body parts, thus resulting in higher negative affect following ED-, BDD-, and IAD-related BC. In contrast, when checking objects, as performed by persons with OCD (e.g., checking that plugs on the stove are turned off to prevent fire; Veale & Roberts, 2014), none of these body-related schemata are activated. Thus, in line with considerations by Shafran et al. (2004), the results of the present study imply that the extension from compulsive checking to BC is not empirically applicable. Furthermore, we did not find significant differences between the diagnosis-specific types of ED-, BDD-, and IAD-related BC in the short-term activation of negative affect and psychopathology. Therefore, one can assume a potential transdiagnostic resemblance in the underlying mechanisms of BC across all three types of BC. However, worry about the body was lower in the IAD-related BC group compared to the ED- and BDD-related BC groups. This might be attributable to an initial vulnerability, suggesting that women may be more susceptible to psychopathology associated with appearance-related disorders (i.e., BN, BDD) compared to illness anxiety (i.e., IAD). This assumption is underscored by the higher prevalence rates observed for appearance-related disorders (cf. Buhlmann, Glaesmer, et al., 2010; Galmiche et al., 2019) compared to IAD (cf. Weck et al., 2014).

By contrast, we did find the postulated decrease in negative affect for the control checking condition (i.e., checking the characteristics of two vases). This finding is in line with a study by Walker et al. (2021), in which a 10-min non-BC condition (i.e., examining a text for errors) led to higher body satisfaction, self-esteem, and a marginally lower negative affect compared to a group that performed a 10-min critical BC condition. Thus, the potential cognitive distraction of checking *something* (i.e., vases in the present study) may reduce negative affect, while performing ED-, BDD-, and IAD-related BC, and the associated activation of body-related schemata, may not. The question of why BC is such a common behavior (Baptista et al., 2021) – if it is not negatively reinforced by negative affect – is thus still unanswered. In two studies examining participants with clinical EDs, BDD, and IAD (Hartmann et al., 2019) and nonclinical women (Opladen et al., 2022), the attainment of certainty, and not the reduction of negative affect, was noted as the most relevant function of BC. Thus, further studies might focus on the attainment of certainty as a potential reinforcing mechanism of BC. If our finding of an increase in negative affect is consistently replicated in clinical samples, we would support Guthoff et al. (2019) call for a revision of the prevailing theories (i.e., Bleichhardt & Rief, 2014; Wilhelm et al., 2014; Williamson et al., 2004), suggesting that the course of negative affect is not negatively reinforced, but that BC immediately leads to negative affective consequences.

Limitations

Although the present study was the first to compare ED-, BDD-, and IAD-related BC in healthy women, allowing BC behavior to be disentangled from its associated psychopathology, certain limitations need to be considered when interpreting the results. First, we only included healthy females. Future studies should therefore examine a more heterogenous sample, although previous research has shown similar results, for example, in samples with healthy men regarding BDD-related BC (Cordes et al., 2017; Walker et al., 2012) and IAD-related BC (Hadjistavropoulos et al., 1998). Furthermore, as our participants did not have a mental disorder, our results cannot yet be transferred to clinical samples of individuals with EDs, BDD, and IAD. Second, we cannot be certain that participants deployed their attention towards the regions of their body that they were supposed to look at. However, according to administered manipulation check items, most participants generally examined their body closely and did not use strategies to distract themselves from the task. Third, for reasons of comparability and in reference to Windheim et al. (2011), all participants checked their body for 10 min. However, the length of a BC episode in real life might differ idiosyncratically. Further, we only examined BC with a focus on negative evaluations of one's own body performed in a standardized manner (i.e., each group inspected two specific body areas related to BN-, BDD-, and IAD-associated BC). However, different types and variations in the execution of BC may occur, which were not addressed in our experiment, thus limiting the generalizability of our findings to all forms of body checking. To enhance ecological validity, future studies might take this into account and adjust the time interval and type for which participants are instructed to perform BC.

Implications

In sum, across all diagnosis-specific BC types, a short-term relief of negative affect after BC, as proposed in the etiological models (Bleichhardt & Rief, 2014; Wilhelm et al., 2014; Williamson et al., 2004), was not confirmed by the present findings. Instead, negative affect increased after ED-, BDD-, and IAD-related BC. The results of our study suggest that the theories may need to be adapted, as assumptions regarding checking behavior in OCD (i.e., Carr, 1974; Hodgson & Rachman, 1977) might not be transdiagnostically valid for BC characteristics in EDs, BDD, and IAD. The increase in negative affect after BC instead shows that BC has negative effects not only in the longer term (Opladen et al., 2022), but also in the short term, further underlining the dysfunctionality of BC.

