Exploring Gender as Moderator in the Longitudinal Bidirectional Relationship Between Psychopathology and Positive Mental Health in a Representative Sample of Dutch Panellists

Merel Hesselink

Faculty of Behavioural, Management and Social Sciences, University of Twente

Department of Psychology, Health and Technology

202200087: Master Thesis Positive Clinical Psychology and Technology

First supervisor: Dr. Marcel E. Pieterse

Second supervisor: Dr. Gerben J. Westerhof

September 26, 2024

Abstract

Background: Psychopathology accounts for a significant portion of the burden of disease worldwide. High levels of PMH may reduce the risk of developing psychopathology and can promote recovery. This study is a secondary analysis based on the original study by Lamers et al. (2015), and partly examined the same longitudinal bidirectional relationship between PMH and psychopathology, by examining both the baseline measurements as predictors as well as the changes within three months, in a representative non-clinical sample of the Dutch population. This secondary analysis differs because it used traditional statistical models while Lamers et al. (2015) used more advanced statistical models. This study extends the original study by examining gender as potential moderator.

Methods: A cross-lagged panel model was used. Secondary data from wave three and four of the mental health study by the Longitudinal Internet studies for the Social Sciences (LISS) panel were used. Participants that filled out both waves (N = 1223) were included in the study. Self-report measures were used where PMH was measured with the Mental Health Continuum Short Form (MHC-SF) and psychopathology was measured with the Brief Symptom Inventory (BSI). Two hierarchical multiple regression models were used to examine the cross-lagged predictive relationship between PMH and psychopathology, using both the baseline measurements as well as the changes over time within three months. It was examined which change was the better predictor, and it was explored whether gender moderated the relationships between the changes in the predictors and the dependent variables.

Results: Psychopathology at T2 and the changes within psychopathology significantly predicted PMH at T3, however, the effect sizes were close to zero. Likewise, PMH at T2 and the changes within PMH significantly predicted psychopathology at T3, however again, the effect sizes were very small. Gender did not moderate the relationships between the changes in the predictors and the dependent variables. The changes in both predictors wielded similar minimal effects on the dependent variables, which prevented identifying a better predictor.

Conclusion: While some expected relationships were found, these relationships were actually negligible, which contradicts the findings of Lamers et al. (2015). The current findings might be the result of the study duration, chosen statistical model and available data, and future research should conquer the limitations of the current study by critically considering these to prevent undiscovering important patterns. Future research should consider the usage of more advanced statistical methods, like Latent Growth Modelling with an IRT model, when examining this longitudinal bidirectional relationship in a non-clinical sample.

Exploring Gender as Moderator in the Longitudinal Bidirectional Relationship Between Psychopathology and Positive Mental Health in a Representative Sample of Dutch Panellists

Introduction

Psychopathology and positive mental health (PMH) influence each other over time (Lamers et al., 2015). Psychopathology refers to mental disorders such as anxiety and depression (Davey, 2021), while PMH refers to aspects such as satisfaction with life, positive emotions (Keyes et al., 2008) and more. The burden of disease for psychopathology is big (Lokkerbol et al., 2013), and higher levels of PMH could provide a protective effect against psychopathology (Burns et al., 2022; Santini et al., 2022). From the study from Lamers et al. (2015) it is known that higher levels of psychopathology are associated with lower levels of PMH and vice versa. Treatments can be improved by learning more about how psychopathology and PMH influence each other over time, and how this knowledge can help to prevent the development of psychopathology (Kazdin & Blase, 2011; Lamers et al., 2015; Wood & Joseph, 2010). In addition, it seems useful to examine whether gender plays a role in how PMH and psychopathology influence each other over time, because, to the author's knowledge, this has not yet been examined. It can be examined whether the protective effect of PMH against psychopathology (Burns et al., 2022; Santini et al., 2022) works the same for males and females, and whether a decrease in PMH leads to an equally large increase in psychopathology in both genders, or whether this differs.

According to World Health Organisation (2022a) one out of every eight individuals (or 970 million individuals) worldwide suffered from a mental disorder in 2019. From these disorders, anxiety and depressive disorders are the most prevalent (World Health Organisation, 2022a). Lokkerbol et al. (2013) found that mental disorders contribute to a great burden of disease, and Wijnen et al. (2023) and World Health Organisation (2024d) also found an economic burden due to mental disorders. The overall burden of disease is measured with disability-adjusted life years (DALYs) (World Health Organisation, 2024b). World Health Organisation (2024c) showed The Netherlands' top 10 causes of DALYs in 2021, which showed neurocognitive disorders on fifth place, anxiety disorders on the eighth place and depressive disorders on the tenth place. A study by Hilderink et al. (2020) found that nearly 5 million DALYs were caused by disease in the Netherlands in 2015, where mental disorders accounted for 14% of cases, making it the fourth biggest cause of disease. The disease burden was also here the biggest for anxiety and depressive disorders and

neurocognitive disorders (Hilderink et al., 2020). Lastly, a report by the government's Rijksinstituut voor Volksgezondheid en Milieu (2024) from 2019 / 2022 indicates a percentage of 25.9% individuals between the age of 18 and 75 years old had a mental disorder in The Netherlands. What significantly adds to this burden is the COVID-19 pandemic which made the number of individuals with a depressive or anxiety disorder rise profoundly (World Health Organisation, 2022a).

Fortunately, these disorders can be treated with successful interventions such as Cognitive Behavioural Therapy (CBT) (Craske et al., 2014; Méndez et al., 2021; Wergeland et al., 2021; World Health Organisation, 2022a), and can possibly even be prevented (Mendelson & Eaton, 2018; World Health Organisation, 2022a). CBT targets the clients' cognitive issues such as distorted thinking patterns and negative thought intrusions, and behavioural issues such as lack of enjoyment and motivation (Walter et al., 2023). Traditional treatments aim to effectively reduce the individual's symptoms and distress in order to support recovery (Davey, 2021, p. 114). But according to World Health Organisation (2024a), health is "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity".

Positive psychology focuses more on the individual's strengths and well-being (Seligman & Csikszentmihalyi, 2000), instead of diminishing pathological complaints. From a subjective perspective, positive psychology is about "valued subjective experiences: well-being, contentment, and satisfaction (in the past); hope and optimism (for the future); and flow and happiness (in the present)" (Seligman & Csikszentmihalyi, 2000, p. 5). From this perspective, positive psychology interventions (PPIs) were developed, which are more concentrated on positive thoughts, behaviour and emotions (Chakhssi & Bohlmeijer, 2018) by means of enhancing meaning, positive relationships, enjoyment, optimism, gratitude and resilience (Chakhssi & Bohlmeijer, 2018; Steinhardt & Dolbier, 2008). PPIs are increasingly being applied for treating mental disorders, and add to fewer pathological issues and more well-being in clinical populations (Chakhssi & Bohlmeijer, 2018; Geerling et al., 2020). Furthermore, Positive Cognitive Behavioural Therapy (PCBT) exists, and is described as follows "the focus of positive CBT is not on mental illness and pathology, on what is wrong with clients and on repairing what is worst, but on mental health and strengths, what is right with them and on creating what is best" (Bannink, 2017, p. 17). These studies suggest that when traditional interventions do not work on individuals, PPIs or PCBT can still be used to improve well-being and lessen mental disorders. These studies also suggest that improving

positive mental health (PMH) should be of as much importance as treating mental disorders (Magyary, 2002, as cited in Lamers et al., 2015).

PMH consists of emotional, social and psychological well-being (Keyes, 2002) and is operationalised by World Health Organisation as “a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community” (World Health Organisation, 2022b; World Health Organisation, 2024d). Emotional well-being includes satisfaction with life and positive emotions (Keyes et al., 2008) and is linked to high hedonic well-being, which is also about positive emotions, pleasure and happiness (Disabato et al., 2016; Quandt et al., 2022; Ryan & Deci, 2001). Social well-being includes aspects such as social acceptance, social integration and social coherence (Keyes, 1998; Keyes et al., 2008) and psychological well-being includes aspects such as purpose in life, autonomy and self-acceptance (Keyes et al., 2008; Ryff, 1989). High eudaimonic well-being is related to meaning, personal development and personal expressiveness, which entails living life as one's authentic self, which links closely to psychological well-being (Disabato et al., 2016; Niemiec, 2014; Ryan & Deci, 2001). Eudaimonic well-being refers to well-being in the future, a form of long-term well-being, while hedonic well-being refers to enjoyable and pleasurable moments in the present moment (Huta, 2013).

Research has been done to gain insight in how these two constructs of mental illness, and PMH both play a role in mental health, which refers to the Two Continua Model. Westerhof and Keyes (2009) write how it was long thought that when mental illness was absent in an individual, the individual was mentally healthy. Suggesting that mental illness and PMH were ends of the same continua or scale. But, as written before, health is more than just the absence of illness (Bannink, 2017; Margraf et al., 2020; Slade, 2010; Westerhof & Keyes, 2009; World Health Organisation, 2024a). The best way to conceptualise mental health is as an exhaustive state, that is not just the absence of mental illness, but the actual presence of PMH (Margraf et al., 2020; Westerhof & Keyes, 2009). According to The Two Continua Model, PMH and mental illness should be seen as connected, but separate dimensions (Margraf et al., 2020; Seow et al., 2016; Westerhof & Keyes, 2009). PMH is represented by one continuum, while mental illness is represented by another, and they show whether PMH and mental illness are present or not (Westerhof & Keyes, 2009). These two continua both separately contribute to an individual’s mental health (Lamers et al., 2015).

Mental illness and PMH are reflected as separate dimensions in studies where individuals were able to have high levels of PMH or were flourishing, while also having a

mental disorder (Bergsma et al., 2010; De Vos et al., 2018; Schotanus-Dijkstra et al., 2019; Seow et al., 2016), which would not be possible if PMH and mental illness were ends of the same scale. Mental illness and PMH are also said to influence each other over time, which represent the connectedness of both constructs. Over time, it was found that increases in PMH resulted in lesser mental illness (Keyes et al., 2010) which suggests a negative relationship, and two other studies found that mental illness influenced PMH over time (Eack & Newhill, 2007; Zatzick et al., 1997). Additionally, it was found that PMH predicted mental illness (Grant et al., 2013; Margraf et al., 2020), that low PMH was identified as a risk factor for the onset of depressive disorders (Wood & Joseph, 2010), and that resilience, part of PMH (Färber & Rosendahl, 2018; Seaton et al., 2017), may act as a barrier to the onset of mental illness (Burns et al., 2022; Shrivastava & Desousa, 2016). Other studies found that higher levels of PMH may be a protective factor against development or the return of common psychopathologies (Burns et al., 2022; Santini et al., 2022), that the chance/vulnerability of developing anxiety and depressive disorders is lower for flourishers (Schotanus-Dijkstra et al., 2016), and that higher levels of PMH are a predicting factor for recovery of anxiety disorders (Iasiello et al., 2019; Schotanus-Dijkstra et al., 2019), as well as depressive and panic disorders (Iasiello et al., 2019). If mental illness and PMH were completely separate dimensions, no influence from one on another and vice versa would be possible.

Furthermore, studies suggest that there are some differences between contributing factors and prevalence for males and females regarding psychopathology and PMH. According to the report by Rijksinstituut voor Volksgezondheid en Milieu (2024) from 2019 / 2022, mental disorders were slightly more common in females (27.8% females, 24% males), and in general most common in the age range of 18 till 24 years old (39.6%). World Health Organisation (2024c) also showed in their top 10 causes of DALYs of 2021, that neurocognitive disorders are on the second place, anxiety disorders on the fifth place and depressive disorders on the seventh place in the top 10 for females, while for males, mental disorders were not present in the top 10 except for neurocognitive disorders on the eighth place. Davey (2021, p. 239) states that females are nearly twice as likely to experience major depression compared to males, and eating disorders are up to 10 times more prevalent in females than in males (Davey, 2021, p. 373). Fonseca et al. (2023) also found a high prevalence of depression in females. Other studies found that depression and anxiety disorders are more prevalent in females (Eaton et al., 2012; Jacobi et al., 2014; Klose & Jacobi, 2004), and Klose and Jacobi (2004) found a higher prevalence of somatoform disorders in females and Eaton et al. (2012) and Klose and Jacobi (2004) found a higher

prevalence of substance use disorders in males. It was also found that females in general experience more psychological distress than males (Gove, 1984; Maestre-Miquel et al., 2021; Masood et al., 2016; Matud et al., 2014), and that females suffer more from mental disorders compared to males (Maestre-Miquel et al., 2021). The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders also indicates generalised anxiety disorders to be up to two times more prevalent among females and they experience 1.5 to 3 times more prevalence of major depressive disorder compared to males (American Psychiatric Association, 2013). Although the study by Margraf et al. (2020) found contradicting evidence, suggesting that males have a heightened risk of depressive disorders in the future. In general, most studies seem to indicate a bigger prevalence of depressive and anxiety disorders in females than males, and that neurocognitive, depressive and anxiety disorders are the most prevalent culprits.

Aside from prevalence, it was found that other factors can play a role regarding gender and mental illness. It was found that substance disorders were connected to a younger age in males and females (Klose & Jacobi, 2004). In both genders, being single and jobless were linked to higher rates of mental illnesses, although this was more prevalent in males than in females (Klose & Jacobi, 2004). Klose and Jacobi (2004) also found that depression was linked to retirement in females, and that having children, working a full-time job, and being a member of a higher social class seemed to be protective factors particularly for males. For both genders, higher degrees of mental illness were not linked to other sociodemographic characteristics, such as work, family status, or education (Klose & Jacobi, 2004). Additionally, a study conducted in Spain found that an occurrence of mental health state seemed to be associated with different health, sociodemographic and living factors, and that females seem to be more at risk for mental illness and psychological distress (Maestre-Miquel et al., 2021). According to the author, primary care should incorporate programs designed to prevent, monitor, and control gender disparities in mental health issues (Maestre-Miquel et al., 2021). The author also suggests to screen for mental health issues in a number of groups, such as individuals who smoke, individuals with a chronic disease, individuals who have a fragile self-reported health, younger adolescents and unmarried individuals, and Spanish females specifically (Maestre-Miquel et al., 2021).

Regarding prevalence for PMH, a report by Rijksinstituut voor Volksgezondheid en Milieu (2024) from 2022 indicates that life satisfaction was only slightly more prevalent in females (83.8%) than in males (82.9%). Furthermore, it was found that gender differences are studied often in terms of flourishing. Flourishing is conceptualised as the ultimate state of

being, individuals that flourish have high degrees of hedonic and eudaimonic well-being (Schotanus-Dijkstra et al., 2015), and Mjøsund (2021) describes that a happy emotional state and good psychological and social functioning are indicators of flourishing. Several studies found flourishing to be more prevalent among females (De La Fuente et al., 2019; Schotanus-Dijkstra et al., 2015; Schotanus-Dijkstra et al., 2016). Contradicting to this, is that Keyes (2002) found that PMH was more common in men, married adults, older adults, and those with higher levels of education. It might be that, over the years, flourishing has become more prevalent among females, or that this differs across continents and regions.

