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REVIEW ARTICLE

Predictive Power of Positive Mental Health: A Scoping Review

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Abstract

Positive mental health (PMH) has been shown to be of great importance to adaptive functioning. The aim of this article is to review the literature on PMH as assessed with the PMH-Scale. A literature search identified 85 articles that were published between 2007 and 2023 on PMH as assessed with the PMH-Scale. The identified articles focus on seven thematic areas: (1) psychometric studies; (2) sociodemographic factors; (3) mental disorders; (4) suicidality; (5) coronavirus disease 2019 (COVID-19); (6) influencing factors; (7) treatment. The findings support the predictive power of PMH regarding the cross-cultural course of psychopathology/mental disorders as well as health-related behavior and healthy development. Results on PMH are comparable across cross-sectional and longitudinal studies. The significance of these findings is limited by the fact that only few studies involving experimental manipulation of PMH have been carried out. The present findings emphasize the importance of PMH at the individual and collective level, as well as the urgent need to make PMH part of the routine assessment of mental health in addition to variables of psychopathology.

Keywords Positive mental health · Mental disorders · Suicidality · Cross-cultural · Scoping review

Abbreviations

PMH	Positive mental health
DALY	Disability adjusted life years
DPS	Dresden predictor study
BOOM	Bochum optimism and mental health
WEIRD	Western, educated, industrialized, rich, and democratic
PTSD	Post-Traumatic stress disorder
COVID-19	Coronavirus disease 2019

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SMU	Social media use
LKM	Loving kindness meditation
CCMI	Cross-Cultural measurement invariance
FoH	Fear of heights

1 Introduction

People often consider health to be their most valuable asset (Bowling, 1995). For a long time, the emphasis of research and care was on physical health (Margraf, 2020). In recent decades, however, mental health has become more of a focus (cf., Prince et al., 2007). Dramatic increases in work disability due to mental health problems and extreme treatment costs have contributed to this development (Layard, 2017; Murray et al., 2012). In industrialized countries, seven out of ten leading causes of disability and premature mortality among 15- to 44-year-olds are mental disorders, and in Europe, the burden of disease due to mental disorders is almost as high as that resulting from somatic diseases (measured by Disability Adjusted Life Years, DALYs, see Gustavson et al., 2018; Murray et al., 2012; Rehm & Shield, 2019; Whiteford et al., 2013; Wittchen et al., 2011). The enormous costs, frequent secondary problems, and massive suffering of those affected and their families make a comprehensive understanding of the developmental pathways to mental disorders urgently necessary in order to develop better treatment and prevention strategies.

Essentially, different conceptions of mental health and mental disorder can be distinguished: The categorical view of healthy and disordered as two qualitatively different categories corresponds to the traditional medical model (cf., Margraf, 2020). In psychology, on the other hand, dimensional approaches have long been more widely accepted (Bohlmeijer & Westerhof, 2021; Keyes, 2005, 2007; Ryff, 2014; Suldo & Shaffer, 2008; Trompetter et al., 2017). Here one can distinguish between unidimensional and multidimensional approaches: In a unidimensional approach, health and illness are assumed to represent different manifestations on a single dimension (cf., Caspi & Moffitt, 2018). In the simplest case, multidimensional models assume that health and disorder are two distinct dimensions. Such two-dimensional models, called "dual-factor models", have recently gained momentum (Bohlmeijer & Westerhof, 2021; Keyes, 2005, 2007; Ryff, 1989, 2014; Suldo & Shaffer, 2008; Trompetter et al., 2017; Westerhof & Keyes, 2010): They postulate a second factor, which includes positive mental health (PMH) or minimal/maximal well-being, in addition to a disorder factor that ranges from minimal to maximal complaints or symptoms. In line with such a conceptualization the World Health Organization (World Health Organization, 2004) emphasized the need to approach mental health not only as the absence of psychopathology, but additionally as "a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community" (p. 12).

Whereas in the past, clinical psychology was primarily concerned with eliminating or reducing disorder, with the rise of positive psychology the focus is increasingly on the positive dimension of health (Fava & Guidi, 2020; Hendriks et al., 2019; Keyes, 2007; Seligman et al., 2005; Wood & Johnson, 2016; Wood & Tarrier, 2010). In addition to negative variables such as symptoms and risk factors of mental health, recent attention has increasingly focused on positive factors of mental health such as optimism, life satisfaction, happiness,

self-acceptance, purpose in life and self-efficacy because of their potentially significant and independent influence on the development and course of mental disorders (Browne et al., 2017; Keyes et al., 2010; Lamers et al., 2015; Schotanus-Dijkstra et al., 2019; Wood & Joseph, 2010) as well as physical illnesses (Lamers et al., 2012; Ryff, 2014). In sum, growing evidence underscores the importance of positive mental health (PMH) as a resilience factor and contributor to adaptive functioning that makes PMH highly relevant for preventive and clinical practice (cf., Wood & Johnson, 2016).

Two broad traditions describe the key components of PMH (Deci & Ryan, 2008): The hedonic tradition emphasizes a person's emotional and cognitive evaluation of the own life. This perspective has been referred to as *hedonic (or subjective) well-being* and mainly comprises constructs such as positive affect and life-satisfaction (Huta, 2015). The eudaimonic tradition focuses on human potential and optimal functioning. The concept of *psychological well-being* (Ryff, 1989) is an example of the eudamonic tradition. In her work, Ryff (1989) proposed six dimensions of psychological well-being: autonomy, environmental mastery, personal growth, positive relationships, purpose in life, and self-acceptance.

Although there is substantial overlap between major theoretical approaches to psychological well-being, different scholars focus on different components of the construct (Martela & Sheldon, 2019). Still, Huta and Waterman (2014) found that four contents appeared in most or all definitions: meaning/value/relevance to a broader context, personal growth/self-realization/maturity, excellence/ethics/quality, and authenticity/autonomy/integration. Measures of subjective and psychological well-being are highly correlated suggesting that positive feelings and positive functioning tend to go hand in hand (Tov, 2018). In consequence, there is a far-reaching consensus that a combination of both hedonia and eudaimonia is needed for an optimal existence (e.g., Keyes et al., 2002; Seligman, 2013). Keyes et al. (2002) offered the term *flourishing* to describe a condition characterized by high levels of both subjective and psychological well-being. Others define the term positive mental health as the simultaneous presence of subjective, social and psychological well-being (Suldo & Shaffer, 2008): PMH therefore comprises a positive sense of well-being, as well as the capacity to enjoy life and deal with life`s challenges.

Assuming that PMH is not simply the same as the absence of a mental disorder, the question arises as to the appropriate way to capture mental health positively, and not only on a negative definition. There are several instruments to assess facets of PMH, such as for example the Psychological Well-Being Scales (Ryff, 1989), the Mental Health Continuum (Keyes et al., 2008; Lamers et al., 2011), the Euthymia Scale (Fava & Bech, 2016), or the Positive Mental Health Questionnaire (Lluch-Canut et al., 2013). To allow for a holistic, yet brief assessment of PMH, the nine-item self-report Positive Mental Health Scale (PMH-Scale) was recently developed (Lukat et al., 2016). The items of the PMH-Scale were selected from four German language instruments: the Trier Personality Inventory (Becker, 1989), Freiburg Personality Inventory (Fahrenberg et al., 1994), Mental Health Scale (Tönnies et al., 1996), and Bernese Questionnaire of Subjective Well-Being (Grob et al., 1991) based on being general, cross-situational, and person-centered (i.e., focus on a person's overall characteristic pattern across many situations).

Participants respond to the items on a scale ranging from 0 (*I disagree*) to 3 (*I agree*), with higher scores displaying greater PMH (Lukat et al., 2016). The PMH-Scale has been shown to be a unidimensional measure (Lukat et al., 2016), nevertheless, the scale includes both items that capture aspects of subjective well-being, such as life satisfaction ("I enjoy

my life"), as well as items that capture aspects of psychological well-being, such as environmental mastery ("I manage well to fulfil my needs"), and self-acceptance ("I am in good physical and emotional condition") (Lukat et al., 2016; Teismann & Brailovskaia, 2020; Toledano-Toledano et al., 2023). The relevance of PMH – as assessed with the PMH-Scale – was first demonstrated in analyses on the data set of the Dresden Predictor Study (DPS), a prospective epidemiological study conducted in the city of Dresden, Germany (Trumpf et al., 2010): The DPS included a representative sample of German women aged 18–24 years. At baseline and again 17 months later, 1396 women took part in an individual diagnostic interview and filled out self-report questionnaires (Trumpf et al., 2010). Using the DPS dataset, Trumpf et al. (2009) found PMH to be the most important predictor of remission from specific phobia in young women. In contrast, specific phobia characteristics (i.e., severity, age at onset), stress, coping skills, a negative cognitive style and psychopathology at baseline did not predict remission (Trumpf et al., 2009). A comparable pattern of results was found by Vriends et al. (2007) for social phobia: In a multivariate regression model, PMH was the strongest predictor of remission from social phobia – even after controlling for avoidance behavior, dysfunctional attitudes, daily hassles, psychopathology, anxiety sensitivity, self-efficacy, social support, and life satisfaction. The findings suggest that the natural course of specific and social phobia in young women depends on facets of subjective and psychological well-being, whereas it is relatively independent of the disorder's characteristics (Vriends et al., 2007). Furthermore, it seems as if PMH – as assessed with the PMH-Scale – is more relevant to the remission of phobic disorders than other potentially protective factors (e.g., social support, self-efficacy, life satisfaction) (Trumpf et al., 2010; Vriends et al., 2007).

Meanwhile, the PMH-Scale has been translated into various languages (e.g., Arabic, English, Chinese, French, Lithuanian, Russian, Persian), and it has been widely used in cross-cultural studies (see https://fbz-bochum.de/open-access-materialien-open-access-materials.html). In this regard, the scale is a central instrument within the so-called "Bochum Optimism and Mental Health (BOOM)" project, a large-scale, cross-cultural, longitudinal investigation of risk and protective factors in mental health (Margraf et al., 2020). Moreover, the usage of the scale covers various topics extending across multiple scientific disciplines.

Against this background, the aim of the present article is to conduct a scoping review to explore the extent, range, and nature of research activity and to summarize research findings on PMH – as assessed with the PMH-Scale. The PMH-Scale is said to be the most widely used instrument to measure positive mental health worldwide (Toledano-Toledano et al., 2023) and therefore represents a good anchor point for a literature review.

An advantage of a scoping review is the fact that it enables a conceptual mapping of topic-related research material without being bound by a specific research question, design, or methodology (Arksey & O'Malley, 2005). Furthermore, a scoping review is less likely to address very specific research questions or, consequently, to assess the quality of the included studies (Arksey & O'Malley, 2005). Given that the scale seems to measure a consistent concept across a wide variety of (cultural) contexts (Bieda et al., 2017), it is suitable to provide an anchor point for summarizing the meaning of PMH across different psychological domains. Within the scoping review the following pre-defined aspects concerning PMH, as assessed with the PMH-Scale, were of special interest: (1) psychometric properties of the PMH-Scale across languages, (2) sociodemographic factors associated with PMH, (3) the association between mental disorders, as well as (4) suicidality and PMH, (5) the asso-

ciation between COVID-19 related phenomena (e.g., vaccination willingness, acceptance of mitigation measures) and PMH, (6) factors influencing PMH, and (7) effects of treatment on PMH. Understanding the current state of the field should furthermore allow for the identification of gaps in knowledge that should be the focus of future research.