Funding: This project was supported by grants from the German Research Foundation (Deutsche Forschungsgemeinschaft) to ASH (HA 8589/5-1) and SV (VO1750/1).

Acknowledgments: We are very thankful to Sarah Mannion de Hernandez for her language assistance.

Competing Interests: The authors declare no potential conflicts of interest in terms of any commercial or financial relationships.

Author Contributions: *V.H.:* data – collection, analysis; writing – original draft; conceptualization & design. *M.-B. V.:* data – collection, writing: review & editing, conceptualization & design. *A.S.H.:* conceptualization & design. *S. V.:* conceptualization & design. All authors contributed to the revision of the manuscript and read and approved the submitted version.

Ethics Statement: All participants provided their written informed consent prior to taking part in the study. The study involving human participants was reviewed and approved by the Ethics Committee of Osnabrueck University (51/2019).

Reporting Guidelines: Our research adheres to the Journal Article Reporting Standards (JARS) for quantitative research in psychology.

Preregistration: The present study is part of a project that is funded by the German Research Foundation (DFG) that is preregistered at the German Clinical Trials Register (ID: DRKS00025780). The study is registered at the Open Science Framework (https://osf.io/rbvk4).

Abbreviations: BC = Body Checking; ED = Eating Disorder; BDD = Body Dysmorphic Disorder; IAD = Illness Anxiety Disorder; DIPS = Diagnostic Interview for Mental Disorders; SAM = Self-Assessment Manikin; PANAS = Positive and Negative Affect Schedule.

Data Availability: The data and materials that support the findings of this study are available on request from the corresponding author, Vanessa Hofschröer, without undue reservation.

Supplementary Materials

The Supplementary Materials contain the preregistration for the study (see Hofschröer et al., 2023S).

Index of Supplementary Materials

Hofschröer, V., Vivell, M.-B., Schulz, I., Hirschfeld, G., Hartmann, A. S., & Vocks, S. (2023S). *Does body checking regulate emotions over time? Psychophysiological and cognitive-affective effects of appearance- and health-related body checking* [Preregistration]. OSF Registries. https://osf.io/rbvk4

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Conducting Behavioural Experiments Using an App-Based Self-Help Program for Social Anxiety Disorder (SMASH): Outcomes of a Quasi-Experimental Pre-Post Pilot Trial

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Clinical Psychology in Europe, 2026, Vol. 8(1), Article e15687, https://doi.org/10.32872/cpe.15687

Received: 2024-09-25 • **Accepted:** 2025-10-05 • **Published (VoR):** 2026-02-27

Handling Editor: Cornelia Weise, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany

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Supplementary Materials: Materials, Preregistration [see Index of Supplementary Materials]

Abstract

Background: Social Anxiety Disorder (SAD) is a prevalent mental disorder characterised by fear of negative evaluation. Although effective treatment approaches are available, access remains limited due to psychological and organisational barriers. Internet-based cognitive behavioural therapy (iCBT) has shown promising results and may facilitate an easy and more resource-efficient access to treatment.

Method: We developed an app-based self-help intervention for SAD based on the Clark and Wells treatment program, implemented as an unguided smartphone application, which was evaluated in this quasi-experimental pre-post pilot study consisting of $N = 33$ patients with a primary diagnosis of SAD. Feasibility was assessed through usage parameters and qualitative feedback. Effectiveness was evaluated in regard to SAD and depression, using clinician-rated measures (LSAS, QIDS-C) at post-treatment (12 weeks) and self-report measures (SPIN, SCQ, BDI-FS) at midpoint and post-

treatment. Additionally, moderating effects of usage parameters on symptom reduction were examined.

Results: Clinician- and self-reported SAD symptoms were significantly reduced at post-measurement (within-group effect sizes LSAS: η^2 = .54; SPIN: η^2 = .47), with 52% of patients achieving a clinically significant improvement. Despite moderate overall adherence, the amount of conducted behavioural experiments moderated reduction in self-reported SAD symptom severity and SAD-related cognitions. Open feedback supported feasibility and acceptability of the app.

Conclusion: In conclusion, findings provide preliminary support for feasibility, acceptability, and potential effectiveness of *Mindable: Soziale Phobie*. A randomised controlled trial will further evaluate the effectiveness and explore the impact of therapist guidance.