Regarding other factors aside from prevalence, it was found that among other things, gender was associated with flourishing in the region of Malaysia and in elderly people (Momtaz et al., 2016). Furthermore, a number of gender differences were found, such as that males score higher in terms of autonomy and self-acceptance, while females score higher in terms of positive relations and personal growth (Matud et al., 2019). Another study from Matud et al. (2020) about older adults also found that self-acceptance and autonomy were higher in males, as well as purpose in life and environmental mastery. The author also found that self-esteem and social support were the best predictors of psychological well-being for both genders. Boardman et al. (2008) found that resilience is inherited, and that males are more likely than females to inherit resilience. It seems that self-acceptance plays an important role in how resilience emerges in both genders (Boardman et al., 2008). Additionally, it was found that environmental mastery was a significant contributing factor to males' heritability of resilience, but environmental mastery had a much smaller effect on females (Boardman et al., 2008). Another study also found that psychological resilience was greater for males (Gök & Koğar, 2021). Chuang et al. (2023) found that resilience should be promoted in mental health care to increase quality of life in individuals with a mental disorder, and Fonseca et al. (2023) found that resilience was lower in females with depression compared to females without depression. Lastly, Margraf et al. (2020) also emphasise the relevance/seriousness of resilience.

To conclude, it seems that some mental disorders manifest more in females and females also experience more psychological distress. Notably, it seems that flourishing is also more prevalent among females although evidence is contradicting. Females score lower on self-acceptance, which is an important part of how resilience forms for females. Aside from that, females are less likely to inherit resilience, which could mean that females contain less resilience which could lead to more mental illness. Although quite some knowledge is available suggesting gender differences regarding psychopathology and PMH, no studies

were identified by the author that explained why the relationship between psychopathology and PMH would differ between males and females. It seems that, to the author's knowledge, the topic of gender playing a role in how PMH and psychopathology influence each other over time has not been examined yet.

Study aim

The current study will be a secondary analysis based on the original study by Lamers et al. (2015).

Original Study

The relatedness of PMH and mental illness from the Two Continua Model was supported by the findings of Lamers et al. (2015). They examined the bidirectional longitudinal relationship between PMH and psychopathology by means of a combination of Latent Growth Modelling and an Item Response Theory (IRT) model (Lamers et al., 2015). Lamers et al. (2015) used the mental health study from the Longitudinal Internet studies for the Social Sciences (LISS) panel (Centerdata, 2023), which measured psychopathological complaints and PMH in four different waves over a period of nine months (T0, T1, T2 and T3) (LISS panel, 2009a). They measured the predictive values separately for PMH on psychopathology from T0 to T1, T1 to T2 and from T2 to T3 over time, and they did the same for predictive values for psychopathology on PMH, while always controlling for initial levels (Lamers et al. 2015).

Additionally, they investigated the predictive values of the changes in PMH and psychopathology over time. An example is the change between T0 and T1 for PMH as predictor for psychopathology at T1, the change between T1 and T2 for PMH as predictor for psychopathology at T2 and so on, and the same was done for the changes in psychopathology as predictor for PMH (Lamers et al. 2015). They found that psychopathology significantly predicted PMH at all four measurement occasions, and that PMH significantly predicted psychopathology at all four measurements (Lamers et al., 2015). Additionally, they found that the changes in PMH and psychopathology between T1 and T0, between T2 and T1 and between T3 and T2 were consistently better predictors than the absolute levels (Lamers et al., 2015). Furthermore, they found that changes in PMH were more effective predictors of psychopathology than changes in psychopathology were for PMH (Lamers et al., 2015). However, the analyses were carried out independently, and were because of this not to be compared straightforwardly (Lamers et al., 2015). The author then estimated the predictive associations all at once in the same model, using all four measurements. Now, changes in

psychopathology were more effective predictors of PMH than vice versa (Lamers et al., 2015).

Secondary Analysis

The current study will be a secondary analysis based on the study by Lamers et al. (2015). The current study will use the exact same data as used by Lamers et al. (2015), but the current study will only use one time interval (T2 and T3), instead of all available time intervals as used by Lamers et al. (2015) (T0, T1, T2 and T3). Secondly, because of only using one time interval, the current study cannot estimate the predictive effects of all waves all at once like Lamers et al. (2015) did, which is also a difference from the original study. Thirdly, the current study will use more traditional statistical analyses such as Pearson correlations and hierarchical multiple regression models for the analyses instead of the more advanced analysis techniques such as Latent Growth Modelling with an IRT model like Lamers et al. (2015) did. The current study will use different analysis techniques to examine whether using more simple and traditional statistical methods will wield approximately the same results as the original study by Lamers et al. (2015).

The aim for the current study and secondary analysis is to partly examine the same hypothesis as Lamers et al. (2015), but also to answer new hypotheses. It seems useful to partly examine the same hypothesis as Lamers et al. (2015), because not much studies have examined the longitudinal and bidirectional relationship between PMH and psychopathology, and by knowing whether there is a predictive effect from PMH to future psychopathology and from psychopathology to future PMH can help to counteract and prevent psychopathology in the future. Furthermore, the current study can contribute to the existing evidence regarding the Two Continua Model (Westerhof & Keyes, 2009) and contribute to the need of including both symptom reduction and improvement of mental well-being during treatments (Lamers et al., 2015). These treatments can be improved by learning more about how psychopathology and PMH change over time and help to prevent the onset of psychopathology (Kazdin & Blase, 2011; Lamers et al., 2015; Wood & Joseph, 2010). Furthermore, interventions can be better targeted to mental health care if it is clear whether PMH is a stronger predictor of psychopathology or vice versa.

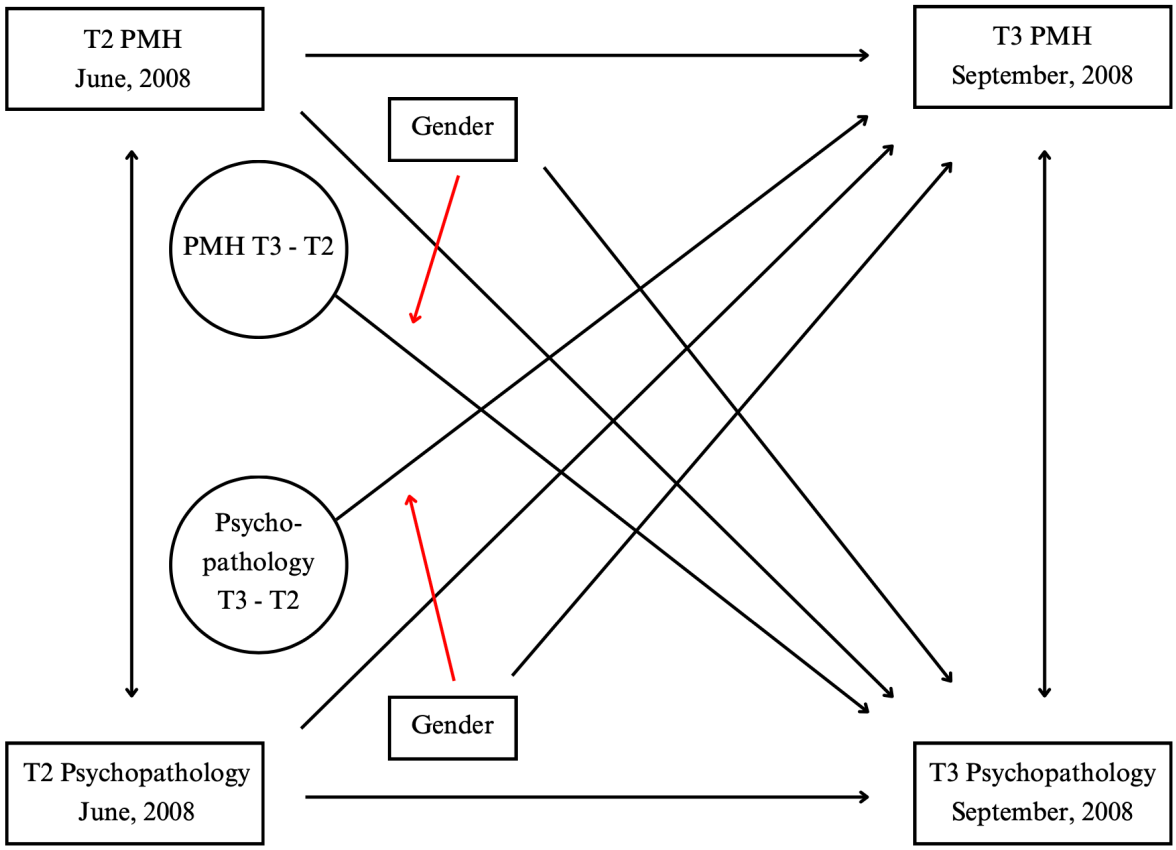
Additionally, Maestre-Miquel et al. (2021) found that it is important to tailor mental health care to gender, but Otten et al. (2021) found that mental health studies often fail to take gender characteristics into account. However, most studies found indicated gender differences regarding prevalence of psychopathology or PMH, or indicated that certain aspects of PMH are more present in one gender than another, or linked to certain aspects such as age. But it

remains unclear whether the predictive effect of changes in PMH on psychopathology and vice versa will differ for females and males, and to the author's knowledge, this relationship has not been examined before. A finding is that, to the author's knowledge, no studies to date exist or were identified that examined if gender plays a role in how PMH and psychopathology influence each other over time. Thus, the current study will explore this potential influence of gender by means of adding gender as moderator to examine if the changes in PMH as predictor for psychopathology and the changes in psychopathology as predictor for PMH are different for males and females. Adding the gender moderation will answer new hypotheses, and is an expansion compared to the original study by Lamers et al. (2015).

A cross-lagged panel design with longitudinal data will be used, see Figure 1. Cross refers to assessing the relationship between two different variables and how they affect each other (Kearney, 2017). Lagged refers to assessing relationships throughout various measurement moments in time which gives insight into the predictive effect as well as the sign or direction of the relationship over time (Kearney, 2017). A longitudinal design can also give insight in if a variable predicts any changes in another variable in the future (Davey, 2021, p. 88).

Figure 1

Cross-Lagged Panel Design



Note. PMH = positive mental health.

Figure 1 shows how PMH at T3 will be predicted by PMH T2, psychopathology T2, changes in psychopathology, gender and the moderator (moderator is indicated with the red arrow from gender to the arrow pointing from the change in psychopathology to PMH T3). Likewise, psychopathology at T3 will be predicted by psychopathology T2, PMH T2, changes in PMH, gender and the moderator (moderator is indicated with the red arrow from gender to the arrow pointing from the change in PMH to psychopathology T3). The concurrent associations between PMH and psychopathology at T2 and PMH and psychopathology at T3 will be assessed with Pearson correlations, as well as predictive correlations between PMH T2 and psychopathology T3, and psychopathology at T2 and PMH at T3.

Based on the literature and study by Lamers et al. (2015), the following research questions are formulated:

1. What is the predictive effect of positive mental health on psychopathology three months later, and what is the predictive effect of psychopathology on positive mental health three months later, among non-clinical Dutch panellists?

2. What is the predictive effect of the changes in positive mental health on psychopathology three months later compared to the predictive effect of the baseline measurement of positive mental health, and what is the predictive effect of the changes in psychopathology on positive mental health three months later compared to the predictive effect of the baseline measurement of psychopathology, among non-clinical Dutch panellists?
3. Is there a difference between males and females regarding the predictive effect of the changes in positive mental health on psychopathology three months later, and is there a difference between males and females regarding the predictive effect of the changes in psychopathology on positive mental health three months later, among non-clinical Dutch panellists?
4. Is the change in positive mental health a better predictor of psychopathology three months later, or is the change in psychopathology a better predictor of positive mental health three months later, among non-clinical Dutch panellists?

For these research questions, the following hypotheses are created:

Hypothesis 1: Psychopathology is a negative predictor of positive mental health three months later.

Hypothesis 2: Positive mental health is a negative predictor of psychopathology three months later.

Hypothesis 3: The change in psychopathology is a stronger predictor of positive mental health three months later than the baseline measurement of psychopathology.

Hypothesis 4: The change in positive mental health is a stronger predictor of psychopathology three months later than the baseline measurement of positive mental health.

Hypothesis 5: The change in psychopathology as predictor of positive mental health three months later is moderated by gender.

Hypothesis 6: The change in positive mental health as predictor of psychopathology three months later is moderated by gender.

Hypothesis 7: The change in positive mental health is a stronger predictor of psychopathology three months later than the change in psychopathology is of positive mental health three months later.

Methods

Participants

For this study, secondary data from CentERdata's LISS panel was used (Centerdata, 2023). CentERdata partnered with Tilburg University in 2022 (Tilburg University, 2022). LISS is an abbreviation of Longitudinal Internet studies for the Social Sciences (Centerdata,

2023), and gathered data via simple random sampling, which falls under the category of probability sampling (Centerdata, 2023). Probability sampling provides that all individuals in the population had an equal opportunity of getting selected for the data collection (Taherdoost, 2016). Families are selected at random from the population register maintained by Centraal Bureau voor de Statistiek (CBS) (Statistics Netherlands), which resulted in the participation of 5000 households and approximately 7500 Dutch panellists in the LISS panel (Centerdata, 2023). LISS differentiates itself as panel by not allowing self-registration and including non-internet users which secures the composition and representativeness of the panel and its data (Centerdata, 2023).

In total, 1356 participants were present in the third (T2) and fourth (T3) wave of the current study, 1234 participants were left after exclusion of missing data from wave three. The final sample consists of 1223 Dutch participants after exclusion of missing data from wave four. From this final sample (N = 1223), about half of the participants were female (51.4%). The age range of the participants is 16 to 88 years old (M = 48.90, SD = 18.20). About half of the participants are married (52.9%), and about a quarter of the participants completed intermediate secondary education (26.7%). The sample characteristics divided by gender can be found in Table 1.

Table 1

Sociodemographic Characteristics of the Participants Divided by Gender

Sample characteristics	Total		Male		Female	
	n	%	*n*	%	*n*	%
Gender			594	48.6%	629	51.4%
Age						
15 – 24 years	134	11.0%	59	9.9%	75	11.9%
25 – 34 years	209	17.1%	94	15.8%	115	18.3%
35 – 44 years	162	13.2%	77	13.0%	85	13.5%
45 – 54 years	184	15.0%	85	14.3%	99	15.7%
55 – 64 years	233	19.1%	124	20.9%	109	17.3%
> 65 years	301	24.6%	155	26.1%	146	23.2%
Civil status						
Married	647	52.9%	337	56.7%	310	49.3%
Separated	5	0.4%	3	0.5%	2	0.3%
Divorced	117	9.6%	54	9.1%	63	10.0%

Widow or widower	90	7.4%	23	3.9%	67	10.7%
Never been married	364	29.8%	177	29.8%	187	29.7%
Level of education						
Primary school	154	12.6%	71	12.0%	83	13.2%
Vmbo	327	26.7%	136	22.9%	191	30.4%
Havo/Vwo	141	11.5%	69	11.6%	72	11.4%
Mbo	249	20.4%	139	23.4%	110	17.5%
Hbo	252	20.6%	124	20.9%	128	20.3%
Wo	100	8.2%	55	9.3%	45	7.2%

Note. Vmbo = intermediate secondary education, havo/vwo = higher secondary education, mbo = intermediate vocational education, hbo = higher vocational education, wo = university.