2 Methods

In the present scoping review, using the databases Web of Science, PubMed, PsycINFO, and Google Scholar, a literature search was conducted with the search term "Positive Mental Health Scale" to ensure findings based on the same assessment instrument. Furthermore, the bibliographies of relevant studies were searched for relevant studies. The following inclusion criteria were applied to the selection of articles: (1) use of the PMH-Scale by Lukat et al. (2016), (2) English-language publication, (3) published in a peer-reviewed journal, and (4) original work examining a research question about the importance of PMH. Commentaries/editorials/letters, poster abstracts, preprints, meta-analysis/systematic reviews, study protocols, gray literature, and unpublished work as well as studies within which the PMH-Scale was only used to validate another questionnaire were excluded. The search included all studies published up to August 2023. First, the titles and abstracts of the records identified through the search process were screened by one author for duplicates. After the exclusion of duplicates, the remaining titles and abstracts were screened for preliminary eligibility by two authors independently from each other. Those considered as eligible by only one author were discussed in the next step. Then, full-text articles of the records considered as eligible in the pre-screening were screened for eligibility by two authors together. Ambiguous articles were discussed with the first author. In a last step, studies that were included in the qualitative and quantitative synthesis were coded based on the full texts and sorted thematically. Hereby, a study was sorted maximal to two thematic categories. The review was conducted according to best practice guidelines for conducting systematic scoping reviews (Arksey & O'Malley, 2005) and the search process was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR; Tricco et al., 2018). The scoping review was pre-registered with AsPredicted.org on September 28, 2023 (Pre-registration Number: #145,239). Where available, the effect sizes of the found effects in the reviewed studies have been included and their magnitude has been commented. Hereby, well-established classifications on the evaluation of effect sizes have been followed (see Cohen, 1988).

3 Results

Figure 1 shows the PRISMA flowchart of the scoping review that summarizes the current identification and decision process.

In total, 223 records were identified through the search process. After removing duplicates, 121 records remained of which titles and abstracts were screened for preliminary eligibility. All of them were considered as eligible after the discussion process and reviewed in their entirety. During the screening of the full-text articles, eighteen articles were screened out because they used a different scale to assess PMH (e.g., the Mental Health Keyes et al.,

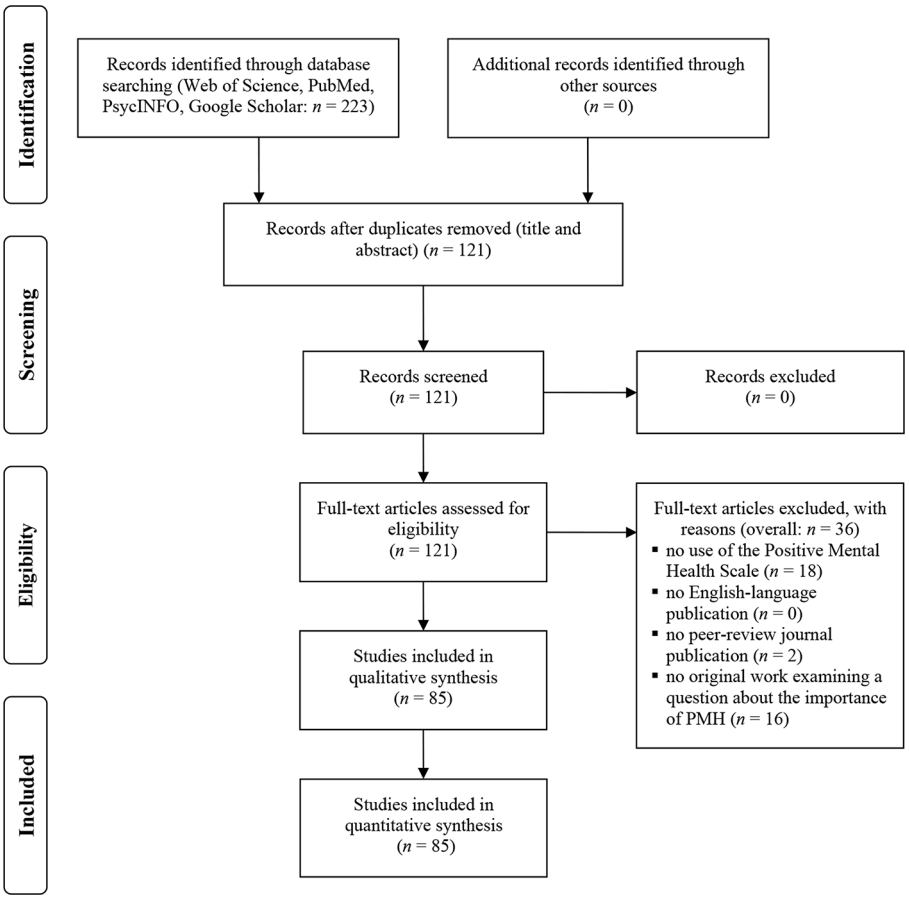

Fig. 1 PRISMA flowchart of the scoping review

2008). Eighteen additional articles were screened out because they were only published as a preprint (Bibi et al., 2021; Mahmood et al., 2021), or the PMH-Scale by Lukat et al. (2016) was only used as a measure to validate another questionnaire (Bibi et al., 2020b; Brailovskaia & Margraf, 2022a; Chao et al., 2020; Cwik et al., 2017, 2021; Hofmann & Kohlmann, 2019; Lin et al., 2020; Scholten et al., 2020; Teismann et al., 2021; Turner et al., 2021; Vatandaşlar et al., 2020), or the manuscript described either a treatment protocol (Denis et al., 2017), a data set (Chusniyah et al., 2020; Qureshi et al., 2020), or a systematic review/meta-analysis (Duradoni et al., 2020; Huang, 2022). Thus, a total of 85 studies that were conducted using student samples (45.9%), representative adult samples (17.6%), non-representative adult samples (32.9%) or clinical samples (12.9%) met inclusion criteria (see Fig. 1). The research was conducted in 23 different countries with most studies including German samples (64.7%). Sample sizes ranged from 57 to 20.809 participants and 61 studies (71.8%) used a cross-sectional design, whereas 31 (36.5%) of the studies included longitudinal analyses with time frames ranging from one week to 60 months. Data were assessed via self-report online surveys in 60 studies (70.6%), via online and paper-and-

pencil surveys in 12 studies (14.1%), and in 14 studies (16.5%) via a set of methods that included online surveys, paper-and-pencil surveys, face-to-face and telephone interviews, and a mixed-method approach that allowed to participate online or via a set-top box (television and remote control). The thematical sorting was conducted using the seven pre-defined thematic areas: (1) psychometric studies; (2) sociodemographic factors; (3) mental disorders; (4) suicidality; (5) COVID-19; (6) influencing factors; and (7) treatment.

3.1 Psychometric Studies

A total of fourteen studies exclusively examined psychometric properties of the PMH-Scale (see Table 1).

In all studies, a unidimensional structure of the 9-item PMH-Scale was found using exploratory factor analyses (explained variance: 48.17–57.93%) as well as confirmatory factor analyses (Comparative Fit Index, CFI = 0.930 to 0.993; Root Mean Square Error of Approximation, RMSEA = 0.009 to 0.110; Standardized Root Mean Residual, SRMR = 0.018 to 0.070). Only in one study that used a Mokken analysis one item ("I am a calm, balanced human being") had to be removed to confirm unidimensionality (Carrozzino et al., 2021). In all analyses – including different sample compositions (students, clinical samples, general population representative samples), language versions of the PMH-Scale and age groups – a good to very good internal consistency (Cronbach's alpha) of the scale was shown: $\alpha = 0.80$ to 0.96 (Md = 0.905; interquartile range = 0.053). The test-retest reliability of the PMH-Scale was found to be between $r = 0.74$–0.81 across a time lag of one to four weeks (Akbaba & Eldeleklioğlu, 2019; Lukat et al., 2016). Sensitivity to therapeutic change was shown in further studies (see below). In terms of convergent and discriminant validity, positive associations between the PMH-Scale and markers of PMH (e.g., happiness, $r = .54$ to 0.81; life-satisfaction, $r = 0.37$ to 0.75; optimism, $r = 0.59$ to 0.79; self-efficacy, $r = 0.51$ to 0.74; social support, $r = 0.37$ to 0.76), and negative (and/or non-existent) associations between the PMH-Scale and markers of mental health problems (e.g., anxiety, $r = -0.07$ to -0.80 depression, $r = -0.06$ to -0.71, stress, $r = -0.06$ to -0.74) were found. The associations between the PMH-Scale and other markers of PMH were either large (54.55%) or moderate (45.45%). The associations between PMH and markers of negative mental health were mostly large (42.11%) or moderate (36.84%), but rarely weak (7.89%) or non-existent (13.16%). Of note, most of the cited studies used the Depression Anxiety Stress Scale 21 (DASS-21; Lovibond & Lovibond, 1995) to assess depression, anxiety and stress; however, in some studies the Beck Depression Inventory (BDI; Beck et al., 1996), the Patient Health Questionnaire (PHQ; Kroenke et al., 2001), or the Beck Anxiety Inventory (BAI; Beck et al., 1988) were used. Taken together, positive health – as measured with the PMH-Scale – and depression (as well as the other markers of mental health problems) are related but relatively distinct dimensions (cf., Ruini & Cesetti, 2019).

Finally, measurement invariance demonstrated scalar measurement equivalence across various countries (Bibi et al., 2020a; Bieda et al., 2017; Velten et al., 2022), time (Bieda et al., 2019; Lukat et al., 2016), gender and age groups (Almubaddel, 2022; Hasan et al., 2023; Velten et al., 2022). The factor structure, item loadings, and item thresholds were found to be the same for all compared subgroups. Therefore, a direct comparison of the sum scores across culturs, gender, age groups, and time periods is justified.