Keywords

social anxiety disorder, cognitive behavioural therapy, behavioural experiment, iCBT, app-based, self-help, mental health

Highlights

- Newly developed unguided iCBT for SAD demonstrates large pre-post treatment effects on self- and clinician-reported SAD and depressive symptom severity.
- Over 50% of participants experienced reliable improvement in SAD symptoms and anxiety-related beliefs.
- High variance in adherence, with the amount of completed exposures moderating treatment success.

Background

Social Anxiety Disorder

Social Anxiety Disorder (SAD) includes fear about negative evaluation in social or performance situations (APA, 2013). SAD symptoms cause considerable suffering, functional impairment and reduced quality of life (Aderka et al., 2012; Lochner et al., 2003). SAD has a lifetime prevalence of 10.7% (Kessler et al., 2012) and is associated with various psychiatric and somatic comorbidities and substantial healthcare costs (Dams et al., 2017; Stein et al., 2017). The Clark and Wells (1995) model explains the psychopathology of SAD by highlighting cognitive and behavioural processes like self-focused attention, negative self-imagery, rumination and safety behaviours. Well-established treatments are available, with cognitive behavioural therapy (CBT) based on the Clark and Wells model (CT-SAD) demonstrating the greatest effectiveness (Mayo-Wilson et al., 2014), including in uncontrolled routine clinical practice (Hoyer et al., 2017). Behavioural experiments (BEs) are the key mechanism driving symptom change (Yilmaz et al., 2025). However, less than 20% of SAD patients receive adequate treatment (Alonso et al., 2018; Stein et al., 2017) due to shame, fear of stigma, uncertainty about treatment access or long waiting times (Goetter et al., 2020; Heinig et al., 2021). Providing CT-SAD requires specific

knowledge, competence and time for conducting in-vivo BEs (Clark et al., 2023; Pittig et al., 2019), which further limits availability of treatment.

Internet-Based CBT

Internet-based CBT (iCBT), delivered via websites or mobile apps, addresses several limitations of face-to-face therapy by increasing accessibility, resource-effectiveness and scalability. Guided iCBT includes therapist support, e.g. in blended formats combining online components with face-to-face sessions, whereas unguided programs are fully self-directed (Käll et al., 2024), and are increasingly provided through mobile apps. Using an iCBT can be less shame-inducing for SAD patients (Goetter et al., 2020) and is explicitly preferred by some patients (Kählke et al., 2019).

iCBTs, including app-based programs, have faced criticism regarding insufficient data security, quality assurance or integration into the healthcare system (e.g. Davies et al., 2020; Denecke et al., 2022; Iwaya et al., 2023). The German DiGA (*Digitale Gesundheitsanwendungen*) program addresses these challenges by providing digital applications that meet strict quality and data security standards, are prescribed by healthcare professionals and reimbursed by health insurances. As part of the Digital Healthcare Act (DVG), DiGAs aim to support diagnosis, monitoring and treatment of diseases (Giebel et al., 2024).

iCBTs have been consistently found to be effective for SAD, with meta-analyses reporting large effects compared to waitlist conditions, including both guided and unguided formats (g = 0.76, Pauley et al., 2023; g = 0.79, Guo et al., 2021; g = 1.31 – 1.34, Andersson et al., 2018). Unguided programs for SAD report a wider range of within-group effect sizes from small (d = 0.38, Titov et al., 2008) and moderate (d = 0.72, McCall et al., 2018) to large (d = 1.17, Kählke et al., 2019).

App-based interventions offer several advantages over web-based iCBTs, including constant availability, which supports the application of strategies in real-world contexts and the conduction of brief, frequent sessions, thereby supporting learning and engagement, and increasing the validity of self-assessments by reducing the reliance on retrospective reporting (Boettcher et al., 2018; Linardon et al., 2024; Stolz et al., 2018). First trials suggest that guided app-based interventions for SAD may be non-inferior to web-based interventions (Stolz et al., 2018) and that combining both approaches can enhance effectiveness (Boettcher et al., 2018). A recent meta-analysis found app-based interventions to reduce SAD symptoms (g = .52, Linardon et al., 2024), without differentiating guided from unguided apps. The only trial on an unguided app-based intervention for SAD reports promising results for a brief, unguided intervention focusing on an imaginal exposure (Schwob & Newman, 2023). To date, no other trials have fully evaluated unguided app-based interventions for SAD, underlining the need to investigate their feasibility and clinical efficacy.