Materials

Positive Mental Health

The Mental Health Continuum-Short Form (MHC-SF) was created by Keyes due to a need for a more concise self-report measure than the Mental Health Continuum-Long Form (Perugini et al., 2017). The MHC-SF is a self-report questionnaire that assesses mental health and consists of 14 items (Keyes et al., 2008; Perugini et al., 2017). The MHC-SF consists of three subscales, namely emotional well-being, social well-being, and psychological well-being (Perugini et al., 2017). Emotional well-being is measured with items 1 till 3, the scale can be described as positive affect and satisfaction with life (Keyes et al., 2008). An example of an item in this scale is: *During the past month, how often did you feel happy?* Social well-being is measured with items 4 till 8 where there is one item for every individual facet, namely social coherence, social actualisation, social integration, social contribution and social acceptance (Keyes, 1998; Keyes et al., 2008). An example of an item in this scale is: *During the past month, how often did you feel that you had something important to contribute to society?* Psychological well-being is measured with items 9 till 14, with one item for every individual dimension, namely self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life and personal growth (Keyes et al., 2008; Ryff, 1989). An example of an item in this scale is: *During the past month, how often did you feel that your life has a sense of direction or meaning to it?*

A high score on the MHC-SF indicates that an individual is experiencing high levels of mental well-being (Lamers et al., 2015). All 14 items of the MHC-SF are answered on a Likert scale ranging from 0 (*never*) to 5 (*every day*) (Lamers et al., 2015). In the dataset from LISS used for the current study, a score of 0 was not possible, so in the dataset the scores

were ranging from 1 (*never*) to 6 (*every day*). The Dutch version of the MHC-SF is considered to be valid and reliable (Lamers et al., 2012). The Dutch and English version of the MHC-SF, as well as which item measures which dimension (Lamers et al., 2012) have been included in Appendix A.

Psychopathology

The Brief Symptom Inventory (BSI) was created by Derogatis in 1975 (Adawi et al., 2019). The BSI is also a self-report questionnaire and assesses psychological distress and psychopathology, and consists of 53 items (Adawi et al., 2019). The BSI measures nine subscales, namely somatisation, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism (Adawi et al., 2019). These subscales lead up to three indices, namely Global Severity Index (GSI), Positive Symptom Total (PST) and Positive Symptom Distress Index (PSDI) (Adawi et al., 2019). The GSI shows the overall level of distress, the PST shows how many symptoms individuals reported, the PSDI shows the average or mean level of distress (Michel et al., 2024). The GSI was used for the current study.

Examples of items are: *During the past 7 days, how much were you distressed by nervousness or shakiness inside?* and *during the past 7 days, how much were you distressed by feeling afraid to travel on buses, subways, or trains?* (Westerhof & Keyes, 2009). High scores on the BSI indicate high levels of psychopathology and psychological distress (Lamers et al., 2015). All 53 items of the BSI are answered on a Likert scale ranging from 0 (*not at all*) to 4 (*extremely*) (Adawi et al., 2019). In the dataset from LISS used for the current study, the subscales and total scales were already divided into norm scores ranging from 1 (*very low*) to 7 (*very high*) upon receival of the data. The reliability of the Dutch version of the BSI is considered to be good, as well as the test-retest reliability (De Beurs & Zitman, 2005). The Dutch BSI is considered to be an excellent screener for psychopathology in the population (De Beurs & Zitman, 2005). The validity of most scales is supported by the convergent and divergent validity of the Dutch version of the BSI (De Beurs & Zitman, 2005).

Gender

In the questionnaire from the LISS panel, the option was given to identify as either male or female. However, it is important to note that individuals can identify themselves in ways other than just as male or female (Diamond et al., 2011; Matsuno & Budge, 2017), but the questionnaire used in the current study did not take this into account.

Procedure

Participants in the mental health study received a questionnaire with each time three

months in between (LISS panel, 2009a). Wave one of the mental health study took place between December third 2007 and January second in 2008 (T0), wave two took place between March third and March 25th in 2008 (T1), wave three between June second and June 26th in 2008 (T2), wave four between September first and September 30th in 2008 (T3) and wave five between December seven and December 30th in 2009 (T4) (LISS panel, 2009a). Wave five was not incorporated in the current study because the BSI was not measured in that wave. Thus, for the most recent measurements, wave three and four were utilised for the current study (T2 and T3), and wave three (T2) can thus be considered the baseline.

Participants also participate in other studies, which results in panellists being asked to fill out multiple questionnaires every month, which can take a maximum of 30 minutes to complete (Centerdata, 2023). Per completed questionnaire, panellists receive a financial compensation (Centerdata, 2023). In case of no internet connection and/or computer, the LISS panel would provide internet and/or a computer to panellists to avoid exclusion (Centerdata, 2023). One family member per household was chosen to complete mental health questionnaires in one-third of the cases in wave one, two, three and four (Lamers et al. 2015). Written informed consent was gained after the participants had received an exhaustive explanation of the study (Lamers et al. 2015).

Data-Analysis

The IBM Statistical Package for the Social Sciences (SPSS) version 27 for Mac was used to perform the analyses. When the data was received, participants with missing data had already been removed. The total scores of the MHC T2 and T3 variables were available in mean scores (continuous measure), the total scores of the BSI T2 and T3 variables were available as ordinal variables (categorical measure), categorised as 1 (*very low*), 2 (*low*), 3 (*below average*), 4 (*average*), 5 (*above average*), 6 (*high*) and 7 (*very high*). Gender was categorised as 1 (*male*) and 2 (*female*). To prepare the data for analysis, change variables were created for MHC (MHC T3 – MHC T2) and BSI (BSI T3 – BSI T2). These change variables were called delta MHC and delta BSI. Next, the moderator variables were created, which was an interaction effect from gender and delta MHC (gender * delta MHC) and an interaction effect from gender and delta BSI (gender * delta BSI). After these steps, the data was sufficiently prepared for analysis.

Descriptive statistics were used to examine the sociodemographic characteristics of the current sample, total scores were presented, but also the scores divided by gender. The internal consistencies for the MHC at T2 ($\alpha = 0.907$) and T3 ($\alpha = 0.904$) were checked with Cronbach's Alpha, which showed excellent internal consistencies. For the BSI at T2 and T3, a

Cronbach's Alpha analysis was not possible, due to the individual scale items not being available (LISS panel, 2009b). Lamers et al. (2015) did report the Cronbach's Alpha, for the BSI T2 they reported an internal consistency of 0.95, and for the BSI T3 they reported an internal consistency of 0.96, which are also excellent internal consistencies. Pearson correlations were performed between MHC T2, MHC T3, BSI T2, BSI T3 and gender. Pearson correlations between delta MHC and BSI T3 and delta BSI and MHC T3 were performed separately.

Two hierarchical multiple regression models were created with linear regression. MHC at T3 was the dependent variable of the first model. The model consisted of five blocks, each block contained one variable. The variables MHC T2, BSI T2, delta BSI, gender and the moderator (gender * delta BSI) were added in this order as independent variables, one variable per block. R Square Change was consulted to see how much explained variance each variable independently added to the model (De Veaux, Velleman & Bock, 2021, p. 240). The second model was created in the same way, but this time with BSI T3 as dependent variable. Five blocks, with again one variable per block, were created. BSI T2, MHC T2, delta MHC, gender and the moderator (gender * delta MHC) were added in this order as independent variables, and R Square Change was also consulted in this model (De Veaux, Velleman & Bock, 2021, p. 240). While predicting MHC T3, the MHC T2 was included in the model, and while predicting BSI T3, BSI T2 was included in the model. This was done to control for autocorrelation and to prevent incorrect conclusions (Huitema & Laraway, 2006). For both the Pearson correlations and the regression models, the significance level was set at $p < 0.05$, $p < 0.01$ and $p < 0.001$.

After these hierarchical multiple regression models, blocks one and two were run again. Once with only BSI T2 in block two (MHC T2 in block one), and once with only delta BSI in block two to predict MHC T3. Then, blocks one and two were run again, with only MHC T2 in block two (BSI T2 in block one), and once with only delta MHC in block two to predict BSI T3. This was done to compare the beta coefficients directly to determine whether the change in MHC or BSI were better predictors than the baseline measurements (hypothesis three and four).

From both models, the unstandardised residuals and unstandardised predicted values were saved to check the assumptions of multiple regression by means of histograms and scatterplots (De Veaux, Velleman & Bock, 2021, p. 315). Males and females were presented separately in the scatterplots to check for potential patterns within gender (De Veaux, Velleman & Bock, 2021, p. 238), these scatterplots are presented in Appendix B, Figure B1

and Figure B2. The histograms are presented in Appendix C, Figure C1 and Figure C2. Tables from the full results from the model summaries have been included in Appendix D Table D1 and Table D3. The full results from the hierarchical multiple regression models were included in Appendix D, Table D2 and Table D4.

Lastly, two comparison tables were made, one comparison table to compare the effect sizes of the current study to the effect sizes found by Lamers et al. (2015), and one comparison table to compare the explained variances found in the current study to the explained variances found by Lamers et al. (2015). Both comparison tables only included information about the T2 and T3 measurement moments, as the current study only used the T2 and T3 measurements. The effect size comparison table was made by looking at the standardised effect size of MHC T2 in step one, BSI T2 in step two and delta BSI in step three of the first model, and by looking at the standardised effect size of BSI T2 in step one, MHC T2 in step two and delta MHC in step three of the second model of the current study. The found effect sizes from Lamers et al. (2015) were retrieved from Table 1 and Table 2 in their study. From Table 1 the standardised estimates of MHC T2, BSI T2 and Change in BSI T3 - T2 were taken for comparison. And from Table 2 the standardised estimates of BSI T2, MHC T2 and Change in MHC T3 - T2 were taken for comparison, retrieved from the study by Lamers et al. (2015). For the explained variance comparison table, the explained variances were taken from step three from both models (R squared) from the current study. Gender and the moderators were not included, hence the explained variance from step four and five were not included, as Lamers et al. (2015) did also not examine these. From the study from Lamers et al. (2015), the explained variances were taken from Table 1 and Table 2 by looking at the very last row called unexplained variance. Since Lamers et al. (2015) reported the unexplained variance, the explained variance was calculated by subtracting the unexplained variance from 1. For example, 1 – 0.51 = 0.49, equalling 49% explained variance (Lamers et al. (2015).

Results

Assumptions Multiple Regression

The linearity, independence, equal variance and normal population assumptions were assessed by means of histograms and scatterplots (De Veaux, Velleman & Bock, 2021). The scatterplots showed that males and females were randomly scattered in the scatterplot, indicating no patterns. The histograms showed some outliers and one histogram showed a slight left skew or ceiling effect. The Central Limit Theorem (CLT) poses that when the sample size is big enough, the distribution will become nearly normal (De Veaux, Velleman

& Bock, 2021, p. 533). With a sample size of 1223 participants, the slight skewness and outliers will thus not pose major problems. All assumptions were accepted.

Descriptive Statistics

In Table 2, means, standard deviations and correlations are presented. PMH measured with the MHC at T2 (M = 3.93, SD = 0.90) and T3 (M = 3.98, SD = 0.88) indicates that participants in this sample experienced PMH on average two or three times a week. Given the ranges of the MHC at T2 (1.00 – 6.00) and MHC at T3 (1.29 – 6.00), a standard deviation of almost 1.00 indicates variability. Psychopathology measured with the BSI at T2 (M = 3.81, SD = 1.51) and T3 (M = 3.79, SD = 1.49) indicates that participants in this sample experienced psychopathological complaints on a below average, to average level. The category three belongs to below average, although, the scores were close to four, which would be the category of average. The standard deviations present variability in psychopathology given the range of 1 – 7.

Table 2

Descriptive Statistics and Correlations for Positive Mental Health, Psychopathology and Gender

Variable	*M*	*SD*	1	2	3	4	5
1. MHC T2	3.93	0.90	-				
2. MHC T3	3.98	0.88	0.71***	-			
3. BSI T2	3.81	1.51	-0.27***	-0.26***	-		
4. BSI T3	3.79	1.49	-0.25***	-0.31***	0.74***	-	
5. Gender	-	-	0.05	0.04	-0.06*	-0.08**	-

Note. MHC assesses positive mental health (PMH), BSI assesses psychopathology.
* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

The MHC T2 presented a negative concurrent correlation with the BSI T2 (r = -0.27, $p < 0.001$), a negative predictive correlation with the BSI T3 (r = -0.25, $p < 0.001$), and a positive predictive correlation with the MHC T3 (r = 0.71, $p < 0.001$). The BSI T2 presented a negative predictive correlation with the MHC T3 (r = -0.26, $p < 0.001$) and a positive predictive correlation with the BSI T3 (r = 0.74, $p < 0.001$). The BSI T3 presented a negative concurrent correlation with the MHC T3 (r = -0.31, $p < 0.001$). No significant correlations were found between gender and MHC T2 (r = 0.05, p = 0.119) and gender and MHC T3 (r = 0.04, p = 0.136), which was unexpected. Lastly, gender correlated negatively with BSI T2 (r = -0.06, p = 0.050) and gender also correlated negatively with BSI T3 (r = -0.08, p = 0.004), suggesting that females exhibit lower levels of psychopathological symptoms at

T2 and T3 compared to males in this sample. This finding was contradicting to the literature presented in the introduction, as it was mostly found that females experience more psychological distress, and the prevalence of some mental disorders is higher in females. The negative correlations between MHC and BSI were expected, suggesting that these two move in opposite directions as hypothesised. What was striking was that the concurrent correlations were almost as strong as the predictive correlations, this was unexpected.

Additionally, correlations were performed between the delta BSI (change in psychopathology) and MHC T3 and delta MHC (change in PMH) and BSI T3, to examine how strong the uncorrected predictive values were without the baseline dependent variables included in the model (not in Table 2). The results presented a significant negative correlation between delta BSI and MHC T3 (r = -0.06, p = 0.049). Moreover, delta MHC and BSI T3 also significantly and negatively correlated with each other (r = -0.06, p = 0.028). These correlations were, however, remarkably weak, compared to the predictive correlations between MHC T2 and BSI T3, and BSI T2 and MHC T3.

Overall Findings of Both Hierarchical Multiple Regression Models

Firstly, all outcomes where MHC T3 was the outcome or dependent variable were listed in Table 3, and all outcomes where BSI T3 was the outcome or dependent variable were listed in Table 4. The models (Table 3 and Table 4) are listed interchangeably in the results section, and each time it is indicated whether reference is made to Table 3 or Table 4.