Table 1 Psychometric studies of the PMH-scale

Authors and year	Focus	Design	*N*	Sample (gender; age)	Primary outcome
Akbaba and Eldeleklioğlu (2019)	Assessment	Cross-sectional	360	Turkish students (80.3% women; *M, SD* = 20.49, 2.32)	Validation of a Turkish PMH-Scale
Almubaddel (2022)	Assessment	Cross-sectional	1.261	Saudi Arabian students (55.5% women; *M, SD* = 31.29, 11.84)	Validation of an Arabic PMH-Scale
Bibi et al. (2020)	Assessment, cross-cultural	Cross-sectional	9.731	Pakistan students (59.6% women, *M, SD* = 22.84, 3.01), German students (68.6% women, *M, SD* = 23.96, 4.64)	Cross-cultural measurement invariance (CCMI)
Bieda et al. (2017)	Assessment, cross-cultural	Cross-sectional	20.783	German students (45.1% women; *M, SD* = 26.54, 4.00), Russian students (34.9% women; *M, SD* = 20.30, 2.40), Chinese students (37.9% women; *M, SD* = 19.73, 1.86)	CCMI
Bieda et al. (2019)	Assessment	Longitudinal (48 months)	4.400	Chinese students (45.0% women; *M, SD* = 19.98, 2.45)	Longitudinal measurement invariance (LMI)
Boufellous et al. (2023)	Assessment	Cross-sectional	845	Spanish general population (50.3% women; *M, SD* = 32.1, 4.2)	Validation of a Spanish PMH-Scale
Carrozzino et al. (2021)	Assessment	Cross-sectional	951	Italian students (77.5% women; *M, SD* = 24.86, 5.62)	Validation of an Italian PMH-Scale
Çeçen and Vatandaşlar (2021)	Assessment	Cross-sectional	317	Turkish students (68.0% women; *M, SD* = 20.64, 1.61)	Validation of a Turkish PMH-Scale
Hasan et al. (2023)	Assessment	Cross-sectional	3.443	Bangladeshi students (42.2% women; *M, SD* = 22.07, 1.47), Bangladeshi general population (46.6% women; *M, SD* = 41.05, 7.88)	Validation of a Bangla PMH-Scale
Lukat et al. (2016)	Assessment, treatment	Cross-sectional and longitudinal (one to four weeks)	10.157	German students (55.5% women; *M, SD* = 26.30, 4.00), German inpatients (74.8% women; *M, SD* = 48.90, 8.40), representative German adults (49.9% women; *M, SD* = 43.40, 13.00)	Validation of a German PMH-Scale
Naghavi et al. (2021)	Assessment	Cross-sectional	573	Iranian students (73.1% women; *M, SD* = 24.45, 6.65)	Validation of a Persian PMH-Scale

Table 1 (continued)

Authors and year	Focus	Design	*N*	Sample (gender; age)	Primary outcome
Toledano-Toledano et al. (2023)	Assessment	Cross-sectional	623	Mexican parents of children with cancer (81.4% women; *M*, *SD* = 31.5, 7.5)	Validation of a Spanish version of the PMH-Scale
Velten et al. (2022)	Assessment	Cross-sectional	8.302	Representative samples in eight countries (France, Germany, Poland, Russia, Spain, Sweden, UK, US) (overall: 51.9% women)	CCMI across gender and age groups
Zhang et al. (2017)	Assessment	Cross-sectional	7.937	Representative German population (50.1% women; *M*, *SD* = 47.65, 17.03)	Measurement invariance between data collection methods (face-to-face interviews, telephone interviews, online questionnaire, offline questionnaire)

Notes. In some studies, mean age was not reported. Some of them reported only the frequency of age groups or age information was missing

In sum, the psychometric properties of the PMH-Scale have been studied very thoroughly. This instrument has been translated into many languages and it measures a consistent concept, allowing scores to be compared across (cultural) groups and time periods.

3.2 PMH and Sociodemographic Factors

A total of 23 studies examined the association between PMH and various sociodemographic factors. Twenty studies focused on the relationship of PMH with age and gender, four studies on national trends of PMH, and four studies assessed its link to further factors such as education, income, race/ethnicity and urbanicity. Of note, some studies investigated several of these factors at once (see Table 2).

3.2.1 Age and Gender

For age and gender, the available results are rather inconclusive: In seven cross-sectional studies (Brailovskaia et al., 2022a; Crisci et al., 2021; Lavallee et al., 2019; Ngoc Nguyen et al., 2022; Niemeyer et al., 2019; Teismann & Brailovskaia, 2020; Wu et al., 2023) and two longitudinal studies (Lukat et al., 2016; Velten et al., 2018), PMH was positively linked to age. Notably, all effects were small (effect size: $r < .30$). In three cross-sectional analyses (Askari et al., 2021; Chuang et al., 2021; Lukat et al., 2016) and three longitudinal analyses (Lukat et al., 2016; Margraf et al., 2020b; Velten et al., 2018), PMH was unrelated to age. In three cross-sectional studies (Lavallee et al., 2019; Lukat et al., 2016; Margraf et al., 2016), PMH was found to be negatively related to age. Again, all effects were small (effect size: $r < .30$). Inconclusive findings were also found in studies that focused on age-related cohort trends: In a comparison of German university freshmen, PMH decreased between 2016 and

Table 2 Sociodemographic, trends and PMH

Authors and year	Focus	Design	*N*	Sample (gender; age)	Primary outcome
Askari et al. (2021)	Dream sharing	Cross-sectional	720	Iranian online sample (71.9% women; *M, SD*=32.3, not reported)	PMH
Asiamah et al. (2021)	Physical activity, COVID-19	Cross-sectional	621	Ghanaian online sample (34.6% women)	PMH
Bekalu et al. (2019)	Social media	Cross-sectional	1.027	Representative sample of American adults (51.5%)	PMH
Bibi et al. (2020)	Assessment, cross-cultural	Cross-sectional	9.731	Pakistan students (59.6% women, *M, SD*=22.84, 3.01),German students (68.6% women, *M, SD*=23.96, 4.64)	Cross-cultural measurement invariance (CCMI)
Bieda et al. (2017)	Assessment, cross-cultural	Cross-sectional	20.783	German students (45.1% women; *M, SD*=26.54, 4.00), Russian students (34.9% women; *M, SD*=20.30,2.40), Chinese students (37.9% women; *M, SD*=19.73, 1.86)	CCMI
Brailovskaia et al. (2022)	Suicidality	Cross-sectional	2.537	Russian female online sample (100% women; *M, SD*=31.41, 7.77)	Lifetime suicidal ideation/ behavior
Brailovskaia and Margraf (2020a)	Cohort trends	Cross-sectional (comparison of four cohorts 2016–2019)	1.985	German students (70.3% women; *M, SD*=21.11, 4.81)	PMH
Çeçen and Vatandaşlar (2021)	Assessment	Cross-sectional	317	Turkish students (68.0% women; *M, SD*=20.64, 1.61)	Validation of a Turkish PMH-Scale
Chow and Choi (2019)	Resilience	Cross-sectional	416	Hong Kong students (59.9% women)	PMH
Chuang et al. (2021)	Rumination, humor	Cross-sectional	382	Taiwanese adults (61.8% women)	PMH
Crisci et al. (2021)	Distance learning	Cross-sectional	637	Italian parents (92.0% women)	Positive and negative effects of distance learning
Lavallee et al. (2019)	Vegetarian diet, cross-cultural	Cross-sectional, longitudinal	20.809	Representative adult samples in 3 countries (Germany, Russia, US), Chinese students, German students (see *Notes*)	PMH
Lukat et al. (2016)	Assessment, treatment	Cross-sectional, longitudinal (one to four weeks)	10.157	German students (55.5% women; *M, SD*=26.30, 4.00), German inpatients (74.8% women; *M, SD*=48.90,8.40), representative German adults (49.9% women; *M, SD*=43.40, 13.00)	Validation of the German PMH-Scale

Table 2 (continued)

Authors and year	Focus	Design	*N*	Sample (gender; age)	Primary outcome
Margraf et al. (2020)	COVID-19 behavioral measures: usefulness perception and adherence	Cross-sectional	7.658	Representative samples in eight countries (France, Germany, Poland, Russia, Spain, Sweden, UK, US) (overall: 53.0% women)	COVID-19 behavioral measures: usefulness perception and adherence
Margraf et al. (2016)	Social rhythm	Cross-sectional	8.095	Representative adult samples in 3 countries (Germany, Russia, US) (overall: 56.5%, *M, SD*=50.10,0.34)	PMH
Margraf et al. (2020)	Social predictors, salutogenic predictors, pathogenic predictors, somatic predictors	Longitudinal (17 months)	14.342	German students (63.8% women; *M, SD*=23.58, 4.73), Russian students (41.5% women; *M, SD*=19.63, 2.16), Chinese students (61.3% women; *M, SD*=19.63, 1.66)	PMH
Ngoc Nguyen et al. (2022)	Mental health in COVID-19 context	Cross-sectional	2.572	Vietnamese adults (77% women; age groups)	PMH
Niemeyer et al. (2019)	Education, psychosocial resources, daily hassles	Cross-sectional	7.937	Representative German sample (52.4% women; *M, SD*=47.60, 17.40)	PMH
Schönfeld et al. (2017)	Mental health, cross-cultural	Cross-sectional	6.303	Representative samples (Germany: 51.1% women; *M, SD*=47.97, 15.26; Russia: 54.9% women; *M, SD*=45.58, 17.49; US: 51.4% women; *M, SD*=46.70, 17.70)	Changes of PMH over lifespan
Teismann and Brailovskaia (2020)	Suicide ideation	Cross-sectional	301	German online sample (57.8% women; *M, SD*=32.43, 13.68)	Suicide ideation
Velten et al. (2022)	Assessment	Cross-sectional	8.302	Representative samples in eight countries (France, Germany, Poland, Russia, Spain, Sweden, UK, US) (overall: 51.9% women)	CCMI across gender and age groups

Table 2 (continued)

Authors and year	Focus	Design	*N*	Sample (gender; age)	Primary outcome
Velten et al. (2018)	Lifestyle choices, cross-cultural	Longitudinal (12 months)	15.396	German students (overall: 58.9% women; *M, SD*=21.69, 4.07), Chinese students (overall: 61.9% women; *M, SD*=20.59, 1.58)	PMH
Wu et al. (2023)	Mental health, physical activity	Cross-sectional	1.248	Chinese adults (49% women; *M, SD*=39.68, 7.93)	PMH

Notes. In some studies, mean age was not reported. Some of them reported only the frequency of age groups or age information was missing. Lavallee et al. (2019): Representative adult samples in Germany: 58.8% women; *M, SD*=51.95, 17.36; Russia: 53.2% women; *M, SD*=43.24, 17.13; US: 63% women; *M, SD*=55.12, 17.50; Chinese students: 62.1% women; *M, SD*=20.63, 1.66; German students: 63.9% women; *M, SD*=24.57 ,4.73

2019 (effect size: Hedge's g=0.21, small effect), while symptoms of depression, anxiety and stress assessed by the DASS-21 increased (effect size: Hedge's g=0.18 to 0.30, small effect) (Brailovskaia & Margraf, 2020a). Furthermore, in a cross-national representative sample that included participants from eight different countries individuals aged 45 to 54 had higher levels of PMH than younger individuals (18 to 44 years), but also than persons aged 55 and older (effect size: Cohen's d=0.26, small effect; Velten et al., 2022). In a US general population representative sample, individuals aged 60 and older had higher PMH than those aged 18 to 29 years (Bekalu et al., 2019). In line with this finding, in a study focusing on age trends in population representative samples (18 to 100 years), PMH increased in the US over the lifespan. However, PMH decreased in Russia and it showed a U-shaped curve in Germany – i.e., a slight PMH decrease until midlife and an increase thereafter (Schönfeld et al., 2017). In both studies, the effects were small (effect size: $r<.30$). Thus, the available studies do not allow a globally valid conclusion on the association between PMH and age. Instead, they point to potentially significant differences in this regard between the cultures studied.

The association between PMH and gender is not clear either, or at least does not appear to be strong: Some analyses found PMH to be positively associated with female gender (Chuang et al., 2021; Velten et al., 2018), while others found a positive association with male gender (Chow & Choi, 2019; Lukat et al., 2016; Margraf et al., 2016; Ngoc Nguyen et al., 2022). For both directions, the found effects were small (effect size: $r<0.30$, Hedge's $g<0.50$). Yet other studies found no association between PMH and gender at all (Asiamah et al., 2021a; Askari et al., 2021; Bekalu et al., 2019; Çeçen & Vatandaşlar, 2021; Crisci et al., 2021; Lavallee et al., 2019; Margraf et al., 2020b; Niemeyer et al., 2019; Teismann & Brailovskaia, 2020; Wu et al., 2023). Also, according to Velten et al. (2022) gender effects on PMH were negligible in a large eight-country sample. Against the inconclusive findings, a clear conclusion on the association between PMH and gender is not possible.