The cost-effectiveness potential has been demonstrated for guided iCBTs (Kählke et al., 2022), though few comparisons to active controls are available. Although unguided programs may offer additional cost savings by reducing personnel involvement, mixed evidence on the role of therapist guidance in improving adherence and reducing attrition (Chen et al., 2020; Dryman et al., 2017) raises concerns that a reduction in treatment effectiveness due to lower adherence and retention could offset these savings.

Research Objectives

In this article, we report findings of a pilot study evaluating the newly developed app-based self-help program *Mindable: Soziale Phobie* for SAD. In line with the Clark and Wells model, in-vivo BEs are the key component. We aimed to investigate three main objectives:

Firstly, we investigated the effectiveness of *Mindable: Soziale Phobie* as stand-alone treatment without therapeutic guidance. We hypothesised that participants would show significant improvements across all outcome measures from pre- to post-treatment. Additionally, we explored clinical relevance of these effects by examining response and remission rates.

Secondly, we examined treatment acceptance, operationalised through treatment expectancy, attrition rates, feedback and adherence measured by app usage parameters. We hypothesised that higher treatment expectancy would be associated with greater adherence.

Lastly, we analysed whether adherence moderated treatment outcomes. Specifically, we hypothesised that the number of conducted *BEs* would moderate treatment outcomes, based on prior findings that greater engagement in behavioural challenges and imaginal exposure exercises is associated with improved outcomes in individuals with SAD (Boettcher et al., 2018; Dryman et al., 2017; Schwob & Newman, 2023).

Method

Study Procedures

This pilot study (ethics approval no.: 2022-77) precedes a randomised controlled trial (RCT; ClinicalTrials.gov registration: NCT05554718) to test effectiveness, feasibility and acceptance of the app-based self-help program *Mindable: Soziale Phobie*. Results of this pilot study were used in the authorisation process of the app as digital health application within the German DiGA program (for reference, see Giebel et al., 2024). The study employed a quasi-experimental pre-post design in a naturalistic setting. Recruitment took place from September 2022 to February 2023 through two pathways: therapist referrals from outpatient centers at Goethe University Frankfurt and Technische Universität Dresden, and online recruitment, where interested respondents completed a pre-screening

procedure assessing whether self-rated SAD symptom severity (SPIN) met the cut-off of 25 points. Eligible individuals from both pathways were contacted for an on-site intake screening conducted by independent, trained psychologists (at least master's level), to assess inclusion and exclusion criteria. Inclusion required ages 18 to 65 years, a primary SAD diagnosis as determined by the Structured Clinical Interview for DSM-5 (SCID-5-CV), and absence of more severe or impairing psychiatric disorder. Exclusion criteria included acute suicidal ideation and current psychotherapeutic or psychopharmacological treatment. See Supplementary Figure 1 for the participant flowchart. Clinician-rated outcomes were assessed at baseline- and post-measurement (Week 12), self-reported questionnaires additionally at midpoint (Week 6). After enrollment, participants received a download link and access code, which was linked to the individual via a linking log stored separately from identifying data. The app was accessible on smartphones or tablets running iOS 12/Android 7 or higher, with a stable internet connection. For more details on procedure, see the RCT study protocol (Schittenhelm et al., 2023).

Participants

Eligible patients after pre-screening or based on referral (N = 39) were screened for intake. Of these, 33 were included in the pilot study. 76% of participants were female and mean age was M = 31.97, SD = 9.14 (Range 19 – 65). Sociodemographic data is shown in Supplementary Table 2.

Intervention

Mindable: Soziale Phobie translates the German adaptation (Stangier et al., 2016) of the CT-SAD treatment (Clark & Wells, 1995) into a smartphone program. In this study, the program was implemented as a fully unguided self-help program; however, it can also be used to bridge waiting times for psychotherapy or in a blended treatment alongside face-to-face therapy.

The program consists of three *structured* and two *unstructured modules*. *Structured modules*, completed in a fixed sequence, include *psychoeducation*, *development of an individualised case formulation*, and a *video-based processing experiment* illustrating the effects of self-focused attention and safety behaviours. These could easily be completed within one week, though users proceed at their own pace. Afterwards, users access the *unstructured modules*, comprising *attention training (AT)* and *behavioural experiments (BEs)*. *BEs* form a core therapeutic component, aimed at testing maladaptive beliefs through real-life exposure tasks without safety behaviours. The app supports users in planning and reflection, but provides no reminders. *BEs* can be undertaken flexibly, with participants encouraged to complete as many as possible during the 12-week program.