From both hierarchical regression models (Table 3 and Table 4), a couple of findings stood out, apart from the findings from the hypotheses. Overall, it was striking that after step one in both hierarchical regression models, all added variables contributed little or nothing at all to the explained variance in MHC T3 and BSI T3, which was unexpected. Some added explained variances were significant, but when solely examining the added explained variance on itself, the added explained variances after step one in both models were very minimal. Also, in step three of the first model (Table 3) when the delta BSI was included, the effect size of the BSI T2 grew, becoming even more negative compared to the effect size of the BSI T2 in step two. This same pattern was also observed in the second model (Table 4) for the MHC T2 when delta MHC was included. These were unusual findings and suggested some interaction between BSI T2 and delta BSI, and between MHC T2 and delta MHC, which could be caused by the delta BSI depending on the values of BSI T2 and T3, and therefore partly explains the same variance as the BSI T2 in the regression model, and the same goes for the delta MHC depending on the values of MHC T2 and T3. Furthermore, a significant association was found in the second model (Table 4) between gender and the BSI T3, which

was also found in the Pearson correlations (Table 2). However, from the literature presented in the introduction, a positive association was expected, meaning that females exhibit more psychopathological complaints, in the current study a minimal but still significant effect size was found, however negative. Suggesting that females exhibit lower levels of psychopathological complaints compared to males in the current sample.

The only findings that were expected in the first model (Table 3), was a high autocorrelation between MHC T2 and MHC T3, which also matched the findings of Table 2, and that the direction of the associations were negative between BSI T2 and MHC T3, and delta BSI and MHC T3 (Table 3). The findings that were expected in the second model (Table 4), was a high autocorrelation between BSI T2 and BSI T3, which was conform the findings of Table 2 again, the direction of the associations being negative again between MHC T2 and BSI T3 and delta MHC and BSI T3, and that gender showed a significant association with BSI T3. However, a positive association was expected, which was not found in the current study. Furthermore, the effect size of gender was very minimal and almost no explained variance was added (Table 4).

Hypothesis 1: Psychopathology is a Negative Predictor of Positive Mental Health Three Months Later

In step two of the first hierarchical multiple regression model, the BSI at T2 was added, see Table 3. The results showed that the BSI at T2 is significantly negatively associated with the MHC at T3 when controlling for the initial level of MHC at T2 ($\beta = -0.077$, $p < 0.001$, $\delta R^2 = 0.005$). However, the effect size was minimal, and the added explained variance was close to zero, which was unexpected. Therefore, hypothesis one was partially accepted, as the p-value was significant, but the effect size was minimal.

Hypothesis 2: Positive Mental Health is a Negative Predictor of Psychopathology Three Months Later

In the second step of the second hierarchical multiple regression model, the MHC T2 was added, see Table 4. The MHC T2 showed a significant negative association with the BSI T3 ($\beta = -0.056$, $p = 0.006$, $\delta R^2 = 0.003$), when controlling for the initial level of the BSI T2. Surprisingly, similarly to the previous model, the effect size was very small and the explained variance almost zero. For this reason, hypothesis two was partially accepted, as the p-value was significant, but the effect size was minimal again.

Hypothesis 3: The Change in Psychopathology is a Stronger Predictor of Positive Mental Health Three Months Later Than the Baseline Measurement of Psychopathology

In order to accept or reject this hypothesis, step two of the first hierarchical multiple

regression model was performed twice to compare the effect sizes of the BSI T2 and the delta BSI on MHC T3 separately. The BSI T2 showed a minimal effect size on the MHC T3 ($\beta = -0.077$, $p < 0.001$, $\delta R^2 = 0.005$), see Table 3. Additionally, the delta BSI showed a significant and negative association with MHC T3, but again, the effect size was minimal and the explained variance almost zero ($\beta = -0.079$, $p < 0.001$, $\delta R^2 = 0.006$) (not in Table 3). The differences between the baseline measurement and the delta were close to zero, and the effect sizes were of almost identical strength, which was unanticipated. Despite the significant association between delta BSI and MHC T3, it cannot be concluded that delta BSI is a stronger predictor than BSI at T2, as the difference between both effect sizes was too minimal. Hence, hypothesis three was rejected.

Hypothesis 4: The Change in Positive Mental Health is a Stronger Predictor of Psychopathology Three Months Later Than the Baseline Measurement of Positive Mental Health

Step two of the second hierarchical multiple regression model was performed twice again, to compare the effect sizes of MHC T2 and delta MHC. The MHC T2 showed a minimal effect size ($\beta = -0.056$, $p = 0.006$, $\delta R^2 = 0.003$), see Table 4. The delta MHC showed a slightly higher significant negative association with the BSI T3 ($\beta = -0.078$, $p = <0.001$, $\delta R^2 = 0.006$) (not in Table 4). However, the effect size of the delta was still very small and the explained variance was close to zero. The differences between the MHC T2 and delta MHC were so small, that it cannot be concluded that delta MHC is a stronger predictor than MHC T2. As a result, hypothesis four was rejected.

Hypothesis 5: The Change in Psychopathology as Predictor of Positive Mental Health Three Months Later is Moderated by Gender

In step five of the first hierarchical multiple regression model, the moderator (gender * delta BSI) was added, see Table 3. Gender did not significantly moderate the relationship between delta BSI and MHC T3, showed a minimal effect size and an explained variance of zero ($\beta = -0.026$, $p = 0.696$, $\delta R^2 = 0.000$). Hypothesis five is therefore rejected.

Hypothesis 6: The Change in Positive Mental Health as Predictor of Psychopathology Three Months Later is Moderated by Gender

In step five of the second hierarchical multiple regression model, the moderator (gender * delta MHC) was added, see Table 4. Gender did also in this model not significantly moderate the relationship between delta MHC and BSI T3, wielded a minimal effect size and added zero explained variance to the model ($\beta = -0.056$, $p = 0.363$, $\delta R^2 = 0.000$), which led to rejecting hypothesis six.

Hypothesis 7: The Change in Positive Mental Health is a Stronger Predictor of Psychopathology Three Months Later Than the Change in Psychopathology is of Positive Mental Health Three Months Later

For this hypothesis, the added explained variance (δR^2) from both models (Table 3 and Table 4) from step two to step three were consulted. In the first model (Table 3), the added explained variance in step two was 0.005, and grew to 0.014 in step three when delta BSI was added. In the second model (Table 4), the added explained variance in step two was 0.003, which grew to 0.012 in step three when delta MHC was added. For both models, the difference in explained variance was only 0.9%. Furthermore, no distinction could be made between an explained variance of 1.4% and 1.2% in terms of a stronger predictor, since both explained variances were almost the same value and were very close to zero. Therefore, hypothesis seven is rejected, as both models were highly identical.

Table 3

Hierarchical Multiple Regression Results for Positive Mental Health T3

Step	Variable	β	*t*	*p*	R^2	δR^2	δF	*p* δF
1	MHC T2 BSI T2 Delta BSI Gender Moderator (gender * delta BSI)	0.706	34.830	<0.001	0.498	0.498	1213.121	<0.001
2	MHC T2 BSI T2 Delta BSI Gender Moderator (gender * delta BSI)	0.685 -0.077	32.698 -3.668	<0.001 <0.001	0.504	0.005	13.456	<0.001
3	MHC T2 BSI T2 Delta BSI Gender	0.676 -0.127 -0.126	32.572 -5.673 -5.839	<0.001 <0.001 <0.001	0.517	0.014	34.098	<0.001

	Moderator (gender * delta BSI)							
4	MHC T2	0.675	32.546	<0.001				
	BSI T2	-0.127	-5.656	<0.001				
	Delta BSI	-0.126	-5.824	<0.001				
	Gender	0.001	0.053	0.957	0.517	0.000	0.003	0.957
	Moderator (gender * delta BSI)							
5	MHC T2	0.675	32.532	<0.001				
	BSI T2	-0.127	-5.649	<0.001				
	Delta BSI	-0.101	-1.524	0.128				
	Gender	0.001	0.049	0.961				
	Moderator (gender * delta BSI)	-0.026	-0.390	0.696	0.517	0.000	0.152	0.696

Note. MHC assesses positive mental health (PMH), BSI assesses psychopathology, delta implies any change in psychopathology, δR^2 = R Square Change, δF = F Change, $p\ \delta F$ = Significant F Change.

Note. Final model: $F(5, 1217) = 260.968$, $p < 0.001$.

Table 4

Hierarchical Multiple Regression Results for Psychopathology T3

Step	Variable	β	*t*	*p*	R^2	δR^2	δF	$p\ \delta F$
1	BSI T2	0.737	38.158	<0.001	0.544	0.544	1456.037	<0.001
	MHC T2							
	Delta MHC							
	Gender							
	Moderator (gender * delta MHC)							
2	BSI T2	0.722	36.074	<0.001				
	MHC T2	-0.056	-2.776	0.006	0.547	0.003	7.705	0.006

	Delta MHC Gender Moderator (gender * delta MHC)							
3	BSI T2	0.710	35.750	<0.001				
	MHC T2	-0.109	-5.018	<0.001				
	Delta MHC	-0.123	-5.839	<0.001	0.559	0.012	34.098	<0.001
	Gender Moderator (gender * delta MHC)							
4	BSI T2	0.709	35.670	<0.001				
	MHC T2	-0.108	-4.957	<0.001				
	Delta MHC	-0.122	-5.824	<0.001				
	Gender	-0.038	-1.981	0.048	0.561	0.001	3.926	0.048
	Moderator (gender * delta MHC)							
5	BSI T2	0.708	35.637	<0.001				
	MHC T2	-0.107	-4.913	<0.001				
	Delta MHC	-0.069	-1.104	0.270				
	Gender	-0.037	-1.915	0.056				
	Moderator	-0.056	-0.910	0.363	0.561	0.000	0.827	0.363
	(gender * delta MHC)							

Note. MHC assesses positive mental health (PMH), BSI assesses psychopathology, delta implies any change in PMH, δR^2 = R Square Change, δF = F Change, $p\ \delta F$ = Significant F Change.

Note. Final model: $F(5, 1217) = 310.801$, $p < 0.001$.

Comparison to the Original Study

Since the current study was a secondary analysis based on the original study by Lamers et al. (2015), it seemed interesting to compare the found results of the current study to the results found by Lamers et al. (2015). The comparison of the found effect sizes are

presented in Table 5, while the comparison of the found explained variances are presented in Table 6.

Regarding the found autocorrelations between MHC T2 and MHC T3 and between BSI T2 and BSI T3, the results seem approximately similar to each other, although it seems that a slightly stronger autocorrelation was found in the current study between MHC T2 and MHC T3. Aside from this, only differences were found between the effect sizes of the two studies. The effect sizes found in the current study for BSI T2 and delta BSI while predicting MHC T3, and MHC T2 and delta MHC while predicting BSI T3, were despite being significant, very minimal. When these results were compared to Lamers et al. (2015), it was found that they found bigger effect sizes, and that the differences between the current study's results and Lamers et al. (2015) are quite large (Table 5).

Table 5

Comparison Between the Standardised Effect Sizes of the Current Study and Lamers et al. (2015)

	Found standardised effect size	
	Current study	Lamers et al. (2015)
Predicting MHC T3		
MHC T2	0.706	0.63
BSI T2	-0.077	-0.13
Delta BSI	-0.126	-0.27
Predicting BSI T3		
BSI T2	0.737	0.73
MHC T2	-0.056	-0.11
Delta MHC	-0.123	-0.26

Note. MHC assesses positive mental health (PMH), BSI assesses psychopathology, delta implies any change in PMH or psychopathology.

Regarding the found explained variances it was found that Lamers et al. (2015) found a clearer difference between their models, compared to the current study, in which the differences in explained variance found were smaller. In the current study, a difference of approximately 4% was found between both regression models, while Lamers et al. (2015) found a difference of 12% between both models (Table 6). What also was striking in the current study, was that the baseline measurement of the dependent variable explained almost all of the variance in the dependent variable (Table 3 and Table 4). While Lamers et al. (2015)

reported that all three variables (BSI, MHC and change in MHC or change in BSI) contributed to the found explained variance in the dependent variable.

Table 6

Comparison Between the Explained Variances of the Current Study and Lamers et al. (2015)

	Found explained variance	
	Current study	Lamers et al. (2015)
Predicting MHC T3		
MHC T2, BSI T2 and delta BSI	51.7%	49%
Predicting BSI T3		
BSI T2, MHC T2 and delta MHC	55.9%	61%

Note. MHC assesses positive mental health (PMH), BSI assesses psychopathology, delta implies any change in PMH or psychopathology.

Discussion

The current study investigated the longitudinal bidirectional relationship between PMH and psychopathology three months later, within a representative sample of the Dutch population ($N = 1223$), while looking at both the baseline measurement of the predictor and the change in the predictor between both waves. It was also examined which change in the predictor (PMH or psychopathology) was the better predictor overall. The current study was a secondary analysis based on the original study by Lamers et al. (2015). A secondary analysis was done to partly examine the same hypothesis as Lamers et al. (2015), but where they examined predictive effects from all four waves, the current study only examined the predictive effect from wave three and four, with the same data, but with different analysis techniques. Lastly, it was examined whether the predictive effect of the changes in PMH and psychopathology was different for males than for females by means of examining two moderators. The gender moderation was added to answer new hypotheses, and is an expansion compared to the original study by Lamers et al. (2015). To the author's knowledge, these specific hypotheses have never been examined before to date.

The results of the current study showed that there was a significant but negligible bidirectional relationship between PMH and psychopathology three months later, for both the baseline measurement (hypothesis one and two) and the change in the predictor between both waves (hypothesis three and four). The results showed no clear differences in terms of a better predictor, due to the changes being negligible predictors (hypothesis seven). Furthermore, no significant difference was found in the predictive effect from the changes in the predictors between males and females (hypothesis five and six). A caveat is that in the correlations, a

predictive effect was found from PMH to psychopathology three months later, and from psychopathology to PMH three months later. These predictive effects did, however, not remain in the regression models, in which the baseline measurements were corrected. The predictive effects of PMH and psychopathology were significant in the regression models, but the associations were negligible. Furthermore, a significant, however, negligible correlation was found between gender and psychopathology three months later, and this negligible effect remained significant in the regression model. However, a positive association was expected in both the correlations and the regression model, but a negative association was found instead. Finally, the correlations between PMH and psychopathology from wave three, and between PMH and psychopathology from wave four wielded similar results compared to the predictive correlations between PMH wave three and psychopathology wave four, and psychopathology wave three and PMH wave four.

The finding that changes in PMH and psychopathology as a predictive effect did not differ for males and females, might mean that the protective effect from a high or moderate level of PMH (Burns et al., 2022; Santini et al., 2022) might work the same for males and females. Furthermore, this may mean that when males and females experience a decrease in psychopathological complaints, this might result in an equally large increase in PMH for both genders. It may also imply that a decrease in PMH will result in an equally large increase in psychopathological complaints for both males and females. This could lead to the conclusion that a decrease in PMH is an equally strong predictor of future psychopathology for both genders. In order to prevent an increase in psychopathology, it seems important that both males and females have equal access to mental health promotion and prevention programs. However, the question arises whether males and females access mental health promotion and prevention in an equal way.