3.2.2 National Trends

Four studies focused on national comparisons of the PMH level: A large cross-national general population representative study compared PMH between eight countries dur-

ing the COVID-19 pandemic in June 2020 by calculating a multiple analysis of variance (MANOVA) (Margraf et al., 2020). The highest PMH level was found in the US (M=18.85, SD=5.57) followed by Germany (M=17.91, SD=5.29), Poland (M=17.58, SD=6.44), Spain (M=17.52, SD=5.40), Sweden (M=17.38, SD=6.73), the UK (M=17.27, SD=5.67), France (M=16.90, SD=4.90), and Russia (M=15.77, SD=5.59). The highest effect size of the comparisons has been reported for US>Russia (Cohen's d=0.55, medium effect; Margraf et al., 2020). In contrast, Margraf et al. (2016), who assessed general population representative samples between the years 2012 and 2014, found higher levels of PMH in Russia (M=23.35, SD=4.95) followed by Germany (M=21.90, SD=4.96) and the US (M=20.92, SD=5.11) in a MANOVA. The highest effect size of the comparisons has been reported for Russia>US, (Cohen's d=0.48, small effect; Margraf et al., 2016). In large student populations, PMH was higher in China (M=21.14, SD=5.06) and Russia (M=19.03, SD=5.11) than in Germany (M=18.09, SD=5.97) (latent mean comparisions; highest effect size Cohen's d=0.50 for China>Germany, medium effect; Bieda et al., 2017), and it was higher in Germany (M=18.25, SD=5.66) than in Pakistan (M=17.42, SD=6.32) (latent mean comparision; effect size: Cohen's d=0.58, medium effect; Bibi et al., 2020). Thus, the level of PMH not only varies from country to country, but also differs depending on the timing of the survey (cf., https://worldhappiness.report). Considering the ample study samples and the reliability and temporal measurement invariance of the PMH-Scale, there could be influences of societal changes behind the observed time effects. For example, those influences could include the deterioration of economic prosperity and societal freedom in some countries in recent years.

3.2.3 Further Demographic Factors

Four studies focused on the association between PMH and further demographic factors. In an investigation among scientific and technological professionals in China, the level of education was positively linked to PMH (effect size: r=0.10, small effect; Wu et al., 2023). Also, the level of education (effect size: β = 0.10 to 0.37, small to medium effect) and income (effect size: β = 0.11 to 0.41, small to medium effect) were positively associated with PMH in a sample of American adults. Specifically, people with some college education and bachelor's or higher degrees had higher levels of PMH than people with less education (Bekalu et al., 2019). Moreover, the authors reported differences in race/ethnicity. Individuals who identified themselves as Black non-Hispanic and Hispanic had higher PMH than people who identified themselves as White non-Hispanic. In contrast, those who identified themselves as "others" had lower PMH than people who identified themselves as White non-Hispanic (effect size: β < 0.30, small effect). In Vietnam, the level of education was not associated with PMH in an adult sample (Ngoc Nguyen et al., 2022). In Germany, Niemeyer et al. (2019) also found no differences in PMH between those with a secondary school qualification and those with a high school qualification in a general population representative sample. However, the authors described a relationship with urbanicity: PMH was higher in towns with more than 100.000 inhabitants in comparison to rural areas and smaller towns (20.000 to 99.999 inhabitants) (effect size: r=0.13, small effect).

Taken together, the present results show that no general rules valid across different countries can be established for the relationship between PMH and sociodemographic factors. As such findings point to the possibility of genuine cultural and/or sociodemographic dif-

ferences that contradict a myth of uniformity and warrant further in-depth investigations beyond so-called WEIRD samples (western, educated, industrialized, rich, and democratic; Henrich et al., 2010; Muthukrishna et al., 2020). Of note, some samples were not gender-balanced and included more female than male participants. Moreover, no study focused on transgender or gender-diverse persons. Cross-national trends on the level of PMH seem to depend on the time point of data assessment. Furthermore, citizens of large towns with a higher education and income could have higher PMH levels than others. For more clarification, further cross-national and longitudinal research is urgently required. Notably, thirteen of the 23 studies (56.5%) were part of the "BOOM" project. Therefore, some of them used the same participant pool at least partly.

3.3 PMH and Mental Disorders

A total of seven studies examined the association between PMH and mental disorders (see Table 3). Four studies (57.1%) focused on anxiety disorders whereas the other studies focused on insomnia, adjustment disorder, and a transdiagnostic sample. All studies were longitudinal with study periods of five to 17 months. Four studies (57.1%) examined the extent to which PMH is predictive of the remission of mental disorders as assessed by structured clinical interviews. The other studies examined the association between PMH and self-reported symptom burden. In three studies (42.9%), patients received psychotherapeutic treatment (see below). The studies were conducted in Germany, the UK, and Lithuania.

Table 3 PMH and mental disorders

Authors	Focus	Design	*N*	Sample (gender; age)	Primary outcome
Denis et al. (2020)	Insomnia, treatment	Longitudinal (Pre-, Mid-, Posttreatment, 6-month Follow-up)	199	English female students (*M, SD*=20.00, 5.00)	Sleep disorder symptom
Lukat et al. (2017)	Mental disorders (transdiagnostic)	Longitudinal (15 months)	1.394	Representative sample of German woman (*M, SD*=22.70, 1.80)	Predictors of Incidence, Remission and Relapse of mental disorders
Teismann et al. (2018)	Panic disorder, agoraphobia, specific phobia, treatment	Longitudinal (Pre-, Posttreatment, 6-month Follow-up)	150	German outpatients (psychotherapy) (65.3% women; *M, SD*=37.79, 13.50)	Remission from anxiety disorder
Trumpf et al. (2009)	Specific phobia	Longitudinal (17 months)	137	German women (*M, SD*=21.00, 1.90)	Remission from anxiety disorder
Truskauskaite-Kuneviciene et al. (2020)	Adjustment disorder	Longitudinal (12 months)	299	Lithuanian students (35.7% women; *M, SD*=20.53, 2.06)	Adjustment disorder symptoms
Vriends et al. (2007)	Social phobia	Longitudinal (17 months)	91	German women (*M, SD*=21.00, 5.00)	Remission from anxiety disorder
Wannemueller et al. (2019)	Fear of heights (FoH), treatment	Longitudinal (Pre-, Posttreatment, 5-month Follow-up)	104	German adults suffering from FoH (64.1% women; *M, SD*=41.76, 12.56)	Fear reduction

The predictive power of PMH was demonstrated in two analyses on the data set of the Dresden Predictor Study (DPS): As has already been described, PMH was found to be the most important predictor of remission from specific phobia (Trumpf et al., 2009) and social phobia (Vriends et al., 2007) in young woman. In a more comprehensive analysis using the DPS data set this pattern of findings was further supported: Lukat et al. (2017) found that PMH was the strongest predictor (effect size: odds ratio = 2.16, CI = 1.40 to 3.32, small effect) of a remitting course of a wide range of mental disorders (affective disorders, anxiety disorders, eating disorders, somatoform disorders, substance disorders). Neuroticism, psychopathology, and dysfunctional attitudes were unrelated to the remission of mental disorders. Furthermore, PMH was unrelated to incidence and relapse of mental disorders. In conclusion, it seems that PMH predicts remission of mental disorders better than traditional psychopathological measures or diagnoses.

This conclusion is further supported by a study of anxiety patients undergoing exposure therapy (Teismann et al., 2018). In this study pre-treatment PMH was found to be the only predictor of post-treatment symptom severity (effect size: $\beta = -0.27$, small effect) and remission status (effect size: odds ratio = 1.11, CI = 1.03 to 1.20, small effect) in outpatients, who suffered from panic disorder, agoraphobia, or specific phobia. Post-treatment PMH and avoidance behavior furthermore predicted symptom severity (effect size: $\beta = -0.27$, small effect) and remission status (effect size: odds ratio = 1.18, CI = 1.04 to 1.33, small effect) at the follow-up assessment six months after treatment termination. In contrast, depression, anxiety, anxiety cognitions, bodily sensations, anxiety sensitivity, number of treatment sessions, age, and gender were not predictive of post-treatment and follow-up remission status – an indication of the special importance of PMH.

Additional studies have shown that PMH (1) predicts reductions in anxiety at 5-month follow-up in German participants who underwent large-group treatment for fear of heights (Wannemueller et al., 2019), (2) predicted lower levels of adjustment disorder symptoms in Lithuanian students exposed to life stressors (Truskauskaite-Kuneviciene et al., 2020), and (3) was unrelated to the effects of an online CBT intervention for insomnia offered to English students (Denis et al., 2020). It should be noted that in the latter studies, no clinical interviews were conducted to assess the presence or absence of a mental disorder diagnosis. It is therefore unclear to what extent the participants suffered from clinically relevant disorders.

In sum, there is evidence that PMH is of special importance to overcoming mental disorders (cf., Keyes et al., 2010; Schotanus-Dijkstra et al., 2019). However, three of the seven studies were conducted using the same data set of young German women.

3.4 PMH and Suicidality

A total of 18 studies examined the association between PMH and suicidal ideation and behavior (see Table 4).

In a first investigation using the data set of the DPS (see above), it was shown that PMH as well as social support predict the remission of suicidal ideation (effect size: odds ratio = 1.07, CI = 1.00 to 1.48, small effect) over the course of 17 months, whereas severity of psychopathology, life satisfaction and self-efficacy were not predictive of the course of suicidal ideation (Teismann et al., 2016). In a series of further studies, it was investigated to what extent PMH can be understood as a resilience factor (cf., Johnson, 2016; Johnson

Table 4 PMH and suicidality

Authors	Focus	Design	*N*	Sample (gender) age)	Primary outcome
Brailovskaia et al. (2018)	Suicidality	Cross-sectional	225	German students (76.4% women; *M, SD*=23.36, 4.18)	Lifetime suicidal ideation/ behavior
Brailovskaia et al. (2019)	Suicidality	Cross-sectional	199	German inpatients (Psychiatry) (54.8% women; *M, SD*=37.56, 14.38)	Lifetime suicide attempts
Brailovskaia et al. (2020a)	Suicidality	Longitudinal (12 months)	209	German Facebook users (72.2% women; *M, SD*=23.01, 4.45)	Lifetime suicidal ideation/ behavior
Brailovskaia et al. (2020b)	Suicidality	Longitudinal (24 months)	126	German students (80.2% women; *M, SD*=24.29, 5.21)	Suicide ideation
Brailovskaia et al. (2022)	Suicidality	Longitudinal (36 months)	223	German students (79.4% women; *M, SD*=22.85, 4.05)	Lifetime suicidal ideation/ behavior
Brailovskaia et al. (2022)	Suicidality	Cross-sectional	2.537	Russian female online sample (100% women; *M, SD*=31.41, 7.77)	Lifetime suicidal ideation/ behavior
Brailovskaia et al. (2023)	Suicidality	Longitudinal (12 months)	406	German adults (75.1% women; *M, SD*=27.69, 6.88)	Lifetime suicidal ideation/ behavior
Naghavi et al. (2021)	Suicidality	Cross-sectional	573	Iranian Students (73.1% women; *M, SD*=24.45, 6.65)	Suicidal ideation/ behavior
Naghavi et al. (2022)	Suicidality	Cross-sectional	214	Afghan students (73.7% women; *M, SD*=23.92, 5.77)	suicidal ideation/ behavior
Siegmann et al. (2018)	Suicidality	Cross-sectional	3.288	German students (68.1% women; *M, SD*=24.97, 4.84), Chinese students (49.4% women; *M, SD*=21.99 ,1.19)	suicide ideation
Siegmann et al. (2019)	Suicidality	Cross-sectional	100	German inpatients (Psychiatry) (52.0% women; *M, SD*=42.99, 11.79)	Lifetime suicidal ideation/ behavior
Teismann et al. (2016)	Suicidality	Longitudinal (17 months)	1.389	Representative sample of German woman (*M, SD*=20.73, 1.80)	Suicide ideation
Teismann et al. (2018)	Suicidality	Cross-sectional	282	Mixed German sample (inpatient: 54% women; *M, SD*=42.95, 12.13; outpatient: 70.9% women; *M, SD*=37.91, 12.81)	Suicide ideation