Outcome Measures

Attrition, Adherence, and Participant Feedback

Attrition was defined as the proportion of patients who did not complete the midpoint or post measure. Adherence was defined as the extent to which participants engaged with the intervention as intended and was operationalised by tracking the number of conducted *psychoeducation modules*, *behavioural experiments (BE)*, *attention trainings (AT)*, and *usage days*. Participants rated their expectancy of iCBT effectiveness for treating mental disorders on a scale from 0 to 100. At post-treatment, feedback was collected through open-ended questions.

Clinical Diagnoses

SAD diagnoses were obtained using the SCID-5-CV (First et al., 2016; German version: Beesdo-Baum et al., 2019a) at the intake screening. We used a short screening scale for Borderline Personality Disorder (Short-Bord; Wongpakaran et al., 2019) and conducted relevant sections of the SCID-5-PD (First et al., 2015; German version: Beesdo-Baum et al., 2019b) if there were indicators of the presence of a personality disorder.

Self- and Clinician-Reported Measures

All questionnaires used are well-established measures with solid psychometric properties. See Supplementary Table 1 for psychometric data. We report results for main outcomes here and present results for additional self-rated measures in Supplementary Tables 3 to 5. Main outcomes included clinician-rated (Liebowitz Social Anxiety Scale; LSAS) and self-rated (Social Phobia Inventory; SPIN) SAD symptom severity as well as clinician-rated (Quick Inventory of Depressive Symptoms, Clinician-Rated Version; QIDS-C) and self-rated (Beck Depression Inventory - Fast Screen; BDI-FS) depressive symptom severity. In addition, anxiety-related beliefs were assessed using the Social Cognitions Questionnaire (SCQ) with subscales for frequency and intensity of beliefs.

Data Analysis

The sample size for this pilot study was determined through simulation-based power analysis using "simr" (Green & MacLeod, 2016). Based on a simplified linear mixed model (LMM) corresponding to a one-group pre-post design of the APP condition described in the study protocol by Schittenhelm et al. (2023), we iteratively increased the number of simulated cases until the estimated power exceeded 80%. Analyses were performed with the intention-to-treat (ITT) sample, consisting of all participants included. Missing data was imputed using a non-parametric Random Forest algorithm (Stekhoven & Bühlmann, 2012). Linear mixed models (LMMs) were used to determine change between measurements. We calculated partial η^2 as effect size, defining a small effect as $\eta^2 > .01$, medium effect as $\eta^2 > .06$ and $\eta^2 > .14$ as large effect (Cohen, 1988). Treatment response was

defined as LSAS sum score reduction of at least 29% and remission as a LSAS sum score below 30 (von Glischinski et al., 2018). Reliable clinical change indices (RCI) were determined following Jacobson and Truax (1991). Moderation analyses were conducted using regression models including interaction terms between time and usage parameters, with baseline scores included as covariates. All analyses were performed using R Statistical Software (v4.2.2; R Core Team, 2021). The reporting of this pilot study was guided by the CONSORT-EHEALTH guidelines for digital health interventions (Eysenbach et al., 2011), with adaptations due to the scope and format of a short report.

Results

Improvement of Symptomatology

Descriptively, all outcomes improved over the study period, with self-rated measures improving by midpoint and remaining stable thereafter. Means and standard deviations for all measures and time points are provided in Supplementary Table 3. LMMs were used to evaluate statistical significance of changes from baseline- to midpoint- and post-measurement (Table 1). LSAS significantly improved from baseline to post-measurement, while QIDS-C did not. SPIN and BDI-FS improved by study midpoint and remained stable afterwards. See Supplementary Table 4 and Supplementary Figure 2 for detailed results including additional measures.