Sharp et al. (2022) indicated that mental health promotion for males should be better directed, and that more should be learned about male standards, such as masculinity, and about how males can participate in mental health promotion. Males can be perceived as being powerful or robust (Moynihan, 1998) which could hinder their access to mental health promotion or prevention. But this does not seem to be the only factor that seems to hinder males from mental health promotion or prevention. Sharp et al. (2022) indicated that social environment and the role of gender frequently hinders the chance for males to talk about mental health. Furthermore, shame was found as a factor which hindered access to the GP for males regarding mental health problems (Doherty & Kartalova-O'Doherty, 2009). There was a seven times smaller chance that males who indicated shame would contact their GP

compared to males that did not indicate shame (Doherty & Kartalova-O'Doherty, 2009). This perceived shame could tie in with the idea that mental health in general is perceived as a highly stigmatising subject, which could hinder the access of males even further (Sharp et al., 2022). According to the findings of the current study, it seems helpful that access to mental health promotion and prevention is equal for both genders. Moreover, it seems important to learn more about what is needed for males to engage more in mental health promotion and prevention.

However, the finding that there was a significant but negligible bidirectional relationship between PMH and psychopathology three months later, for both the baseline measurement, as well as the change in the predictor between both waves, while controlling for the baseline measurements, is contradictory to the findings of Lamers et al. (2015) (Table 5). Although, the finding that psychopathology was not a significant predictor of PMH is consistent with the study by Margraf et al. (2020), who found that psychopathology was not a significant predictor of PMH 17 months later in non-clinical populations across three different countries. However, this same study did find that PMH was a significant predictor of psychopathology 17 months later, which contradicts the current study again. Not only the studies by Lamers et al. (2015) and Margraf et al. (2020) contradict the findings of the current study. In fact, it was striking that almost no studies could be identified that confirm the current findings, and many studies that refute the current findings. Several studies found that psychopathology was a predictor of PMH (Eack & Newhill, 2007; Hansson, 2006; Seow et al., 2016; Zatzick et al., 1997), and several studies found that PMH or flourishing was a predictor of psychopathology (Burns et al., 2022; Grant et al., 2013; Keyes et al., 2010; Margraf et al., 2020; Santini et al., 2022; Schotanus-Dijkstra et al., 2016; Schotanus-Dijkstra et al., 2019; Wood & Joseph, 2010).

In addition, Lamers et al. (2015), the original study where the current secondary analysis was based upon, found a significant bidirectional relationship between PMH and psychopathology, as well as that the changes in both PMH and psychopathology were persistently better predictors compared to the pre-measurements over a period of nine months as a whole, but also in intervals of three months. In addition, Keyes et al. (2010) found that individuals whose PMH changed to a lower level, for example from flourishing or moderate PMH to languishing, were more likely to experience a mental illness in the future. In the specific example of PMH decreasing from flourishing or moderate PMH to languishing, individuals were expected to be up to eight times more prone to have a mental illness 10 years later compared to individuals who remained flourishing (Keyes et al., 2010). Whereas in the

current study, the changes in both PMH and psychopathology wielded significant, but negligible results, which is contradicting. Moreover, the current study found weak correlations between PMH and psychopathology in wave three and PMH and psychopathology in wave four compared to other literature (Cendejas, 2022; De Vos et al., 2018). Compared to De Vos et al. (2018), the correlations found in the current study between PMH and psychopathology in wave three and PMH and psychopathology in wave four were around 0.40 weaker, and compared to the study of Cendejas (2022), the correlations found in the current study were around 0.16 and 0.28 weaker. All these studies are very contradictory to the findings of the current study.

Another contradiction was found when a significant association emerged in the current study between gender and psychopathology three months later. Despite being significant, the association on itself was negligible, however, it is notable that the association found was negative, suggesting that females in the current study exhibit lower levels of psychopathology compared to males. This is contradicting with findings from other studies, which reported that females seem to experience more psychological distress, and that some mental disorders manifest more in females (American Psychiatric Association, 2013; Davey, 2021, p. 239; Davey, 2021, p. 373; Eaton et al., 2012; Fonseca et al., 2023; Gove, 1984; Jacobi et al., 2014; Klose & Jacobi, 2004; Maestre-Miquel et al., 2021; Masood et al., 2016; Matud et al., 2014; Rijksinstituut voor Volksgezondheid en Milieu, 2024; World Health Organisation, 2024c).

A plausible explanation for the large difference found between existing literature and the current study could be the duration of the current study. What was striking about a large number of studies was a considerable difference in duration compared to the current study. The time intervals used in some studies were one year (Grant et al., 2013), between 12 and 16 months (Santini et al., 2022), 17 months (Margraf et al., 2020), three years (Schotanus-Dijkstra et al., 2016), four years (Burns et al., 2022), 10 years (Keyes et al., 2010; Wood & Joseph, 2010), and in waves from 2007 to 2009, 2010 to 2012, and 2013 to 2015 (Schotanus-Dijkstra et al., 2019). With the study of Lamers et al. (2015) being an exception, who estimated their predictive effects over a period of nine months but also in intervals of three months. Also, most studies seemed to have reported their corrected predictive effects, meaning they controlled for previous measurements of the outcome (Grant et al., 2013; Margraf et al., 2020; Santini et al., 2022; Schotanus-Dijkstra et al., 2016; Schotanus-Dijkstra et al., 2019; Wood & Joseph, 2010). Only for the studies by Burns et al. (2022) and Keyes et al. (2010) it is not entirely clear whether they controlled for the previous measurements of the outcome. Burns et al. (2022) controlled for mental health status, but it is not entirely clear if

that means that they controlled for the baseline of anxiety and depression, and Keyes et al. (2010) wrote that they controlled for confounding variables, although it is not entirely clear if this means they controlled for their baseline measurements. Nevertheless, all the other mentioned studies had a much larger time interval in common compared to the current study, and, except for Lamers et al. (2015), no studies were identified that used the same three-month time interval as the current study. Given that no studies were identified that used this same time interval, except for Lamers et al. (2015), it seems useful to consider how stable the questionnaires were that measured PMH and psychopathology in the current study, since this stability could provide an explanation as to why most studies chose for a longer time path when examining PMH or psychopathology as a predictor.

Lamers et al. (2012) investigated the longitudinal psychometric properties of the MHC-SF with a sample from the LISS panel, and found that both the individual items and the subscales were stable over time. This finding suggests good reliability of the MHC-SF questionnaire, but more importantly, that there is not much change in MHC scores in the general (non-clinical) Dutch population (Lamers et al., 2012). A study on the psychometric properties of the BSI questionnaire by De Beurs and Zitman (2005) found that the test-retest reliability of the BSI was good in the Dutch population, and Drobnjak (2020) found that the BSI can be used in longitudinal studies, suggesting stability of the scores over time. However, the BSI scores are receptive to psychological treatment (De Beurs & Zitman, 2005), but this does not apply to the non-clinical sample of the current study. These studies indicate the stability of the MHC-SF and BSI questionnaires, or PMH and psychopathology, over time (De Beurs & Zitman, 2005; Drobnjak, 2020; Lamers et al., 2012), and this explains why most studies, except for Lamers et al. (2015), have looked at a longer time period to discover a predictive effect, and why the current study failed to find this effect.

Another explanatory factor for the current study's results may be the occurrence of stressful life events (SLEs), which are major events with often great consequences (Tibubos et al., 2020). SLEs can be divided into normative and non-normative SLEs (Wrzus et al., 2013), with the former generally occurring more frequently, while the latter is less frequent (Filip, 1995 as cited in Tibubos et al., 2020). Normative SLEs include expected events, like reaching puberty, a relocation, parenting, getting married, starting a first official job, retiring, or the death of one's parents, which will or may happen to everyone at a certain age or stage of life (Tibubos et al., 2020). Non-normative SLEs are often unexpected and can occur at any age, such as becoming unemployed, a divorce, or (sudden) death of a spouse (Tibubos et al., 2020). SLEs were found to be predictors of future depression and anxiety (Tibubos et al.,

2020), and changes in PMH over time were strongly predicted by occupational and traumatizing incidents (Chilver et al., 2023). However, the greatest stressful life events such as the death of a spouse or family member, or being sentenced to prison, were weakly or not at all related to mental health (Tibubos et al., 2020). An explanation is that health behaviours and coping can mediate the relationship between SLEs and health (Schwarzer & Schulz, 2003), which may mean that individuals can reduce the impact of SLEs on their mental health. Moreover, SLEs have a greater impact on psychopathology in females (Armstrong et al., 2018), which may mean that males suffer less from SLEs once they are also suffering from psychopathology. Another explanation is cognitive reappraisal, which can also alleviate negative emotions by reframing situations as less stressful than they actually are (Lazarus & Alfert, 1964 as cited in Gross & John, 2003). In conclusion this means that SLEs are rare and will never occur in a large group of individuals at the same time, and SLEs do not even always have to have a big impact on individuals due to, among other things, coping mechanisms, which might be an explanatory factor for not finding bigger predictive effects for the changes in PMH and psychopathology in the current study.

Furthermore, PMH three months earlier was added as a predictor of PMH three months later, and the same applies to the predictor for psychopathology. The baseline measurements were included because this is how cross-lagged panel models are constructed (Hamaker et al., 2015), however, by including them, all explained variance was explained by these baseline measurements, and this left little room for other predictors to explain any variance. Moreover, including the baseline measurements caused the current study to only examine the predictive effect on what changed over the course of only three months between both waves. When it is taken into account that PMH and psychopathology are two stable constructs over time (De Beurs & Zitman, 2005; Drobnjak, 2020; Lamers et al., 2012), the found results in the current study are not as unexpected anymore. It might be that negligible changes occurred in these three months, which also poses an explanation for the identical concurrent correlations of PMH and psychopathology compared to the predictive correlations.

However, it remains unclear why the concurrent correlations were weak in the current study, compared to other literature (Cendejas, 2022; De Vos et al., 2018). What stood out was that De Vos et al. (2018) only looked at females in a clinical sample, with a lower average age than in the current study, and specifically eating disorders as pathology. In the study by Cendejas (2022) a lower average age was also found, the majority of the sample concerned females but it was a non-clinical sample, where depression and anxiety were examined as pathologies. It is unlikely that the different sample characteristics in the current study are

responsible for finding much weaker correlations. It remains rather unclear as to why the correlations in the current study were weak, which raises additional questions. A statistical explanation could be that a categorical variable (BSI, measure of psychopathology) was used in a correlation meant for numerical variables (Aggarwal & Ranganathan, 2017), although it is unclear if this is the real cause.

Nevertheless, the stability of the MHC-SF and BSI questionnaires, and the potential absence of SLEs still do not explain why Lamers et al. (2015) were able to find a significant longitudinal bidirectional relationship between PMH and psychopathology, as well as for the changes, over the course of three months. It seems useful to critically compare the current study and the study by Lamers et al. (2015), to see what could possibly explain these differences. A number of differences between the current study and Lamers et al. (2015) were found. First of all, Lamers et al. (2015) examined all predictive effects from all available waves from the mental health study by the LISS panel, while the current study only used one time interval (wave three and four). So, Lamers et al. (2015) captured the predictive effects of PMH on psychopathology and vice versa, as well as the changes, from the very baseline of the study, until the last measurement. The current study only used the last two waves, and therefore misses the fact that the measurements taken here as baseline (wave three), were actually explained by the measurements before that (wave one and two) and also by the changes between those waves. The current study did not take this into account, and by only taking a small part of the mental health study by the LISS panel, the current study does not grasp the entire picture.

Secondly, Lamers et al. (2015) reported that 50.8% of the respondents in their sample responded to all four of the waves. Their total sample size was 1932 respondents, and they indicated that at baseline (T0) 1662 participants responded, at T1 1675 participants responded, at T2 1243 participants responded and at T3 1466 participants responded. The sample size of 1932 participants is bigger than the present participants at the individual waves, suggesting that Lamers et al. (2015) might have been able to work with missing values. It is not entirely clear if Lamers et al. (2015) worked with missing values or not, but they reported that it is more manageable for IRT models to handle missing values. Nevertheless, their sample size of 1932 participants is bigger than the current study, with 1223 participants, although it seems unlikely that this difference between the two studies led to such different findings in the current study.

Thirdly, it is suspected that Lamers et al. (2015) not only had the individual items of the MHC-SF, just like in the current study, but that they also had access to the individual

items of the BSI questionnaire, and maybe even the raw scores instead of the norm scores. This is suspected because Lamers et al. (2015) were able to calculate the Cronbach's Alpha for the BSI for all waves, and for that, all items of the questionnaire or scale are needed. Additionally, it was found that another study by Westerhof and Keyes (2009), calculated a mean score over the BSI, where raw scores would also be needed in order to do this. The current study only had access to the total score of the BSI in the dataset. Furthermore, for the MHC-SF and the BSI questionnaires, the current study only had access to mean scores regarding the total scores, which means that relevant information was already lost when the dataset was received. For the BSI questionnaire, this process of information loss went even one step further. The BSI total scale was only available in norm scores ranging from 1 to 7. To decide in what category an individual falls regarding these norm scores or categories, the mean score, or standardised score, on the total scale is consulted. This means that for the BSI questionnaire, twice as much information was lost, resulting in less precise estimation in the current study. This might be the case, because the BSI questionnaire is prohibited from publication (LISS panel, 2009b), which might mean that individual items and raw scores were not allowed to be in the dataset for the general public. Working with norm scores in the current study may have biased the results, especially since it is recommended to work with continuous variables in regression analysis and not categorical ones (De Veaux, Velleman & Bock, 2021, p. 242).

Fourthly, differences were found regarding the statistical methods used in both studies. The current study used more traditional methods, while Lamers et al. (2015) used more advanced methods to estimate their effects. Regression analysis can predict the value of the outcome variable by the value of an observed value (De Veaux, Velleman & Bock, 2021, p. 227), meaning that psychopathology or PMH can be predicted by regression based on an earlier measurement. But in the regression analysis in the current study, only the total scales were used to predict one by the other, and both total scales were affected by information loss, which might have led to less precise estimation. Furthermore, according to Duncan et al. (2006) measuring change can be quite challenging. Latent Growth Models or Latent Growth Curve Models, take into account individual development, the differences between the development of individuals longitudinally, but also development at group level (Duncan et al., 2006). In addition, Latent Growth Models are also able to analyse which factors influence the development, and which variables are most important in this (Duncan et al., 2006). This suggests that Latent Growth Models, as used by Lamers et al. (2015) are a very good way to measure change or growth over time. While regression analysis might be able to predict

variables, it might be that regression is not necessarily good at estimating change or growth over time.