Table 4 (continued)

Authors	Focus	Design	*N*	Sample (gender) age)	Primary outcome
Teismann et al. (2018)	Suicidality	Longitudinal (12 months)	207	German students (70.3% women; *M*, *SD*=26.04, 5.33)	Suicide ideation
Brailovskaia et al. (2019a, b, c)	Suicidality	Cross-sectional	150	German outpatients (Psychotherapy) (65.3% women; *M*, *SD*=37.79, 13.50)	Suicide ideation
Teismann et al. (2019)	Suicidality	Cross-sectional	95	German inpatients (Psychiatry) (54.7% women; *M*, *SD*=43.28, 12.20)	Suicide ideation
Teismann and Brailovskaia (2020)	Suicidality	Cross-sectional	301	German online sample (57.8% women; *M*, *SD*=32.43, 13.68)	Suicide ideation
Teismann et al. (2022)	Suicidality	Cross-sectional	992	German students (84.1% women; *M*, *SD*=23.87, 5.50), Iranian students (73.2% women; *M*, *SD*=24.46, 6.65)	Lifetime suicidal ideation/ behavior

et al., 2011): PMH moderated the association between a variety of risk factors (depression, entrapment, perceived burdensomeness, PTSD symptoms, social media use, stressful life events, suicidal ideation) and suicidal outcomes (suicidal ideation, suicidal ideation/behavior, lifetime suicide attempts). Specifically, the higher the level of PMH, the less close the association between the risk factor and the suicidal outcome (Brailovskaia et al., 2019a, b, c; Brailovskaia et al., 2020b, 2022a, b; Siegmann et al., 2018, 2019; Teismann & Brailovskaia, 2020; Teismann et al., 2018; Teismann et al., 2022). Further studies showed that the association between risk factors (cyberbullying, depression, Facebook addiction disorder symptoms), as well as a protective factor (physical activity) and suicidal outcomes is fully mediated by PMH (Brailovskaia et al., 2018, 2020a, 2022a, b; Brailovskaia et al., 2023a, c, d) and that positive affect in turn fully mediates the effect of PMH on suicidal ideation (Brailovskaia et al., 2019a, b, c). In most of these studies suicidal ideation and behavior was assessed using the Suicidal Behaviors Questionnaire in its revised form (SBQ-R; Osman et al., 2001); however, some studies also used the Depressive Symptom Inventory – Suicidality Subscale (DSI-SS; Joiner Jr et al., 2002), or the suicidal ideation item of the Beck Depression Inventory (BDI; Beck et al., 1996).

Corresponding effects were shown in both, cross-sectional and longitudinal studies and they were shown in Western and Eastern samples (see Table 4): In a study comparing the buffering qualities of PMH in German and Chinese students, only PMH, but neither self-efficacy, satisfaction with life, social support nor psychosocial stress resistance moderated the effects of depression on suicide ideation in the samples from both countries (Siegmann et al., 2018): For those German and Chinese students who reported high levels of positive mental health, their levels of suicide ideation did not increase significantly even when they experienced a heightened level of depressive symptoms. Similarly, PMH moderated the association between PTSD symptoms and suicidal ideation/behavior both in German

and in Iranian students (Teismann et al., 2022). Therefore, it could be that PMH is a cross-culturally relevant resilience factor against suicidality.

However, PMH might lose its protective power in the context of increasing symptom burden. Along these lines, PMH was not shown to moderate the association between depression, hopelessness, and childhood trauma experiences and suicidal ideation/behavior in German psychiatric inpatients (Siegmann et al., 2019), nor did it moderate the association between depression and PTSD symptoms and suicidal ideation in Afghan students immediately after the Taliban came to power in 2021 (Naghavi et al., 2022). Nonetheless, it is possible that PMH still protects against an escalation from suicidal ideation to suicidal behavior. In this regard, an independent study of German psychiatry patients showed that the association between suicidal ideation and lifetime suicide attempt was moderated by PMH (Brailovskaia et al., 2019).

Finally, it is important to point out that – in the sense of the *Dual-Factor Model* (see above) – PMH and suicide ideation are not mutually exclusive, but can exist simultaneously (Teismann et al., 2018): Indeed, 6% of a German outpatient sample and 10% of a German inpatient sample reported moderate to high levels of PMH and suicidal ideation at the same time (cf., Keyes et al., 2012; Teismann et al., 2018) It is prudent to consider the presence of PMH in addition to traditional risk factors when screening individuals for suicide risk in clinical practice. The study findings outlined also point to the possibility that strengthening PMH might be of special importance in prevention and treatment of suicidality, in our view an important topic for future intervention studies.

3.5 PMH and COVID-19

A total of 17 studies examined the association between PMH and coronavirus disease 2019 (COVID-19)-related outcomes (see Table 5).

The COVID-19 outbreak and the measures taken, such as the need for "social distancing" and the wearing of face masks to combat the pandemic, have changed the daily lives of many people and could have had an impact on their mental health (Bäuerle et al., 2020). Truskauskaite-Kuneviciene et al. (2021) compared the level of PMH assessed prior to the COVID-19 outbreak (October to December 2019) and at the early state of the pandemic (March to April 2020) in student samples in Germany and Lithuania. Their findings revealed no changes of PMH in the German sample, whereas the PMH level slightly increased after the pandemic outbreak in the Lithuanian sample (effect size: Cohen's d = 0.12, no effect). In contrast, the PMH level decreased in a German adult sample between March 2020 and March 2021 (effect size: $\eta^2_p = 0.156$, large effect) (Brailovskaia et al., 2023). Truskauskaite-Kuneviciene et al. (2021) emphasized that overall people who reported high levels of PMH before the COVID-19 outbreak demonstrated a higher resilience to the changes of everyday life after the outbreak than others. This conclusion corresponds to several further cross-sectional and longitudinal studies that described the predictive power of PMH in the COVID-19 situation. In a German adult sample, PMH assessed in October 2019 acted as a negative predictor of psychological burden caused by the COVID-19 situation in March 2020 that was assessed by the COVID-19 Burden Scale (effect size: $\beta = -0.13$, small effect; Brailovskaia & Margraf, 2020b). Sense of control assessed in March 2020 by the Sense of Control Scale (SoC-Scale; Niemeyer et al., 2019) mediated the link between PMH and burden (Brailovskaia & Margraf, 2020b). Specifically, the higher the level of PMH, the higher the

Table 5 PMH and COVID-19

Authors	Focus	Design	*N*	Sample	Primary outcome
Asiamah et al. (2021)	Academic job components	Cross-sectional	1064	African academic staff (32.3% women; *M, SD*=44.00, not reported)	PMH
Asiamah et al. (2021)	Physical activity, COVID-19	Cross-sectional	621	Ghanaian online sample (34.6% women)	PMH
Balay-Odao et al. (2021)	eHealth literacy	Cross-sectional	468	Saudi nursing students (73.9% women; *M, SD*=21.44, 1.73)	PMH
Brailovskaia and Margraf (2020b)	COVID-19 burden	Longitudinal (6 months)	436	German adult online sample (77.3% women; *M, SD*=27.01, 6.41)	COVID-19 Burden
Brailovskaia and Margraf (2022b)	PMH, mindfulness, addictive social media use	Cross-sectional	1.049	German adult online sample (71.6% women; *M, SD*=24.60, 6.76)	Addictive social media use
Brailovskaia et al. (2021b)	Vaccination willingness	Cross-sectional	9.264	Representative samples in nine countries (China, France, Germany, Poland, Russia, Spain, Sweden, UK, US) (see *Notes*)	Vaccination willingness
Brailovskaia et al. (2023)	Suicidality, physical activity	Longitudinal (12 months)	406	German adults (75.1% women; *M, SD*=27.69, 6.88)	Lifetime suicidal ideation/ behavior
Brailovskaia et al. (2021)	COVID-19 burden	Cross-sectional & Longitudinal (12 and 60 months)	833	Chinese students (68.6% women; *M, SD*=21.66, 0.86), German students (76.9% women; *M, SD*=25.73, 7.28)	COVID-19 burden, physical activity
Breetzke and Wild (2022)	Social connection at work during COVID-19	Cross-sectional	507	German employees (68.1% women; *M, SD*=38.49, 12.03)	PMH
Crisci et al. (2021)	Distance learning	Cross-sectional	637	Italian parents (92.0% women)	Positive and negative effects of distance learning
Lavallee et al. (2021)	Adherence to COVID-19 Safety Guidelines	Cross-sectional	7.437	Representative samples in eight countries (France, Germany, Poland, Russia, Spain, Sweden, UK, US) (overall: 52.1% women)	Adherence to COVID-19 safety guidelines
Brailovskaia et al. (2020a, 2020b)	COVID-19 Behavioral Measures: usefulness perception and adherence	Cross-sectional	7.658	Representative samples in eight countries (France, Germany, Poland, Russia, Spain, Sweden, UK, US) (overall: 53.0%)	COVID-19 behavioral measures: usefulness perception and adherence
Ngoc Nguyen et al. (2022)	Mental health in COVID-19 context	Cross-sectional	2.572	Vietnamese adults (77% women; age groups)	PMH
Precht et al. (2021)	Mental health	Cross-sectional	568	German students (69.0% women; *M, SD*=19.90, 4.52)	PMH

Table 5 (continued)

Authors	Focus	Design	*N*	Sample	Primary outcome
Precht et al. (2022)	Mental health	Longitudinal (12 months)	356	German adults (76.0% women; *M, SD* = 27.43, 6.59)	PMH
Truskaus-kaite-Kun-eviciene et al. (2021)	Mental health	Longitudinal (5–7 months)	775	Lithuanian students (79.3% women; *M, SD* = 19.45, 0.93), German students (78.2% women; *M, SD* = 23.08, 2.94)	PMH
Zhang et al. (2023)	Mental health	Cross-sectional	521	Chinese students (34.3% women; *M, SD* = 21.05, 1.51)	PMH