Table 1

Linear Mixed Model Results for all Outcomes, Intention-To-Treat Data Set (N = 33)

				Midpoint (6 weeks)			Post (12 weeks)		
Variable	F^a	p^a	**Within-group η_p^2 [95% CI]**	β^b	S^b	p^b	β^b	SE^b	p^b
LSAS Total	38.18	*	.54 [.30, .70]	/	/	/	-21.55	3.49	*
SPIN	28.93	*	.47 [.29, .60]	-10.91	1.74	*	-11.97	1.74	*
SCQ Frequency	28.93	*	.37 [.18, .52]	-0.46	0.10	*	-0.54	0.10	*
SCQ Conviction	18.89	*	.31 [.12, .46]	-8.87	2.51	*	-13.05	2.51	*
QIDS-C	14.07	.539	.01 [.00, .17]	/	/	/	-0.42	0.68	.539
BDI-FS	11.98	*	.27 [.10, .43]	-4.55	1.12	*	-4.91	1.12	*

Note. LSAS = Liebowitz Social Anxiety Scale; SPIN = Social Phobia Inventory; SCQ = Social Cognitions Questionnaire; QIDS-C = Quick Inventory of Depressive Symptoms; BDI-FS = Beck Depression Inventory. See Supplementary Table 4 for results on additional measures.

[a]*F*- and *p*-values derived from *F*-tests of linear mixed models. [b]β-values with standard errors and according *p*-values derived from coefficients of linear mixed models using Satterthwaite's method.

*$p < .001$.

Response and Remission

Treatment response was achieved by 17 participants (52%). Only one patient reached remission. Reliable clinical change in SAD symptom severity was observed in 67% of participants based on clinician ratings (LSAS) and in 61% based on self-ratings (SPIN) at post-measurement. Notably, all self-rated improvements were achieved by midpoint. For an overview of RCI outcomes, see Supplementary Table 5.

Attrition, Adherence and Feedback

22 participants (67%) completed all study procedures, eleven participants (33%) dropped out either before ($N = 4$) or after ($N = 7$) midpoint-measurement. The mean duration of study participation among drop-outs was $M = 41.82$ days, $SD = 15.65$. Reasons for drop-out included initiating psychotherapeutic or psychopharmacologic treatment ($N = 3$) and dissatisfaction with the intervention ($N = 2$). For six participants, the drop-out reasons were unknown. On average, patients used the app on $M = 8.18$ days, $SD = 6.78$, spread out over a mean duration of $M = 49.45$ days, $SD = 31.47$. Most participants completed all three *psychoeducation modules* (97%) and all three *model creation modules* (70%), which were both part of the *structured modules*. 39% of participants conducted at least one *BE*, with a maximum of 13 experiments. The number of usage days was correlated more strongly with the number of *unstructured modules* (*BE:* $r_s = .85$, $p < .001$; *AT:* $r_s = .83$, $p < .001$) than *structured modules* ($r_s = .49$, $p = .004$). A priori treatment expectancy was moderate with $M = 68.52$, $SD = 19.41$, and was not correlated with any usage parameter. See Supplementary Table 6 for descriptive data on usage parameters. An overview of open feedback is presented in Supplementary Table 7.

Moderation Analyses

The number of conducted *BEs* moderated SAD symptom severity (SPIN) and both intensity and frequency of anxiety-related cognitions (SPQ), but not clinician-rated symptom severity (LSAS). Specifically, a higher number of BEs was associated with greater reductions in SAD symptoms and cognitions. A similar effect was observed for AT: both the number of *ATs* and the number of *usage days* moderated self-rated SAD symptom severity (SPIN) and the frequency of anxiety-related cognitions (SPQ), with greater engagement linked to stronger symptom improvement. The number of completed *structured modules* did not moderate any outcome. See Table 2 for detailed results.

Table 2

Outcomes of Moderation Analyses

		Structured Modules		Behavioural Experiments		Attention Trainings		Usage Days	
Variable	***df***	***t***	***p***	***t***	***p***	***t***	***p***	***t***	***p***
LSAS	31	0.44	.67	-0.47	.64	-0.56	.58	-0.17	.86
SPIN	62	-1.33	.19	-2.52	**.01**	-2.20	**.03**	-2.13	**.04**
SCQ Frequency	62	-0.39	.70	-2.25	**.03**	-1.77	.08	-1.54	.13
SCQ Conviction	62	-1.50	.14	-2.25	**.03**	-2.10	**.04**	-2.05	**.04**

Note. Results of moderation analyses showing the moderating effect of each usage parameter (listed in the title row) on each outcome. Boldface *p* values denote statistical significance at α = .05.