Furthermore, Lamers et al. (2015) used an IRT model. IRT models relate to a set of mathematical models that describe the relationship between latent traits, such as characteristics that are not observable, and their outcomes (Columbia University Mailman School of Public Health, 2024). A connection then is being created between the characteristics of a questionnaire's items, individuals or participants responding or answering the items, and the actual measured characteristic or trait (Columbia University Mailman School of Public Health, 2024). IRT models take the idea that latent traits, for example stress, and the test items are arranged on an "unobservable continuum" (Columbia University Mailman School of Public Health, 2024). Determining the individual's place on that continuum is the primary goal of IRT models (Columbia University Mailman School of Public Health, 2024). Furthermore, it was found that instead of the total scale being the unit of analysis, in IRT models, the individual items are the unit of analysis (Columbia University Mailman School of Public Health, 2024). So, instead of examining the questionnaires as a whole, it seems IRT models can examine more in detail where an individual is positioned on a continuum based on their item scores (Columbia University Mailman School of Public Health, 2024). A combination of these two methods leads to a statistical method which is not only good at estimating change or growth (Duncan et al., 2006), but also allows for very precise estimation regarding where individuals are on the continuum of PMH and the continuum of psychopathology (Columbia University Mailman School of Public Health, 2024). Furthermore, Lamers et al. (2015) indicated that IRT models allow for estimation that is more exact and shows reduced bias.

To conclude, it remains unclear what exactly explains the different findings in the current study compared to Lamers et al. (2015), although it seems likely that the current study obtained different results due to information loss on both the MHC-SF and BSI questionnaires and due to the chosen statistical model. The study duration may also have played a role regarding the different findings.

Strengths & Limitations

A strength of the current study is the large sample size which was created by simple random sampling, a probability sampling technique (Centerdata, 2023), which ensures that the sample provides a representative picture of the Dutch population because the chance of entering the study was equal for everyone in The Netherlands (Taherdoost, 2016). The combination of the sample size and probability sampling technique also allow for good

generalisability of the results. Moreover, because the data was already collected (secondary data) and still available, this study did not require any additional effort and time from the participants. Lastly, this study used sufficiently reliable and valid measuring instruments. Nevertheless, it is also important to point out the limitations of the current study.

The sample size was, aside from a strength, also a limitation, because predictors were significant more quickly (Lantz, 2012; Tibubos et al., 2020) even though the found effects were actually negligible, and would probably not have been significant in a smaller sample. This is also called a type one error (De Veaux, Velleman & Bock, 2021, p. 607). Despite the negative associations found, it was a bit meaningless to conclude that when PMH became higher, psychopathology became lower or vice versa since the changes were too small, which might have been the result of the three-month interval of the current study. The study duration combined with the chosen statistical analyses and loss of information from the PMH and psychopathology questionnaires present some limitations, which might have influenced the overall findings of the current study. Moreover, the current study only used two waves from the mental health study by the LISS panel instead of all waves. By looking at only this specific interval, wrong conclusions can be drawn, and it can be harder to provide answers to the research questions and hypotheses, because the current study did not include the whole mental health study. An example of drawing the wrong conclusion is that if Lamers et al. (2015) would have based their conclusions solely on the predictive effects of wave three and four, they could have concluded that there was no difference regarding the predictive effect of the change in PMH and psychopathology. However, when they did consult all waves in one model, they were able to draw the conclusion that changes in psychopathology were the better predictor (Lamers et al., 2015), but they would have missed this important insight if they only examined the wave three and four interval.

Furthermore, the data used in the current study originate from 2008, which is a limitation because the current study lacks up-to-date information. Moreover, there are more ways for an individual to identify themselves than just as male or female (Diamond et al., 2011; Matsuno & Budge, 2017), which may have influenced the results. In addition, Hamaker et al. (2015) indicated that there are limitations to the cross-lagged panel model as used in the current study, especially with only two measurement moments, because the model might always fit perfectly then. Another limitation might be that the current study did not use Hayes' PROCESS macro tool to examine the moderators (Hayes, 2013). Hayes' PROCESS macro tool is a more advanced commonly used tool for SPSS, SAS and R for examining mediators and moderators (Hayes & Rockwood, 2017; SPSS analysis, 2024), which provides

outcomes that are robust and reliable by using bootstrapping (SPSS analysis, 2024). Although, one caveat is that the found associations were so small in the current study, that it is debatable whether Hayes' PROCESS macro tool would have found much better results regarding the moderators. Finally, self-report questionnaires as used in the current study may be susceptible to bias, such as socially desirability, poor self-insight or the individual presenting oneself differently (Atkinson et al., 1997; Luteijn & Barelds, 2019, p. 107; Van de Mortel, 2008).

Implications

The findings of the current study have both theoretical and practical implications. The theoretical implication is that the current study did not contribute to the existing evidence of the Two Continua Model (Westerhof & Keyes, 2009). The current study provided evidence for the separateness of PMH and psychopathology, but falls short in proving the relatedness of these dimensions (Westerhof & Keyes, 2009). Furthermore, the current study proved the stability of PMH and psychopathology over a period of three months, despite this not being the initial goal. It seems that the study duration, the loss of information regarding the MHC-SF and BSI questionnaires, and the chosen statistical model obscured the predictive effects in the current study, which were uncovered in the study by Lamers et al. (2015). It was found that statistical models can have an impact on the findings and drawn conclusions (Muniz-Terrera et al., 2016). It seems of upmost importance to choose the statistical models carefully, and critically examining what data is available and in what way (item/total scores, mean/norm scores or raw scores, continuous/categorical measure) is incredibly important for the outcomes of a study, and that by choosing the wrong or less fitting statistical techniques or models, important effects or patterns may remain undiscovered.

The practical implications for the current study are more difficult to estimate due to the study's duration, the loss of information and the chosen statistical model. The current study actually shows that for clinical practice, preventive measures and mental health promotion might not be that helpful, because developing psychopathology might still happen despite a high PMH. However, because of the findings by Lamers et al. (2015), it is known that the longitudinal bidirectional relationship, and the effects of the changes, remained undiscovered in the current study, and it is known from literature that prevention and mental health promotion is effective and helpful (Kalra et al., 2012; Keyes et al., 2010; Lawrie et al., 2019; Singh et al., 2022). What might be an implication for clinical practice is that the protective effect of PMH or flourishing (Schotanus-Dijkstra et al., 2016; Schotanus-Dijkstra et al., 2019) works the same for males and females, which indicates increasing PMH would be

equally beneficial and important for both males and females. Furthermore, it was found that a decrease in PMH seems to lead to an equally large increase in psychopathology for both males and females, and thus, an implication might be that the access to mental health promotion and prevention should be equal for both genders.

Future Recommendations

The main recommendation is to overcome the limitations of the current study. It is recommended to investigate the longitudinal bidirectional relationship between PMH and psychopathology over a longer time period, with a recommendation of around a year or longer. A shorter study duration can also be chosen, but in both situations, it is recommended to pay very close attention to the statistical techniques chosen and to the available data when using secondary data. Next to paying close attention to the statistical techniques, another recommendation is to use more sophisticated statistical methods, like Latent Growth Modelling with an IRT model as used by Lamers et al. (2015), because more sophisticated statistical methods appear to have benefits over more traditional methods, because otherwise patterns in the data that are actually present may be missed, like in the current study.

It is also recommended to use newer data, which takes individuals that identify as non-binary into account, because those individuals have a significant risk of mental health problems, partly because our current society is geared towards solely males and females (Matsuno & Budge, 2017). Taking this group into account can enrich the current knowledge. In addition, a post-hoc recommendation for the current study could have been to look at a smaller group within this large sample. If a smaller group could be identified in which, for example, SLEs occurred, it could have been interesting to examine whether a high PMH at the beginning would have had a protective effect on this group against psychopathology later in time. And if that group is very small, semi-structured interviews could even be considered to deepen the knowledge, ask follow-up questions and overcome the issues that occur when solely relying on self-report measures (Atkinson et al., 1997; Luteijn & Barelds, 2019, p. 107; Van de Mortel, 2008). Relevant observations and impressions of the participants can also be added to create a more in-depth picture.

Another recommendation is, given that the BSI is a very broad measurement instrument, to examine the longitudinal bidirectional relationship between PMH and depression and between PMH and anxiety, because these two are the most prevalent disorders (Hilderink et al., 2020; World Health Organisation, 2022a; World Health Organisation, 2024c). Depression could be measured with the Beck Depression Inventory (BDI) because this questionnaire has good reliability and validity (Wang & Gorenstein, 2013), and anxiety

could be measured with the General Anxiety Disorder 7-Item Scale (GAD-7), because of its good reliability, validity and high internal consistency (Johnson et al., 2019). Other valid questionnaires with good psychometric properties would also be applicable. The longitudinal bidirectional relationship between MHC-SF and the BDI, and between MHC-SF and the GAD-7 could then be examined. In addition, the subscales of the MHC-SF could be included, which was not done in the current study. It can be examined whether changes in MHC-SF, BDI or GAD-7 are better predictors than the pre-measurements, and whether there is a difference between the predictive effect of emotional, social and psychological well-being on depression and anxiety and vice versa. This can make the current knowledge more specific than when using a broader screening instrument like the BSI. For all these recommendations, carefully considering the study duration, statistical methods and models and available data apply.

Conclusion

Although the expected longitudinal bidirectional relationship between PMH and psychopathology among non-clinical Dutch panellists within three months was found, this relationship was actually negligible and no differences for males and females were found. Evidence emerged for the separateness of PMH and psychopathology, while the current study failed to uncover the relatedness as suggested by the Two Continua Model. The original study by Lamers et al. (2015) did find the longitudinal bidirectional relationship between PMH and psychopathology, even over the course of three months, which remained undiscovered in the current secondary analysis. This emphasises the need to critically consider the duration of the study, the statistical methods used, and the available data. Future research is to overcome the shortcomings of the current study, and should, aside from other recommendations, consider using more advanced statistical methods such as Latent Growth Modelling with an IRT model, when examining the longitudinal bidirectional relationship between PMH and psychopathology in a large non-clinical sample.

References

Adawi, M., Zerbetto, R., Re, T. S., Bisharat, B., Mahamid, M., Amital, H., Del Puente, G., & Bragazzi, N. L. (2019). Psychometric properties of the Brief Symptom Inventory in nomophobic subjects: insights from preliminary confirmatory factor, exploratory factor, and clustering analyses in a sample of healthy Italian volunteers. *Psychology Research and Behavior Management*, *Volume 12*, 145–154. https://doi.org/10.2147/prbm.s173282

Aggarwal, R., & Ranganathan, P. (2017). Common pitfalls in statistical analysis: Linear regression analysis. *Perspectives in Clinical Research*, *8*(2), 100. https://doi.org/10.4103/2229-3485.203040

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Armstrong, J. L., Ronzitti, S., Hoff, R. A., & Potenza, M. N. (2018). Gender moderates the relationship between stressful life events and psychopathology: Findings from a national study. *Journal of Psychiatric Research*, *107*, 34–41. https://doi.org/10.1016/j.jpsychires.2018.09.012

Atkinson, M., Zibin, S., & Chuang, H. (1997). Characterizing quality of life among patients with chronic mental illness: a critical examination of the self-report methodology. *American journal of psychiatry, 154*(1), 99-105.

Bannink, F. (2017). Positive CBT in practice. In *Springer eBooks* (pp. 15–28). https://doi.org/10.1007/978-3-319-51787-2_2

Bergsma, A., Veenhoven, R., Have, M. T., & De Graaf, R. (2010). Do they know how happy they are? on the value of Self-Rated Happiness of people with a Mental disorder. *Journal of Happiness Studies*, *12*(5), 793–806. https://doi.org/10.1007/s10902-010-9227-5

Boardman, J. D., Blalock, C. L., & Button, T. M. M. (2008). Sex differences in the heritability of resilience. *Twin Research and Human Genetics*, *11*(1), 12–27. https://doi.org/10.1375/twin.11.1.12

Burns, R. A., Windsor, T., Butterworth, P., & Anstey, K. J. (2022). The protective effects of wellbeing and flourishing on long-term mental health risk. *SSM - Mental Health*, *2*, 100052. https://doi.org/10.1016/j.ssmmh.2021.100052

Cendejas, C. (2022). Not Just Surviving but Thriving: Predictors of Flourishing among College Students (Doctoral dissertation, University of Oregon).

https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/27722/Cendejas_oregon_0171A_13110.pdf?sequence=1&isAllowed=y

Centerdata. (2023). *LISS panel. Over het LISS panel.* https://www.centerdata.nl/liss-panel

Chakhssi, F., Bohlmeijer, E. T. (2018). Mentale gezondheid: De betekenis van positieve psychologie voor de klinische behandeling. *Tijdschrift voor Psychotherapie, 44*(1), 5–16. https://ris.utwente.nl/ws/portalfiles/portal/287851864/PositievePsyChakhssietal.2018TvPsych.pdf

Chilver, M. R., Champaigne-Klassen, E., Schofield, P. R., Williams, L. M., & Gatt, J. M. (2023). Predicting wellbeing over one year using sociodemographic factors, personality, health behaviours, cognition, and life events. *Scientific Reports*, *13*(1). https://doi.org/10.1038/s41598-023-32588-3

Chuang, S. P., Wu, J. Y. W., & Wang, C. S. (2023). Resilience and Quality of Life in People with Mental Illness: A Systematic Review and Meta-Analysis. *Neuropsychiatric Disease and Treatment*, *Volume 19*, 507–514. https://doi.org/10.2147/ndt.s392332

Columbia University Mailman School of Public Health. (2024). *Item Response Theory.* https://www.publichealth.columbia.edu/research/population-health-methods/item-response-theory#readings

Craske, M. G., Niles, A. N., Burklund, L. J., Wolitzky-Taylor, K. B., Vilardaga, J. C. P., Arch, J. J., Saxbe, D. E., & Lieberman, M. D. (2014). Randomized controlled trial of cognitive behavioral therapy and acceptance and commitment therapy for social phobia: Outcomes and moderators. *Journal of Consulting and Clinical Psychology*, *82*(6), 1034–1048. https://doi.org/10.1037/a0037212

Davey, G. (2021). *Psychopathology: Research, Assessment and Treatment in Clinical Psychology* (3rd ed.). John Wiley & Sons.

De Beurs, E., & Zitman, F. (2005). De brief symptom inventory (BSI). De betrouwbaarheid en validiteit van een handzaam alternatief voor de SCL-90. Leiden: Leids universitair medisch centrum. https://www.researchgate.net/profile/Edwin-De-Beurs/publication/284679116_The_Brief_Symptom_Inventory_BSI_Reliability_and_validity_of_a_practical_alternative_to_SCL-90/links/565c20fd08aefe619b251cba/The-Brief-Symptom-Inventory-BSI-Reliability-and-validity-of-a-practical-alternative-to-SCL-90.pdf

De La Fuente, R. A., Jiménez, Á. P., Sánchez-Queija, I., & Lizaso, I. (2019). Flourishing During Emerging Adulthood from a Gender Perspective. *Journal of Happiness Studies*, *21*(8), 2889–2908. https://doi.org/10.1007/s10902-019-00204-9

De Veaux, R. D., Velleman, P. F., & Bock, D. E. (2021). *Stats: Data and Models* (5th ed.). Pearson Education Limited 2021.