Notes. In some studies, mean age was not reported. Some of them reported only the frequency of age groups or age information was missing; Brailovskaia et al. (2021b): women: China: 44.2%, France: 54.9%, Germany: 52.0%, Poland: 53.7%, Russia: 51.5%, Spain: 51.9%, Sweden: 51.5, UK: 55.4%, US: 51.3%

level of sense of control and the lower the burden level. In mixed samples in China and Germany, PMH assessed in 2015 (China) and in 2019 (Germany) negatively predicted COVID-19 burden assessed by the COVID-19 Burden Scale (Brailovskaia & Margraf, 2020b) in the middle of 2020 (China, effect size: $r = -0.25$, small effect) and at the end of 2020 (Germany, effect size: $r = -0.17$, small effect), i.e., higher PMH was followed by lower COVID-19 burden (Brailovskaia et al., 2021). In Crisci et al. (2021), better parental PMH was linked to fewer negative effects of homeschooling (introduced as a COVID-19 mitigation measure) on parents and more positive effects on the whole family (effect size: $\beta < 0.30$, small effect). Moreover, three cross-national studies that worked with large representative samples confirmed further predictive effects of PMH: In a sample that combined data from eight countries, PMH predicted the adherence to COVID-19 mitigation measures positively (effect size: $\beta < 0.30$, small effect; Lavallee et al., 2021). Furthermore, PMH positively predicted the perception of the COVID-19 mitigation measures as useful in the US and the adherence to mitigation measures in Poland, Spain, and Sweden (effect size: $\beta < 0.30$, small effect). In contrast, there was no predictive effect of PMH in Germany, France, Russia, and the UK (Margraf et al., 2020). In May 2021, PMH predicted higher willingness for COVID-19 vaccination in China, whereas its predictive effect was negative in Germany and the US (effect size: $r < 0.30$, small effect; Brailovskaia et al., 2021). The authors hypothesized that some individuals with high levels of PMH might underestimate their own infection risk and therefore consider their vaccination as less important. In France, Poland, Russia, Spain, Sweden and the UK, there was no predictive effect of PMH on vaccination willingness (Brailovskaia et al., 2021). Brailovskaia et al. (2021) reported not only a predictive effect of PMH on COVID-19 burden. They also identified physical activity (e.g., jogging, cycling, yoga) as a predictor of higher PMH during the pandemic. Similar results were shown by two cross-sectional studies (Asiamah et al., 2021a; Precht et al., 2021) and a longitudinal study (Precht et al., 2022) that investigated German student and adult populations in Germany and Ghana in 2020 and in 2021. All those studies described a small effect (effect size: r or $\beta < 0.30$). Notably, there was no effect of physical activity on PMH in a cross-sectional study that investigated African academics (Asiamah et al., 2021). In a further cross-sectional study that focused on German adults, COVID-19 burden predicted PMH negatively (effect size: $\beta = -0.32$, medium effect; Brailovskaia & Margraf, 2022b).

Further positive predictors of PMH during the COVID-19 situation were sense of control (assessed by SoC-Scale), life satisfaction (assessed by Satisfaction with Life Scale, SWLS; Diener et al., 1985), sense of coherence (assessed by short form of the Sense of Coherence

Scale, SOC-L9; Lin et al., 2020), positive affect (assessed by Positive Affect and Negative Affect Scale, PANAS; Watson et al., 1988), increased sexual behavior, social support and social interaction at work, eHealth literacy and offline/onsite teaching. Negative predictors of PMH were the need for public social distancing and quarantine, negative affect (assessed by PANAS; Watson et al., 1988), unregular social rhythm (assessed by Brief Social Rhythm Scale, BSRS; Margraf et al., 2016), online teaching, time spent on research-related activities, the engagement in addictive use of social media (assessed by Bergen Social Media Addiction Scale, BSMAS; Andreassen et al., 2016), enhanced sedentary time during the pandemic, and depressive mood after the end of a screen product (e.g., series) (assessed by Post-Series Depression Scale, PSD-Scale; Kottasz et al., 2019) watched during the pandemic (Asiamah et al., 2021, 2021b; Balay-Odao et al., 2021; Breetzke & Wild, 2022; Ngoc Nguyen et al., 2022; Precht et al., 2021; Precht et al., 2022; Zhang et al., 2023). The effects were mostly small (effect size: r or $\beta < 0.30$). However, the effect of sense of coherence and social interaction at work was medium sized (effect size: r or $\beta < 0.50$), and the effect of time spent on research-related activities, enhanced sedentary time during the pandemic and sense of control was large (effect size: r or $\beta > 0.50$).

Overall, there is evidence of a bidirectional relationship: on the one hand, PMH predicted the impact of the COVID-19 situation on mental status and behavior during this time; on the other hand, one's activities during the pandemic, such as physical activity and excessive use of social media, predicted PMH. Of note, ten of the 17 studies (58.8%) were part of the "BOOM" project. Of the studies that did not belong to the "BOOM" project, two were from the same lab in Ghana. Furthermore, the COVID-19 situation changes permanently and some of its consequences will become visible only in the future. Moreover, due to the mostly small effect sizes, conclusions on a predictive effect should be considered with caution.

3.6 Factors Influencing PMH

A total of 26 studies examined factors that might predict PMH (see Table 6). Sixteen studies (61.5%) focused on other factors related to mental health, ten studies (38.5%) on lifestyle variables, four studies (15.4%) on (cyber-)bullying, and four studies (15.4%) on social media use. Of note, some studies focused on several of the topics at once.

3.6.1 PMH and Other Factors of Mental Health

Sixteen studies focused on the association between PMH and other mental health-related factors (see Table 6). Enhanced symptoms of depression, anxiety, and stress assessed by the appropriate subscales of DASS-21 predicted lower PMH in a longitudinal study up to one year later in Chinese and German students (effect size: $r = -0.24$ to -0.36, small to medium effect) (Velten et al., 2018). For stress symptoms assessed by the stress subscale of the DASS-21, this finding was confirmed in two longitudinal studies on student samples in China, Germany, and Russia (Margraf et al., 2020) and in Italy (Brailovskaia et al., 2023), as well as in a cross-sectional study on employees in China (Wu et al., 2023). Hereby, most of the effects were medium to large (effect size: up to $r = -0.53$, large effect). In a cross-sectional study, higher levels of insomnia symptoms assessed by the Insomnia Symptoms Scale (Pallesen et al., 2019) predicted lower PMH in adult samples in Germany and Poland

Table 6 Factors influencing PMH, and PMH and treatment

Authors and year	Focus	Design	*N*	Sample (gender; age)	Primary outcome
Factors influencing PMH					
Bekalu et al. (2019)	Social media	Cross-sectional	1.027	Representative sample of American adults (51.5% women)	PMH
Brailovskaia et al. (2023)	Mental health	Cross-sectional	1.816	German online sample (76.9% women; *M, SD*=25.96, 8.66), Polish online sample (73% women; *M, SD*=24.34, 6.67)	PMH, addictive social media use
Brailovskaia et al. (2023)	Mental health, cyberbullying, cybercompetence	Cross-sectional	372	German teachers (74.2% women; *M, SD*=41.71, 11.82)	PMH, stress symptoms
Brailovskaia et al. (2023)	Mental health	Longitudinal (15 months)	189	Italian students (77% women; *M, SD*=26.10, 7.75)	PMH, addictive social media use
Brailovskaia et al. (2019)	Mental health	Longitudinal (6 weeks)	349	German inpatients (Psychosomatic rehabilitation) (70.2% women; *M, SD*=50.13, 9.41)	PMH
Brailovskaia et al. (2019)	Mental health	Cross-sectional comparison Facebook users vs. non-Facebook users	601	German inpatients (Psychosomatic rehabilitation) (71.2% women; *M, SD*=51.38, 8.68)	PMH, depression, social stress, insomnia
Brailovskaia et al. (2018)	Suicidality	Cross-sectional	225	German students (76.4% women; *M, SD*=23.36, 4.18)	Lifetime suicidal ideation/behavior
Cai et al. (2017)	Social rhythm	Longitudinal (36 months)	2.031	Chinese students (79.8% women; *M, SD*=19.89, 0.91)	PMH, reciprocal relationships
Chow and Choi (2019)	Resilience	Cross-sectional	416	Hong Kong students (59.9% women)	PMH
Chuang et al. (2021)	Rumination, humor	Cross-sectional	382	Taiwanese adults (61.8% women)	PMH
Hofmann et al. (2022)	Mental health activities	Cross-sectional	326	German teachers (75.0% women; *M, SD*=44.00, 11.85)	PMH
Lavallee et al. (2019)	Vegetarian diet, cross-cultural	Cross-sectional, Longitudinal	20.809	Representative adult samples in 3 countries (Germany, Russia, US), Chinese students, German students (see *Notes*)	PMH
Lin et al. (2020b)	Bullying, cross-cultural	Cross-sectional	7.847	Chinese students (60.0% women; *M, SD*=21.54, 1.20), German students (61.7% women; *M, SD*=21.73, 4.93)	PMH

Table 6 (continued)

Authors and year	Focus	Design	*N*	Sample (gender; age)	Primary outcome
Lin et al. (2020a)	Bullying, cross-cultural	Cross-sectional	6.947	Chinese students (55.8% women; *M, SD*=21.50, 1.20), German students (60.3% women; *M, SD*=21.30, 3.50)	PMH
Liu and Yeo (2022)	Media multiplexity	Cross-sectional	504	Chinese migrant workers (42.1% women; *M, SD*=32.58, 9.08)	PMH
Margraf et al. (2016)	Social Rhythm	Cross-sectional	8.095	Representative adult samples in 3 countries (Germany, Russia, US) (overall: 56.5%, *M, SD*=50.10, 0.34)	PMH
Margraf et al. (2020)	Social predictors, salutogenic predictors, Pathogenic predictors, somatic predictors	Longitudinal (17 months)	14.342	German students (63.8% women; *M, SD*=23.58, 4.73), Russian students (41.5% women; *M, SD*=19.63, 2.16), Chinese students (61.3% women; *M, SD*=19.63, 1.66)	PMH
Niemeyer et al. (2019)	Education, psychosocial resources, daily hassles	Cross-sectional	7.937	Representative German sample (52.4% women; *M, SD*=47.60, 17.40)	PMH
Precht et al. (2022)	Mental health	Longitudinal (12 months)	356	German adults (76.0% women; *M, SD*=27.43,6.59)	PMH
Schönfeld et al. (2016)	Mental health, cross-cultural	Cross-sectional	10.698	Representative German adult sample (47.9% women; *M, SD*=48.03, 14.26), German students (69.0% women; *M, SD*=26.33, 5.23), Russian students (66.6% women; *M, SD*=21.39, 2.19), Chinese students (62.7% women; *M, SD*=21.57, 1.68)	PMH
Schönfeld et al. (2018)	Mental health	Longitudinal (24 months)	2.160	Chinese students (51.3% women; *M, SD*=19.03, 1.19)	PMH
Tajul Ariffin et al. (2022)	Mental health, religiosity	Cross-sectional	179	Malaysian students (62% women; *M, SD*=22.51, 1.24)	PMH
Velten et al. (2018)	Lifestyle choices, cross-cultural	Longitudinal (12 months)	15.396	German students (overall: 58.9% women; *M, SD*=21.69, 4.07), Chinese students (overall: 61.9% women; *M, SD*=20.59, 1.58)	PMH

Table 6 (continued)