Discussion

Treatment Effectiveness

The app-based self-help program *Mindable: Soziale Phobie* demonstrated a very large pre-post treatment effect on clinician-rated (LSAS: η^2 = .54) and self-reported SAD symptoms (SPIN: η^2 = .47. These effects are in line with, and in part exceed, those reported in previous studies on unguided web-based iCBT programs for SAD (e.g. Kählke et al., 2019; McCall et al., 2018; Titov et al., 2008). Large effects were also observed in anxiety-related cognitions and depressive symptoms. Over half of the participants experienced reliable clinical improvement in SAD symptom severity and beliefs. Consistent with prior evidence, our study's pre-post treatment effects are in the same range as face-to-face CBT (*d* = 1.22, Bandelow et al., 2015). Notably, these effects were achieved without clinician guidance, highlighting the potential of app-based self-help for SAD.

Attrition and Treatment Adherence

Despite large treatment effects, attrition and adherence remain challenges in unguided app interventions. Our program's drop-out rate of 33% was higher than in face-to-face CBT for SAD (e.g. Stangier et al., 2011; Clark et al., 2006), but lower than most unguided internet-based CBT trials, which report rates up to 66% (Chen et al., 2020; McCall et al., 2018; Titov et al., 2008). Our comparatively low drop-out may be attributed to the app-based format, which offers greater flexibility and easier integration into daily life.

Adherence declined over time, with most patients completing the initial *structured modules*, but 61% of participants not conducting any *BEs*. This aligns with Dryman et al. (2017), who report that one third of users dropped out after cognitive restructuring but before completing exposures, potentially due to avoidance or task difficulty. Alternatively, users might have disengaged after an initial symptom reduction, as reflected in

our finding that improvements occurred mostly in the first half of the study. Notably, patients who engaged more in *unstructured modules*, specifically *BEs*, showed greater reductions in SAD symptoms and beliefs, consistent with findings identifying BEs as a key mechanism in CT-SAD (Yilmaz et al., 2025).

Results on attrition and adherence raise questions about the impact of lacking therapist guidance. While some participants independently engaged fully, others who dropped out early might have benefited from additional support, as suggested in participant feedback indicating a desire for external encouragement (see Supplementary Table 2). Other participants, however, valued the flexibility and anonymity of the self-guided format, consistent with previous observations (Kählke et al., 2019). These findings highlight individual differences in treatment needs, emphasising the importance of future research to identify differentiating patient characteristics in order to optimise adherence, effectiveness, and resource allocation in digital interventions (Ibeh et al., 2024).

Limitations

First, as this was a pilot study assessing the feasibility of an app-based self-help intervention, the small sample size limits external validity. Second, the uncontrolled design prevents firm conclusions about efficacy, so results should be interpreted with caution. Third, selective sampling may restrict the generalizability to the population of SAD patients. For example, digital affinity may be higher among younger individuals, while older patients may prefer face-to-face interaction. This could lead to an overestimation of efficacy in the general population. Fourth, the 12-week study duration limits assessment of long-term engagement or sustained effects and short-term improvements observed may not persist over time. Fifth, participants were not blinded due to the nature of the intervention, which may further contribute to expectancy effects or reporting bias. Finally, the app was tested as a standalone tool, whereas in real-world clinical settings such tools are more commonly used as part of therapist-guided treatments.

Future Directions

Future research should investigate the effectiveness of app-based self-help interventions in an RCT with a larger and more diverse patient sample. A key area for further study is the specific contribution of app usage to the efficacy of therapist-guided treatments (Schittenhelm et al., 2023; Stolz et al., 2018), and their benefit for subgroups of patients less inclined to blended care, such as older adults. Several of these questions are currently being explored in an ongoing RCT (Schittenhelm et al., 2023), which compares unguided app use, guided use with additional therapy sessions, and a waitlist control condition. This study also examines predictors of treatment success, including patient characteristics and mechanisms of change, monitored through weekly symptom assessments.

Conclusion

iCBTs offer a quickly available, effective, and potentially resource-efficient treatment option for highly self-motivated patients or patients who feel too ashamed to pursue face-to-face psychotherapy. This pilot study provides initial evidence for the effectiveness of an app-based self-help program implementing CT-SAD based on the Clark and Wells model. Despite moderate overall treatment engagement, the results demonstrate significant improvements in SAD symptomatology. Further research on its implementation and the potential benefit of therapist guidance is warranted.

Funding: Research costs and the salaries of all authors have been funded by Mindable Health GmbH.

Acknowledgments: The authors have no additional (i.e., non-financial) support to report.