De Vos, J., Radstaak, M., Bohlmeijer, E. T., & Westerhof, G. J. (2018). Having an eating disorder and still being able to flourish? Examination of Pathological Symptoms and Well-Being as two continua of Mental Health in a Clinical sample. *Frontiers in Psychology*, *9*. https://doi.org/10.3389/fpsyg.2018.02145

Diamond, L. M., Pardo, S. T., & Butterworth, M. R. (2011). Transgender experience and identity. In *Springer eBooks* (pp. 629–647). https://doi.org/10.1007/978-1-4419-7988-9_26

Disabato, D. J., Goodman, F. R., Kashdan, T. B., Short, J. L., & Jarden, A. (2016). Different types of well-being? A cross-cultural examination of hedonic and eudaimonic well-being. *Psychological Assessment, 28*(5), 471–482. https://doi.org/10.1037/pas0000209

Doherty, D. T., & Kartalova-O'Doherty, Y. (2009). Gender and self-reported mental health problems: Predictors of help seeking from a general practitioner. *British Journal of Health Psychology*, *15*(1), 213–228. https://doi.org/10.1348/135910709x457423

Drobnjak, S. (2020). Brief symptom inventory. In *Springer eBooks* (pp. 308–309). https://doi.org/10.1007/978-3-030-39903-0_3

Duncan, T. E., Duncan, S. C., & Strycker, L. A. (2006). *An Introduction to Latent Variable Growth Curve Modeling: Concepts, Issues, and Applications* (2nd ed.). Lawrence Erlbaum Associates, Inc.

Eack, S. M., & Newhill, C. E. (2007). Psychiatric Symptoms and Quality of Life in Schizophrenia: A Meta-Analysis. *Schizophrenia Bulletin*, *33*(5), 1225–1237. https://doi.org/10.1093/schbul/sbl071

Eaton, N. R., Keyes, K. M., Krueger, R. F., Balsis, S., Skodol, A. E., Markon, K. E., Grant, B. F., & Hasin, D. S. (2012). An invariant dimensional liability model of gender differences in mental disorder prevalence: Evidence from a national sample. *Journal of Abnormal Psychology*, *121*(1), 282–288. https://doi.org/10.1037/a0024780

Färber, F., & Rosendahl, J. (2018). The association between resilience and mental health in the somatically ill. *Deutsches Ärzteblatt International*. https://doi.org/10.3238/arztebl.2018.0621

Fonseca, A., De Matos, M. G., & Gois, C. (2023). Resilience and Mental Health: A Study of Women with and without Depression. *Journal of Psychology and Neuroscience*, *5*(2), 1–9. https://www.researchgate.net/publication/370946398_Resilience_and_Mental_Health_A_Study_of_Women_with_and_without_Depression

Geerling, B., Kraiss, J., Kelders, S., Stevens, A., Kupka, R., & Bohlmeijer, E. (2020). The effect of positive psychology interventions on well-being and psychopathology in patients with severe mental illness: A systematic review and meta-analysis. *The Journal of Positive Psychology*, *15*(5), 572–587. https://doi.org/10.1080/17439760.2020.1789695

Gök, A., & Koğar, E. Y. (2021). A Meta-Analysis Study on Gender Differences in Psychological Resilience Levels. *Cyprus Turkish Journal of Psychiatry & Psychology*, *3*(2), 132–143. https://doi.org/10.35365/ctjpp.21.2.15

Gove, W. R. (1984). Gender differences in mental and physical illness: The effects of fixed roles and nurturant roles. *Social Science & Medicine*, *19*(2), 77–84. https://doi.org/10.1016/0277-9536(84)90273-9

Grant, F., Guille, C., & Sen, S. (2013). Well-Being and the Risk of Depression under Stress. *PLoS ONE*, *8*(7), e67395. https://doi.org/10.1371/journal.pone.0067395

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

Hamaker, E. L., Kuiper, R. M., & Grasman, R. P. (2015). A critique of the cross-lagged panel model. *Psychological Methods*, *20*(1), 102–116. https://doi.org/10.1037/a0038889

Hansson, L. (2006). Determinants of quality of life in people with severe mental illness. *Acta Psychiatrica Scandinavica*, *113*(s429), 46–50. https://doi.org/10.1111/j.1600-0447.2005.00717.x

Hayes, A. F. (2013). *Introduction to Mediation, Moderation, and Conditional Process Analysis : A Regression-Based Approach* (1st ed.). New York : The Guilford Press.

Hayes, A. F., & Rockwood, N. J. (2017). Regression-based statistical mediation and moderation analysis in clinical research: Observations, recommendations, and implementation. *Behaviour Research and Therapy*, *98*, 39–57. https://doi.org/10.1016/j.brat.2016.11.001

Hilderink, H., Plasmans, M., Poos, M. J. J. C., Eysink, P. E. D., & Gijsen, R. (2020). Dutch DALYs, current and future burden of disease in the Netherlands. *Archives of Public Health, 78*(1). https://doi.org/10.1186/s13690-020-00461-8

Huitema, B., & Laraway, S. (2006). *Autocorrelation.* ResearchGate. https://www.researchgate.net/publication/280722480_Autocorrelation

Jacobi, F., Höfler, M., Siegert, J., Mack, S., Gerschler, A., Scholl, L., Busch, M. A., Hapke, U., Maske, U., Seiffert, I., Gaebel, W., Maier, W., Wagner, M., Zielasek, J., & Wittchen, H. (2014). Twelve-month prevalence, comorbidity and correlates of mental disorders in Germany: the Mental Health Module of the German Health Interview and Examination Survey for Adults (DEGS1-MH). *International Journal of Methods in Psychiatric Research*, *23*(3), 304–319. https://doi.org/10.1002/mpr.1439

Johnson, S. U., Ulvenes, P. G., Øktedalen, T., & Hoffart, A. (2019). Psychometric properties of the general anxiety disorder 7-Item (GAD-7) scale in a heterogeneous psychiatric sample. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.01713

Kalra, G., Christodoulou, G., Jenkins, R., Tsipas, V., Christodoulou, N., Lecic-Tosevski, D., Mezzich, J., & Bhugra, D. (2012). Mental health promotion: Guidance and strategies. *European Psychiatry*, *27*(2), 81–86. https://doi.org/10.1016/j.eurpsy.2011.10.001

Kazdin, A. E., & Blase, S. L. (2011). Rebooting psychotherapy research and practice to reduce the burden of mental illness. *Perspectives on Psychological Science, 6*(1), 21–37. https://doi.org/10.1177/1745691610393527

Kearney, M. W. (2017). Cross-Lagged Panel Analysis. In M. Allen (Ed.), *The SAGE Encyclopedia of Communication Research Methods.* SAGE Publications, Inc. https://doi.org/10.4135/9781483381411

Keyes, C. L. M. (1998). Social Well-Being. *Social Psychology Quarterly*, *61*(2), 121. https://doi.org/10.2307/2787065

Keyes, C. L. M. (2002). The mental health continuum: from languishing to flourishing in life. *Journal of Health and Social Behavior*, *43*(2), 207. https://doi.org/10.2307/3090197

Keyes, C. L., Dhingra, S. S., & Simoes, E. J. (2010). Change in level of positive mental health as a predictor of future risk of mental illness. *American journal of public health, 100*(12), 2366-2371.

Keyes, C. L. M., Wissing, M. P., Potgieter, J. C., Temane, Q. M., Kruger, A., & Van Rooy, S. (2008). Evaluation of the mental health continuum–short form (MHC–SF) in setswana-speaking South Africans. *Clinical Psychology & Psychotherapy*, *15*(3), 181–192. https://doi.org/10.1002/cpp.572

Klose, M., & Jacobi, F. (2004). Can gender differences in the prevalence of mental disorders be explained by sociodemographic factors? *Archives of Women's Mental Health*, *7*(2), 133–148. https://doi.org/10.1007/s00737-004-0047-7

Lamers, S. M. A., Glas, C. A. W., Westerhof, G. J., & Bohlmeijer, E. T. (2012). Longitudinal Evaluation of the Mental Health Continuum- short Form (MHC-SF). *European Journal of Psychological Assessment*, *28*(4), 290–296. https://doi.org/10.1027/1015-5759/a000109

Lamers, S. M. A., Westerhof, G. J., Glas, C. A. W., & Bohlmeijer, E. T. (2015). The bidirectional relation between positive mental health and psychopathology in a longitudinal representative panel study. *The Journal of Positive Psychology*, *10*(6), 553–560. https://doi.org/10.1080/17439760.2015.1015156

Lantz, B. (2012). The large sample size fallacy. *Scandinavian Journal of Caring Sciences*, *27*(2), 487–492. https://doi.org/10.1111/j.1471-6712.2012.01052.x

Lawrie, S. M., Fletcher-Watson, S., Whalley, H. C., & McIntosh, A. M. (2019). Predicting major mental illness: ethical and practical considerations. *BJPsych Open*, *5*(2). https://doi.org/10.1192/bjo.2019.11

LISS panel. (2009a). *Mental Health.* https://www.dataarchive.lissdata.nl/study_units/view/101

LISS panel. (2009b). *Welzijn.* https://www.dataarchive.lissdata.nl/control-construct-schemes/view/68

Lokkerbol, J., Adema, D., De Graaf, R., Have, M. T., Cuijpers, P., Beekman, A. T., & Smit, F. (2013). Non-fatal burden of disease due to mental disorders in the Netherlands. *Social Psychiatry and Psychiatric Epidemiology, 48*(10), 1591–1599. https://doi.org/10.1007/s00127-013-0660-8

Luteijn, F., & Barelds, D. (2019). *Psychological Diagnostics in Health Care.* Boom uitgevers Amsterdam.

Maestre-Miquel, C., López-De-Andrés, A., Ji, Z., De Miguel-Diez, J., Brocate, A., Sanz-Rojo, S., López-Farre, A., Carabantes-Alarcon, D., Jiménez-García, R., & Zamorano-León, J. J. (2021). Gender differences in the prevalence of mental health, psychological distress and psychotropic medication consumption in Spain: A Nationwide Population-Based study. *International Journal of Environmental Research and Public Health*, *18*(12), 6350. https://doi.org/10.3390/ijerph18126350

Margraf, J., Zhang, X. C., Lavallee, K. L., & Schneider, S. (2020). Longitudinal prediction of positive and negative mental health in Germany, Russia, and China. *PLoS ONE*, *15*(6), e0234997. https://doi.org/10.1371/journal.pone.0234997

Masood, A., Masud, Y., & Mazahir, S. (2016). Gender differences in resilience and psychological distress of patients with burns. *Burns*, *42*(2), 300–306. https://doi.org/10.1016/j.burns.2015.10.006

Matsuno, E., & Budge, S. L. (2017). Non-binary/Genderqueer Identities: a Critical Review of the Literature. *Current Sexual Health Reports*, *9*(3), 116–120. https://doi.org/10.1007/s11930-017-0111-8

Matud, M. P., Bethencourt, J. M., & Ibáñez, I. (2014). Gender differences in psychological distress in Spain. *International Journal of Social Psychiatry*, *61*(6), 560–568. https://doi.org/10.1177/0020764014564801

Matud, M. P., Bethencourt, J. M., Ibáñez, I., & Fortes, D. (2020). Gender and psychological well-being in older adults. *International Psychogeriatrics*, *32*(11), 1293–1302. https://doi.org/10.1017/s1041610220000824

Matud, M. P., López-Curbelo, M., & Fortes, D. (2019). Gender and Psychological Well-Being. *International Journal of Environmental Research and Public Health/International Journal of Environmental Research and Public Health*, *16*(19), 3531. https://doi.org/10.3390/ijerph16193531

Mendelson, T., & Eaton, W. W. (2018). Recent advances in the prevention of mental disorders. *Social Psychiatry and Psychiatric Epidemiology, 53*(4), 325–339. https://doi.org/10.1007/s00127-018-1501-6

Méndez, J., Sánchez-Hernández, Ó., Garber, J., Espada, J. P., & Orgiles, M. (2021). Psychological treatments for depression in adolescents: more than three decades later. *International journal of environmental research and public health, 18*(9), 4600.

Michel, G., Baenziger, J., Brodbeck, J., Mader, L., Kuehni, C. E., & Roser, K. (2024). The Brief Symptom Inventory in the Swiss general population: Presentation of norm scores and predictors of psychological distress. *PLoS ONE*, *19*(7), e0305192. https://doi.org/10.1371/journal.pone.0305192

Mjøsund, N. H. (2021). A salutogenic mental health model: Flourishing as a metaphor for good mental health. *Health promotion in health care – Vital theories and research*, 47-59. https://www.ncbi.nlm.nih.gov/books/NBK585669/#:~:text=Mental%20health%20is%20about%20subjective,optimal%20state%20of%20mental%20health.

Momtaz, Y. A., Hamid, T. A., Haron, S. A., & Bagat, M. F. (2016). Flourishing in later life. *Archives of Gerontology and Geriatrics*, *63*, 85–91. https://doi.org/10.1016/j.archger.2015.11.001

Moynihan, C. (1998). Theories in health care and research: Theories of masculinity. *BMJ*, *317*(7165), 1072–1075. https://doi.org/10.1136/bmj.317.7165.1072

Muniz-Terrera, G., Robitaille, A., Kelly, A., Johansson, B., Hofer, S., & Piccinin, A. (2016). Latent growth models matched to research questions to answer questions about dynamics of change in multiple processes. *Journal of Clinical Epidemiology*, *82*, 158–166. https://doi.org/10.1016/j.jclinepi.2016.09.001

Niemiec, C. P. (2014). Eudaimonic Well-Being. In *Springer eBooks* (pp. 2004–2005). https://doi.org/10.1007/978-94-007-0753-5_929

Otten, D., Tibubos, A. N., Schomerus, G., Brähler, E., Binder, H., Kruse, J., Ladwig, K., Wild, P. S., Grabe, H. J., & Beutel, M. E. (2021). Similarities and differences of mental health in women and men: A systematic review of findings in three large German cohorts. *Frontiers in Public Health*, *9*. https://doi.org/10.3389/fpubh.2021.553071

Perugini, M. L. L., De La Iglesia, G., Solano, A. C., & Keyes, C. L. M. (2017). The Mental Health Continuum–Short Form (MHC–SF) in the Argentinean context: Confirmatory factor analysis and measurement invariance. *Europe's Journal of Psychology*, *13*(1), 93–108. https://doi.org/10.5964/ejop.v13i1.1163

Quandt, T., Klapproth, J., & Frischlich, L. (2022). Dark social media participation and well-being. *Current Opinion in Psychology*, *45*, 101284. https://doi.org/10.1016/j.copsyc.2021.11.004

Rijksinstituut voor Volksgezondheid en Milieu: RIVM. (2024, February 15). *Enige psychische aandoening.* https://www.rivm.nl/mentale-gezondheid/monitor/algemene-bevolking/enige-psychische-aandoening

Rijksinstituut voor Volksgezondheid en Milieu: RIVM. (2024, February 15). *Levenstevredenheid.* https://www.rivm.nl/mentale-gezondheid/monitor/algemene-bevolking/levenstevredenheid

Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual review of psychology, 52*(1), 141-166.