Authors and year	Focus	Design	*N*	Sample (gender; age)	Primary outcome
Wang et al. (2022)	Mental health, music preference	Cross-sectional	380	Chinese students (52.1% women)	PMH
Wu et al. (2020)	Resilience	Longitudinal (48 months)	314	Chinese students (46.8% women; *M, SD*=18.23, 0.76)	PMH
Wu et al. (2023)	Mental health, physical activity	Cross-sectional	1.248	Chinese adults (49% women; *M, SD*=39.68, 7.93)	PMH
PMH and treatment					
Brailovskaia et al. (2022)	Gaming abstinence	Longitudinal (Pre-, Mid-, Posttreatment, 1- and 3-month follow-up)	271	German online sample (Gaming abstinence group: 29% women; *M, SD*=26.21, 7.70; control group: 27.9% women; *M, SD*=25.10, 4.94)	PMH, Internet Gaming Disorder, daily stress, anxiety symptoms,
Brailovskaia et al. (2019)	Mental health, treatment	Longitudinal (6 weeks)	349	German inpatients (psychosomatic rehabilitation) (70.2% women; *M, SD*=50.13, 9.41)	PMH
Denis et al. (2020)	Insomnia, treatment	Longitudinal (Pre-, Mid-, Posttreatment, 6-month Follow-up)	199	English female students (*M, SD*=20.00, 5.00)	Sleep disorder symptoms
Precht et al. (2023)	Smartphone use time reduction and/or phsycial activity time enhancement	Longitudinal (Pre-, Mid-, Posttreatment, 1- and 3-month follow-up)	503	German online sample (Social Media Reduction group: 81.3% women; *M, SD*=28.65, 9.71; Physical activity group: 82.5% women; *M, SD*=29.06, 11.20; combination group: 79.5% women; *M, SD*=28.55, 9.71; control group: 78.9% women; *M, SD*=30.58, 11.40)	PMH, addictive smartphone use, depression symptoms, anxiety symptoms
Teismann et al. (2018)	Panic disorder, agoraphobia, specific phobia, treatment	Longitudinal (Pre-, Posttreatment, 6-month Follow-up)	150	German outpatients (psychotherapy) (65.3% women; *M, SD*=37.79, 13.50)	Remission from anxiety disorder
Totzeck et al. (2020)	Loving Kindness Meditation	Treatment, Longitudinal (one year)	110	German students (70.9% women; *M, SD*=22.83, 2.11)	PMH

Table 6 (continued)

Authors and year	Focus	Design	*N*	Sample (gender; age)	Primary outcome
Wannemueller et al. (2019)	Fear of heights (FoH), treatment	Longitudinal (Pre-, Posttreatment, 5-month Follow-up)	104	German adults suffering from FoH (64.1% women; *M, SD*=41.76, 12.56)	Fear reduction
Westermann et al. (2021)	Positive mental imagery training (PMIT)	Longitudinal (two weeks)	57	German inpatients (49.1% women; *M, SD*=45.06, 13.41)	PMH

Notes. In some studies, mean age was not reported. Some of them reported only the frequency of age groups or age information was missing. Lavallee et al. (2019): Representative adult samples in Germany: 58.8% women; *M, SD*=51.95, 17.36; Russia: 53.2% women; *M, SD*=43.24, 17.13; US: 63% women; *M, SD*=55.12, 17.50; Chinese students: 62.1% women; *M, SD*=20.63, 1.66; German students: 63.9% women; *M, SD*=24.57, 4.73

(effect size: $r<0.30$, small effect; Brailovskaia et al., 2023). Moreover, cross-sectional findings in a German general population representative sample and in student samples in Germany, Russia, and China (effect size: $r>0.50$, large effect; Schönfeld et al., 2016), as well as longitudinal 24-month findings in Chinese students (effect size: $r<0.30$, small effect; Schönfeld et al., 2018) revealed that regular experiences of daily stressors assessed by the Brief Daily Stressors Screening Tool (BDSST; Scholten et al., 2020) are a further predictor of lower PMH. In contrast, higher self-efficacy assessed by the Generalized Self-Efficacy Scale (GSE-Scale; Schwarzer & Jerusalem, 1995) predicted higher PMH. The effects were medium to large (effect size: $r=0.32$ to 0.65). Moreover, self-efficacy buffered the impact of daily stressors on PMH as a mediator in both studies (Schönfeld et al., 2016, 2018). In a cross-sectional study of Taiwanese adults, rumination assessed by the Ruminative Response Scale (RRS; Nolen-Hoeksema, 2000) was a predictor of lower PMH (effect size: $r=-0.40$, medium effect), with this association being moderated by humor. Specifically, the higher one's humor level, the less close the association between rumination and PMH (Chuang et al., 2021). In addition to self-efficacy and humor, resilience served as predictors of higher PMH in a cross-sectional study of students in Hong Kong (Chow & Choi, 2019), and in a longitudinal study of students in China (Wu et al., 2020). Chow and Choi (2019) who assessed resilience by the Brief Resilience Scale (BRS; Liu et al., 2017) revealed a medium sized effect (effect size: $r=0.49$), and Wu et al. (2020) who used the Resilience Scale 11 (RS-11; Schumacher et al., 2005) described a small effect (effect size: $r<0.30$). In a general population representative sample in Germany, resilience (assessed by RS-11), sense of control (assessed by SoC-Scale) and daily stressors (assessed by BDSST) mediated the positive association between education level and PMH, whereas delay of gratification showed no significant effect (Niemeyer et al., 2019). Specifically, the higher one's education level, the higher the level of resilience and sense of control and the lower the level of experienced daily stressors, and the higher the level of PMH. Furthermore, resilience (assessed by RS-11), social support (assessed by Questionnaire for Social Support, F-SozU K-14; Fydrich et al., 2009), and physical health (assessed by the physical health item of the EQ-VAS; The Euroqol Group, 2013) predicted higher PMH in Margraf et al. (2020). The effects were small to medium sized (effect size: $r=0.20$ to 0.42). The predictive effect of social support (assessed by Multidimensional Scale of Perceived Social Support, MSPSS; Zimet et al., 1988) was supported by a cross-sectional study on Chinese workers (effect size: β

= 0.31, medium effect; Liu & Yeo, 2022). Positive affect predicted higher PMH, whereas negative affect (assessed by PANAS) had a negative effect on the level of PMH in a cross-sectional study of German teachers (effect size: $r > 0.50$, large effect; Hofmann et al., 2022). Positive orientation (e.g., to be engaged in activities that provide the person with a feeling of achievement) and emotion regulation (e.g., practicing in relaxation methods) mediated the relationship between positive/negative affect and PMH in this study.

3.7 PMH and Lifestyle

Ten studies focused on the association between PMH and (un)healthy lifestyle (see Table 6). In a cross-sectional study of Chinese students (Cai et al., 2017), in a cross-sectional study of general population representative samples in Germany, Russia and the US (Margraf et al., 2016), and in a longitudinal study of student samples in Germany, Russia and China (Margraf, Zhang, Margraf et al., 2020b), a regular social rhythm that implies for example regular bedtime, food intake, and meeting with others (assessed by BSRS in all studies) predicted higher PMH. The effects were small (effect size: $r < 0.30$). Regarding dietary habits, the results are rather mixed: a vegetarian diet did not predict PMH in general population representative samples in Germany, Russia, and the United States, and in student samples in China and Germany (Lavallee et al., 2019). In Velten et al. (2018), however, being a non-vegetarian predicted higher PMH up to one year later in Chinese students, but not in German students. Other predictors in the Chinese sample, but not in the German sample, were not smoking, regular physical activity (e.g., jogging, cycling), and cultural activities such as reading, playing music, and attending theaters and movies (Velten et al., 2018). The predictive effect of cultural activities was confirmed by Niemeyer et al. (2019) and that of physical activity by Chow and Choi (2019). In all studies, the effects were small (effect size: r or $\beta < 0.30$). Furthermore, resilience (assessed by Connor-Davidson Resilience Scale, CD-RISC; Campbell-Sills & Stein, 2007) and social support (assessed by Perceived Social Support Scale, PSSS; Wang et al., 1999) enhanced as mediators the predictive effect of physical activity on PMH in employees in China. Specifically, the higher the level of physical activity, the higher the level of resilience and social support, and the higher the level of PMH. In contrast, stress symptoms served as a negative mediator for the association between physical activity and PMH. Specifically, the higher the level of physical activity, the lower the level of stress symptoms and the higher the level of PMH (Wu et al., 2023). In a cross-sectional study on Chinese students, the form of preferred music predicted the level of PMH. Pop music, Western classic music, and Chinese traditional music served as positive predictors; heavy music (including rock music, heavy metal music, rap music) served as a negative predictor (Wang et al., 2022). Most effects were medium sized (effect size: $r < 0.50$). In a cross-sectional study on Malaysian students, religiosity served as a positive predictor of PMH (effect size: $r < 0.30$, small effect; Tajul Ariffin et al., 2022). Overall, the results suggest associations between PMH and lifestyle, with cultural differences such as dietary behavior appearing quite plausible.

3.8 PMH and (Cyber-)Bullying

Four cross-sectional studies focused on the association between PMH and (cyber-) bullying in student samples (see Table 6). Lin, Wolke, Lin et al. (2020a) found that being a victim

of bullying in the real world (or world offline) predicted lower PMH in Germany and in China. Brailovskaia et al. (2018) confirmed this finding in the cyberspace (e.g., on social platforms such as Facebook) for German students. In both studies, the effects were small (effect size: $r < 0.30$). For offline bullying, social support (assessed by F-SozU K-14), resilience (assessed by RS-11), and self-efficacy (assessed by GSE-Scale) as mediators buffered the negative effect of victimization on PMH in Germany and China (Lin et al., 2020b). An interesting cultural difference concerned the mental health of perpetrators: in China, perpetrators of bullying had lower PMH levels than non-perpetrators, whereas in Germany, the PMH levels of perpetrators of bullying were similar to those of non-perpetrators (Lin et al., 2020a). The effects were small to medium sized (effect size: Hedge's $g = 0.37$ and 0.55). Here, the authors discuss the possibility that bullying may function less as an adaptive strategy in a more collectively oriented society than in a more individualized society. In a further cross-sectional study that investigated the German teacher population, PMH mediated the association between cyberbullying experience (i.e., experience with students being victimized by cyberbullying, students engaging in cyberbullying as perpetrators, and teachers being the victim of cyberbullying), and stress symptoms (assessed by DASS-21). Teachers' cybercompetence in managing cyberbullying moderated the relationship between PMH and stress symptoms. Specifically, the higher the cybercompetence the weaker the relationship (Brailovskaia et al., 2023).

3.9 PMH and Social Media use

Two cross-sectional and two longitudinal studies described an association between PMH and the use of social media such as Facebook, Instagram, Twitter, and WeChat (see Table 6). In a German psychosomatic rehabilitation hospital, Facebook users had a lower level of PMH than Facebook non-users in a cross-sectional study (effect size: Hedge's $g = 0.21$, small effect). Moreover, in the user group, PMH was negatively related to the duration of daily Facebook activity (effect size: $r = -0.15$, small effect; Brailovskaia et al., 2019). In the cross-sectional study of Bekalu et al. (2019), integration of social media use (SMU) into social routines was linked to higher PMH. In contrast, the development of an emotional connection to the online activity was associated with lower PMH. In line with these findings, addictive SMU (assessed by BSMAS) that is characterized by a close emotional bond to social media preceded lower PMH that was assessed six weeks later in an inpatient sample (Brailovskaia et al., 2019), and that was assessed one year later in a sample of healthy individuals in Germany (Precht et al., 2022). In all studies, the effects were small (effect size: $\beta < 0.30$).

Taken together, the evidence suggests that several factors related to mental health and daily behaviors in the offline and online world predict PMH. Some of them, such as depressive symptoms, (cyber)bullying, and addictive SMU, contribute to its reduction, while others, such as self-efficacy and a regular social rhythm, promote PMH levels. The findings are mostly consistent over different sample compositions. Of note, however, is that 14 of the 19 studies (73.7%) belong to the "BOOM" project and at least partly used the same participant pool.

3.10 PMH and Treatment

A total of eight studies examined PMH in the context of a treatment-seeking population and/or effects of a psychosocial intervention on PMH (see Table 6). Five studies investigated a cognitive-behavioral treatment, one study examined a computerized positive mental imagery training, one study tested a loving-kindness meditation, one study investigated the effect of gaming abstinence, and one study the effects of smartphone use time reduction and/or increase of physical activity. Changes in PMH were reported in seven studies - no respective data are reported by Teismann et al. (2018) and Wannemueller et al. (2019).