Competing Interests: Research costs and the salaries of all authors have been funded by Mindable Health GmbH, the creator and developer of the app evaluated in this research. Jacob Kujat was employed by Mindable Health GmbH during the study period. However, Jacob Kujat was no longer employed there at the time of the preparation of this publication. The study teams of both universities (JSS, JMS, RR, JH, US) were involved in the development of the app as scientific advisors. The funding provided by Mindable Health GmbH supported the study design, data collection, data analysis, and preparation of the publication. The content of the publication is solely the responsibility of the authors. Mindable Health GmbH was not involved in the preparation of the publication and was unable to exert any influence over the results presented here.

Ethics Statement: The research project, the results of which are presented here, strictly followed recognised ethical guidelines and was approved by the Ethics Committee of the Department of Psychology at Goethe University Frankfurt before the study was initiated (no. of ethics approval: 2022-77). All participants that were involved in this study previously gave their informed consent to study procedures in accordance with the Declaration of Helsinki. The personal rights of all participants were carefully respected throughout, and the study data was only analysed in pseudonymised form.

Preregistration: The entire research project (the RCT and the associated pilot study presented here) was preregistered on ClinicalTrials.gov (registration number: NCT05554718; see Schüller et al., 2022S).

Reporting Guidelines: The reporting of this pilot study was guided by the CONSORT-EHEALTH guidelines for digital health interventions, with adaptations due to the scope and format of a short report.

Author Note: The authors made the following contributions: *Johanna S. Schüller*: Intervention Development, Recruitment, Trial Management, Data Collection, Formal Analysis, Writing - Original Draft Preparation, Writing - Review & Editing; *Jacob Kujat*: Conceptualization, Intervention Development, Trial Management, Formal Analysis, Writing - Original Draft Preparation, Writing - Review & Editing; *Jan M. Schittenhelm*: Intervention Development, Recruitment, Trial Management, Data Collection, Formal Analysis, Writing - Original Draft Preparation, Writing - Review & Editing; *Ronja von Rechenberg*: Intervention Development, Recruitment, Trial Management, Data Collection, Formal Analysis, Writing - Review & Editing; *Antonia Čerič*: Recruitment, Trial Management, Data Collection, Writing - Review & Editing; *Jürgen Hoyer*: Conceptualization, Intervention Development, Trial Management, Review & Editing, Supervision; *Ulrich Stangier*: Conceptualization, Intervention Development, Trial Management, Review & Editing, Supervision.

Data Availability: As the data collected is particularly sensitive personal health data, it can be accessed in pseudonymised form and only in the case of legitimate interest upon request from the Department for Clinical Psychology and Psychotherapy, Goethe University Frankfurt, Frankfurt, Germany. R scripts and study materials used here can also be accessed on request by contacting the same institute.

Supplementary Materials

The Supplementary Materials contain the following items:

- Preregistration (Schüller et al., 2022S)
- Supplementary figures and tables (Schüller et al., 2026S)
  - *Supplementary Figure 1:* Study flow chart
  - *Supplementary Figure 2:* Results for patient- and clinician-rated outcomes
  - *Supplementary Table 1:* Overview of clinician-rated and self-report questionnaires used in the study
  - *Supplementary Table 2:* Sociodemographic data of study participants
  - *Supplementary Table 3:* Descriptive data of all outcomes for baseline-, midpoint- (6 weeks) and post-measurement (12 weeks), intention-to-treat data set
  - *Supplementary Table 4:* Linear mixed model results for all outcomes, intention-to-treat data set
  - *Supplementary Table 5:* Reliable change indices and response rates for study outcomes, intention-to-treat data set
  - *Supplementary Table 6:* Descriptive data for usage parameters
  - *Supplementary Table 7:* Overview of the responses to the open-format feedback survey

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Schüller, J. S., Kujat, J., Schittenhelm, J. M., von Rechenberg, R., Čerič, A., Hoyer, J., & Stangier, U. (2022S). *Evaluation of a smartphone application for self-help for social anxiety (SMASH)* [Preregistration; Registration No.: NCT05554718]. ClinicalTrials.gov. https://clinicaltrials.gov/study/NCT05554718

Schüller, J. S., Kujat, J., Schittenhelm, J. M., von Rechenberg, R., Čerič, A., Hoyer, J., & Stangier, U. (2026S). *Supplementary materials to "Conducting behavioural experiments using an app-based self-help program for social anxiety disorder (SMASH): Outcomes of a quasi-experimental pre-post pilot trial"* [Supplementary figures and tables]. PsychOpen GOLD. https://doi.org/10.23668/psycharchives.21616

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Clinical Psychology in Europe (CPE) is the official journal of the European Association of Clinical Psychology and Psychological Treatment (EACLIPT).

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