In two samples of psychosomatic inpatients receiving cognitive-behaviorally oriented treatment, PMH significantly increased over the course of six weeks (effect size: Cohen's d = 0.50, large effect; Lukat et al., 2016); and (η^2_p = 0.31, large effect; Brailovskaia et al., 2019). Similarly, German inpatients showed higher levels of PMH with small to large within-group effect sizes after receiving either usual care (effect size: Hedge's g = 0.66, medium effect), additional positive mental imagery training (effect size: Hedge's g = 0.83, large effect), or additional cognitive control treatment (effect size: Hedge's g = 0.33, small effect), with no significant differences between treatment groups (Westermann et al., 2021). In contrast, a brief online CBT intervention to treat subclinical insomnia in English female students did not affect PMH, nor did PMH moderate the effects of the intervention on insomnia (Denis et al., 2020). In further studies, a two week gaming abstinence intervention was associated with an increase in PMH (effect size: η^2_p = 0.018, large effect; Brailovskaia et al., 2022), as was a two-week reduction of time spent on smartphone use alone as well as the combination of a smartphone use time reduction and of an increase of physical activity time (effect size: Cohen's d = 0.25 to 0.27, small effect; Precht et al., 2023).

Finally, in an initial pilot study of direct change in positive mental health, Totzeck et al. (2020) sought to determine if Loving Kindness Meditation (LKM) was effective in promoting PMH in college students and if this would subsequently lead to improvements in depression, anxiety, and stress. All participants were assessed for PMH and psychological complaints at baseline and at one-year follow-up. For the LKM participants, the same surveys were additionally conducted immediately before and after treatment. A significant short-term effect of LKM on PMH (effect size: η^2_p = 0.013, small effect) and anxiety was found. Moreover, the long-term analyses showed a significant decrease in depression, anxiety, and stress for the LKM group at the 1-year follow-up. In contrast, the control group showed a significant increase in depression, anxiety, and stress. The results suggest that LKM improves mental health, and that this improvement has longer-term meaningful positive effects on psychological distress.

In sum, there is initial evidence that PMH can be fostered by psychosocial interventions and that this may have long-term positive effects on well-being and affective symptoms. However, research on ways to promote and strengthen PMH – as assessed with the PMH-Scale – is obviously still in its infancy. In this context, it is worth pointing out that the effect of specific positive psychological interventions on PMH – as assessed with instruments other than the PMH-Scale – is well established (Bolier et al., 2013; Chakhssi et al., 2018; Fava, 2016; Geerling et al., 2020).

4 Discussion

Findings from the current scoping review highlight different outcomes: (1) PMH can be reliably and validly assessed across groups, cultures, and time. (2) PMH – as assessed with the PMH-Scale (Lukat et al., 2016) – is relatively independent of mental health problems, and relevant to the course of psychopathology (including suicidal thoughts and behaviors) and mental disorders as well as health-related behavior (within the COVID-19 pandemic), and healthy development. (3) PMH is influenced by social factors, physical activity, lifestyle choices and social support as well as depression, anxiety, stress, bullying and addictive social media use. The studies therefore point to a bi-directional relationship between PMH and markers of negative mental health. (4) PMH is amenable to therapeutic interventions. To date, however, there are only a few studies that have examined the effect of therapeutic intervention on PMH (as assessed with the PMH-Scale). (5) PMH shows no consistent association with age, gender, and nationality – thus, the possibility of positive mental health does not appear to be determined by uninfluenceable factors (cf., Lyubomirsky, 2008). (6) Results on PMH are comparable across cross-sectional and longitudinal studies. (7) Largely comparable results are found across cultures as well as when using different instruments to assess PMH (e.g., Keyes et al., 2010; Keyes et al., 2012; Schotanus-Dijkstra et al., 2019; Wood & Johnson, 2016). The reviewed findings underscore the call to consider PMH more widely in preventive and clinical contexts worldwide. In addition, the findings indicate that the PMH-Scale is suitable for use in practice and research. The present scoping review thus complements the results of other literature compilations, which - based on different conceptualizations of PMH - arrive at very comparable results (Caspi & Moffitt, 2018; Keyes, 2007; Ryff, 2014; Westerhof & Keyes, 2010; Wood & Tarrier, 2010).

However, it must be noted that, 31 of the identified studies had a longitudinal study design, twice as many studies had a cross-sectional design, and only several studies were designed as a randomized controlled trail. Therefore, so far, almost all studies are basically correlative in nature, so that the causal significance of the observed relationships is still open. Furthermore, most effects are rather small sized. Therefore, conclusions on predictive effects should be considered with caution. In general, the assessment of causal relationships requires a multistage approach that must ultimately include experimental or at least quasi-experimental designs. The research program for identifying causal risk or protective factors comprises four steps according to Kraemer and colleagues (Kraemer et al., 1997): (1) First, it must be determined whether a potential risk or protective factor has any correlation at all with the outcome of interest. If this is the case, at least a correlate is present. (2) In order to proceed with the appraisal of a possible causality, the next step is to determine whether the factor precedes the outcome. The means of choice at this level are prospective longitudinal studies. Only when they show temporal precedence, one can speak of a risk factor or a protective factor, depending on the nature of the correlation. (3) However, even prospective longitudinal studies cannot conclusively clarify the question of causality of the observed associations. For this purpose, it still has to be determined whether the respective factor is variable, and eventually (4), in a final step, intervention studies are needed in which the assumed causal factor is experimentally manipulated (Blackwell & Woud, 2022). It is this experimental step that provides the best evidence for establishing a causal relationship. For ethical reasons, prevention and therapy ("experimental reduction of risk factors or complaints") are of particular importance here (Margraf, 2020).

If we look at previous research on PMH according to this scheme, a very consistent picture emerges: At the level of correlates, associations between PMH and a variety of psychological complaints were found in all studies conducted. Also, at the second level of the research scheme (temporal priority), different findings consistently show that PMH prospectively predicts, in particular remission of psychological complaints (Teismann et al., 2016, 2018b). The third level, which asks about the variability of the factors of interest, again gives a clear picture: both for PMH and for the different psychological complaints (diagnoses, dimensional measures of depression, anxiety, stress), the data demonstrate a clear variability. However, at the fourth level, which is crucial for the question of causality, the data on PMH measures are still very sparse, as mentioned above (Totzeck et al., 2020). Nevertheless, other authors using assessment instruments other than the PMH-Scale have already shown that PMH is amenable to therapeutic intervention (Bolier et al., 2013; Chakhssi et al., 2018; Fava, 2016; Geerling et al., 2020). Remarkably, Trompetter et al. (2017) were even able to show that – in line with the dual-factor model (see above) – therapeutic improvements in mental health and improvements in depression and anxiety occur independently (cf., Brailovskaia et al., 2024). Nevertheless, there is a considerable need for research in this area.

Despite the comprehensive research program described above, there are further gaps in current research: The PMH-Scale has not yet been validated for children and adolescents. Accordingly, there are no studies on this age group, although the development of PMH in adolescence is likely to be of greatest importance. Studies on the elderly are also largely lacking and there are no or comparatively few studies conducted in highly stressed populations (e.g., patients, prisoners, refugees, war-affected (Brailovskaia et al., 2019; Brailovskaia et al., 2019a, b, c; Naghavi et al., 2022; Siegmann et al., 2019; Teismann et al., 2018; Westermann et al., 2021). Thus, it is largely unclear to what extent the results described here can be extrapolated to more heavily burdened populations. Furthermore, there is a lack of studies on the variation of PMH in everyday situations. Here, Ecological-Momentary-Assessment studies would be useful and, because of the brevity of the PMH-Scale, quite feasible. Also, there are still no studies on the relationship between PMH and biological markers (cf., Ryff, 2014), which could provide information on the mode of action of PMH at this level. In addition, even though cross-national studies showed mostly comparable findings on PMH and its associations, there is a need for more PMH studies in non-WEIRD populations that are underrepresented in the available literature. Also, more cross-cultural studies are required to identify the impact of the cultural context on PMH and how PMH interventions should be designed or modified to correspond to the needs of a specific culture. Finally, it is important to mention that the scoping review only used the search term "Positive Mental Health Scale". On the one hand, this ensured findings based on the same instrument. On the other hand, this as well as the fact that only English-language studies were considered in the scoping review may have resulted in relevant studies not being identified. Furthermore, the literature search of the scoping review was limited to the databases Web of Science, PubMed, PsycINFO, and Google Scholar. Even though these are very common databases in the field of studies on PMH, it cannot be excluded that they do not include all relevant studies. In addition, systematic biases such as publication bias as well as sample selection bias that could impact the findings of the identified studies and the conclusions drawn in the scoping review cannot be fully excluded. Those conclusions could concern the

significance of the associations of PMH with other variables or the effectivity of treatments that influenced the PMH level.

In terms of practical implications, the results of the current review underscore the importance of accounting for the presence of PMH in addition to aspects of psychopathology in counselling and clinical settings. This seems to be especially relevant in the context of suicide risk assessments (Teismann et al., 2016). Fostering well-being has been shown to be effective in the treatment of depression and anxiety disorders (cf., Fava, 2016); with respect to the fact that self-acceptance and environmental mastery are relevant facets of PMH (Teismann & Brailovskaia, 2020), counsellors and clinicians might also put a special focus on fostering self-compassion (Gilbert, 2014; Wilson et al., 2019) and (renewed) access to personal strengths and resources (Flückiger et al., 2023). Furthermore, the relevance of PMH to the remission of mental disorders and associated psychopathology, suggests that PMH – alongside aspects such as symptom reduction, and response rates – should be understood as a central outcome measure for assessing the effectiveness of counseling or treatment (cf., Brailovskaia et al., 2024) in treatment studies and in clinical practice. Moreover, the current review underscores the necessity that theoretical models of various forms of psychopathology should strive to integrate both pathogenetic and protective factors. Finally, it is of great importance that policymakers promote the significance of PMH and its enhancement. This could be done by public advertising campaigns on the Internet, TV, and offline billboards. Hereby, for example, celebrities including popular athletes and actors could participate in short videos that promote PMH. In addition, a "PMH promotion day" could be integrated in the school routine to improve the understanding of PMH and how it can be enhanced in children and adolescents.

5 Conclusions

To sum up, the present scoping review of the studies conducted to date shows that PMH is often investigated as an antecedent or predictor variable, and occasionally studied as an outcome or a dependent variable. Increasingly, it is also considered as a moderating or a mediating factor. The scoping review indicates that a continuation of efforts to pursue the effect and mode of action of PMH in a cross-cultural, comparative approach appears highly relevant. This would contribute to the replication of the available findings on PMH by further independent investigations that do not use the same participant pool, and thus allow to assess their generalizability to other populations and to foster our understanding of PMH's relevance to the remission of disorders in diverse samples. Policymakers, researchers, and practitioners, are therefore called upon to include the assessment of PMH as a routine in mental health assessments and make PMH a central outcome measure to evaluate the effectiveness of counselling and therapy. Finally, given the importance of PMH, it is essential that studies focusing on the early promotion of PMH and randomized-controlled trials on prevention and treatment approaches to promote PMH become a research priority. Corresponding studies must be conducted cross-cultural and take into account the needs of specific target groups.

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Declarations

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