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology*, *57*(6), 1069–1081. https://doi.org/10.1037/0022-3514.57.6.1069

Santini, Z. I., Ekholm, O., Koyanagi, A., Stewart-Brown, S., Meilstrup, C., Nielsen, L., Fusar-Poli, P., Koushede, V., & Thygesen, L. C. (2022). Higher levels of mental wellbeing predict lower risk of common mental disorders in the Danish general population. *Mental Health & Prevention*, *26*, 200233. https://doi.org/10.1016/j.mhp.2022.200233

Schotanus-Dijkstra, M., Have, M. T., Lamers, S., De Graaf, R., & Bohlmeijer, E. T. (2016). The longitudinal relationship between flourishing mental health and incident mood, anxiety and substance use disorders. *European Journal of Public Health*, *27*(3), 563–568. https://doi.org/10.1093/eurpub/ckw202

Schotanus-Dijkstra, M., Keyes, C. L., de Graaf, R., & Ten Have, M. (2019). Recovery from mood and anxiety disorders: The influence of positive mental health. *Journal of affective disorders*, *252*, 107-113. https://www.howtoflourish.nl/wp-content/uploads/2019/08/Schotanus-Dijkstra-et-al.-2019_recovery.pdf

Schotanus-Dijkstra, M., Pieterse, M. E., Drossaert, C. H., Westerhof, G. J., De Graaf, R., Have, M. T., Walburg, J., & Bohlmeijer, E. T. (2015). What Factors are Associated with Flourishing? Results from a Large Representative National Sample. *Journal of Happiness Studies*, *17*(4), 1351–1370. https://doi.org/10.1007/s10902-015-9647-3

Schwarzer, R., & Schulz, U. (2003). Stressful life events. *Handbook of psychology, 9*, 29-56. https://www.researchgate.net/profile/Ralf-Schwarzer/publication/228026680_Stressful_Life_Events/links/5ff0ae2d299bf1408868588e/Stressful-Life-Events.pdf

Seaton, C. L., Bottorff, J. L., Jones-Bricker, M., Oliffe, J. L., DeLeenheer, D., & Medhurst, K. (2017). Men's Mental Health Promotion Interventions: A Scoping Review. *American Journal of Men S Health*, *11*(6), 1823–1837. https://doi.org/10.1177/1557988317728353

Seligman, M. E. P., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist*, *55*(1), 5–14. https://doi.org/10.1037/0003-066x.55.1.5

Seow, L. S. E., Vaingankar, J. A., Abdin, E., Sambasivam, R., Jeyagurunathan, A., Pang, S., Chong, S. A., & Subramaniam, M. (2016). Positive mental health in outpatients with affective disorders: Associations with life satisfaction and general functioning. *Journal of Affective Disorders*, *190*, 499–507. https://doi.org/10.1016/j.jad.2015.10.021

Sharp, P., Bottorff, J. L., Rice, S., Oliffe, J. L., Schulenkorf, N., Impellizzeri, F., & Caperchione, C. M. (2022). "People say men don't talk, well that's bullshit": A focus group study exploring challenges and opportunities for men's mental health

promotion. *PLoS ONE*, *17*(1), e0261997. https://doi.org/10.1371/journal.pone.0261997

Shrivastava, A., & Desousa, A. (2016). Resilience: A psychobiological construct for psychiatric disorders. *Indian Journal of Psychiatry/Indian Journal of Psychiatry*, *58*(1), 38. https://doi.org/10.4103/0019-5545.174365

Singh, V., Kumar, A., & Gupta, S. (2022). Mental Health Prevention and Promotion—A Narrative Review. *Frontiers in Psychiatry*, *13*. https://doi.org/10.3389/fpsyt.2022.898009

Slade, M. (2010). Mental illness and well-being: the central importance of positive psychology and recovery approaches. *BMC Health Services Research*, *10*(1). https://doi.org/10.1186/1472-6963-10-26

SPSS analysis. (2024). *Mediation Analysis with Hayes PROCESS Macro.* https://spssanalysis.com/mediation-analysis-using-hayes-process-macro/#:~:text=Hayes%20PROCESS%20Macro%20is%20a,moderation%2C%20and%20conditional%20process%20analysis.

Steinhardt, M., & Dolbier, C. (2008). Evaluation of a resilience intervention to enhance coping strategies and protective factors and decrease symptomatology. *Journal of American college health, 56*(4), 445-453.

Taherdoost, H. (2016). Sampling Methods in Research Methodology; How to Choose a Sampling Technique for Research. *International Journal of Academic Research in Management (IJARM), 5*(2), 18-27. https://hal.science/hal-02546796/file/Sampling%20Method%20in%20Research%20Methodology;%20How%20to%20Choose%20a%20Sampling%20Technique%20for%20Research.pdf

Tibubos, A. N., Burghardt, J., Klein, E. M., Brähler, E., Jünger, C., Michal, M., Wiltink, J., Wild, P. S., Münzel, T., Singer, S., Pfeiffer, N., & Beutel, M. E. (2020). Frequency of stressful life events and associations with mental health and general subjective health in the general population. *Journal of Public Health*, *29*(5), 1071–1080. https://doi.org/10.1007/s10389-020-01204-3

Tilburg University. (2022, June 30). *Tilburg University en Centerdata tekenen voor nog nauwere samenwerking.* https://www.tilburguniversity.edu/nl/actueel/nieuws/meer-nieuws/tilburg-university-en-centerdata-tekenen-voor-nog-nauwere-samenwerking

Van de Mortel, T. F. (2008). Faking it: social desirability response bias in self-report research. *The Australian Journal of Advanced Nursing, 25*(4), 40-48. https://www.ajan.com.au/archive/Vol25/Vol25-4.pdf#page=41

Walter, H. J., Abright, A. R., Bukstein, O. G., Diamond, J., Keable, H., Ripperger-Suhler, J., & Rockhill, C. (2023). Clinical Practice Guideline for the assessment and treatment of children and adolescents with major and Persistent depressive Disorders. *Journal of the American Academy of Child and Adolescent Psychiatry, 62*(5), 479–502. https://doi.org/10.1016/j.jaac.2022.10.001

Wang, Y., & Gorenstein, C. (2013). Psychometric properties of the Beck Depression Inventory-II: a comprehensive review. *Brazilian Journal of Psychiatry*, *35*(4), 416–431. https://doi.org/10.1590/1516-4446-2012-1048

Wergeland, G. J. H., Riise, E. N., & Öst, L. (2021). Cognitive behavior therapy for internalizing disorders in children and adolescents in routine clinical care: A systematic review and meta-analysis. *Clinical Psychology Review, 83*, 101918. https://doi.org/10.1016/j.cpr.2020.101918

Westerhof, G. J., & Keyes, C. L. (2009). Mental Illness and Mental Health: The Two Continua Model Across the Lifespan. *Journal of Adult Development*, *17*(2), 110–119. https://doi.org/10.1007/s10804-009-9082-y

Wijnen, B., Have, M. T., De Graaf, R., Hoek, H. W., Lokkerbol, J., & Smit, F. (2023). The economic burden of mental disorders: results from the Netherlands mental health survey and incidence study-2. *The European Journal of Health Economics, 25*, 925–934. https://doi.org/10.1007/s10198-023-01634-2

Wood, A. M., & Joseph, S. (2010). The absence of positive psychological (eudemonic) well-being as a risk factor for depression: A ten year cohort study. *Journal of Affective Disorders*, *122*(3), 213–217. https://doi.org/10.1016/j.jad.2009.06.032

World Health Organisation: WHO. (2022a, June 8). *Mental disorders.* https://www.who.int/news-room/fact-sheets/detail/mental-disorders

World Health Organisation: WHO. (2022b, June 17). *Mental health.* https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response

World Health Organisation: WHO. (2024a). *Constitution.* https://www.who.int/about/governance/constitution

World Health Organisation: WHO. (2024b). *Disability-adjusted life years (DALYs).* https://www.who.int/data/gho/indicator-metadata-registry/imr-details/158#:~:text=Method%20of%20estimation%3A,resulting%20from%20the%20specific%20cause.

World Health Organisation: WHO. (2024c). *Global health estimates: Leading causes of DALYs.* https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/global-health-estimates-leading-causes-of-dalys

World Health Organisation: WHO. (2024d). *Mental health.* https://www.who.int/health-topics/mental-health#tab=tab_1

Wrzus, C., Hänel, M., Wagner, J., & Neyer, F. J. (2013). Social network changes and life events across the life span: A meta-analysis. *Psychological Bulletin*, *139*(1), 53–80. https://doi.org/10.1037/a0028601

Zatzick, D., Marmar, C. R., Weiss, D. S., Browner, W. S., Metzler, T. J., Golding, J. M., Stewart, A. L., Schlenger, W. E., & Wells, K. B. (1997). Posttraumatic stress Disorder and functioning and quality of life outcomes in a nationally representative sample of male Vietnam veterans. *The American Journal of Psychiatry*, *154*(12), 1690–1695. https://doi.org/10.1176/ajp.154.12.1690

Appendix A

Mental Health Continuum Short Form Items (MHC-SF) (Dutch version)

Gescoord op een 5-punts Likertschaal: 0 = *nooit*, 1 = *één of twee keer*, 2 = *ongeveer 1 keer per week*, 3 = *2 of 3 keer per week*, 4 = *bijna elke dag*, 5 = *elke dag*.

Items 1 tot en met 3 meten emotioneel welzijn, items 4 tot en met 8 meten sociaal welzijn, items 9 tot en met 14 meten psychologisch welzijn. Items worden gepresenteerd met hun corresponderende dimensie tussen haakjes (Lamers et al., 2012).

In de afgelopen maand, hoe vaak had u het gevoel:

1. Dat u gelukkig was? (positief affect)
2. Dat u geïnteresseerd was in het leven? (positief affect)
3. Dat u tevreden was? (levenstevredenheid)
4. Dat u iets belangrijks hebt bijgedragen aan de samenleving? (sociale bijdrage)
5. Dat u deel uitmaakte van een gemeenschap (zoals een sociale groep, uw buurt, uw stad)? (sociale integratie)
6. Dat onze samenleving beter wordt voor mensen? (sociale actualisatie)
7. Dat mensen in principe goed zijn? (sociale acceptatie)
8. Dat u begrijpt hoe onze maatschappij werkt? (sociale samenhang)
9. Dat u de meeste aspecten van uw persoonlijkheid graag mocht? (zelfacceptatie)
10. Dat u goed kon omgaan met uw alledaagse verantwoordelijkheden? (omgevingsbeheersing)
11. Dat u warme en vertrouwde relaties met anderen had? (positieve relaties met anderen)
12. Dat u werd uitgedaagd om te groeien of een beter mens te worden? (persoonlijke groei)
13. Dat u zelfverzekerd uw eigen ideeën en meningen gedacht en geuit hebt? (autonomie)
14. Dat uw leven een richting of zin heeft? (doel in het leven)

Mental Health Continuum Short Form Items (MHC-SF) (English version)

Scored on a 5-point Likert scale: 0 = *never*, 1 = *once or twice*, 2 = *about once a week*, 3 = *about 2 or 3 times a week*, 4 = *almost every day*, 5 = *every day*.

Items 1 till 3 measure emotional well-being, items 4 till 8 measure social well-being, items 9 till 14 measure psychological well-being. Items are presented with their corresponding dimension in parentheses (Lamers et al., 2012).

During the past month, how often did you feel:

1. Happy? (positive affect)
2. Interested in life? (positive affect)
3. Satisfied with life? (life satisfaction)
4. That you had something important to contribute to society? (social contribution)
5. That you belonged to a community (like a social group, or your neighbourhood)? (social integration)
6. That our society is a good place, or is becoming a better place, for all people? (social actualisation)
7. That people are basically good? (social acceptance)
8. That the way our society works makes sense to you? (social coherence)
9. That you liked most parts of your personality? (self-acceptance)
10. Good at managing the responsibilities of your daily life? (environmental mastery)
11. That you had warm and trusting relationships with others? (positive relations with others)
12. That you had experiences that challenged you to grow and become a better person? (personal growth)
13. Confident to think or express your own ideas and opinions? (autonomy)
14. That your life has a sense of direction or meaning to it? (purpose in life)

Appendix B

Scatterplots

Figure B1

Scatterplot of Unstandardised Residuals and Unstandardised Predicted Values by Gender of the Hierarchical Multiple Regression Model for Positive Mental Health (N = 1223)

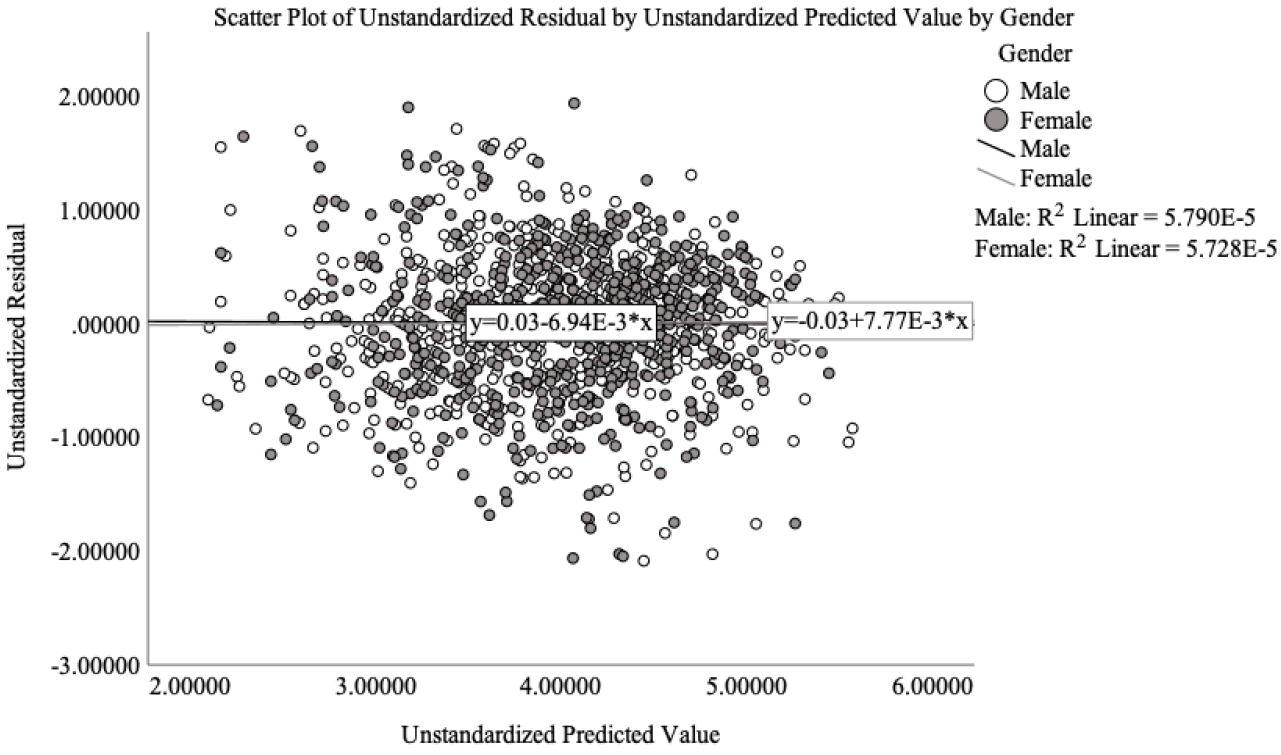
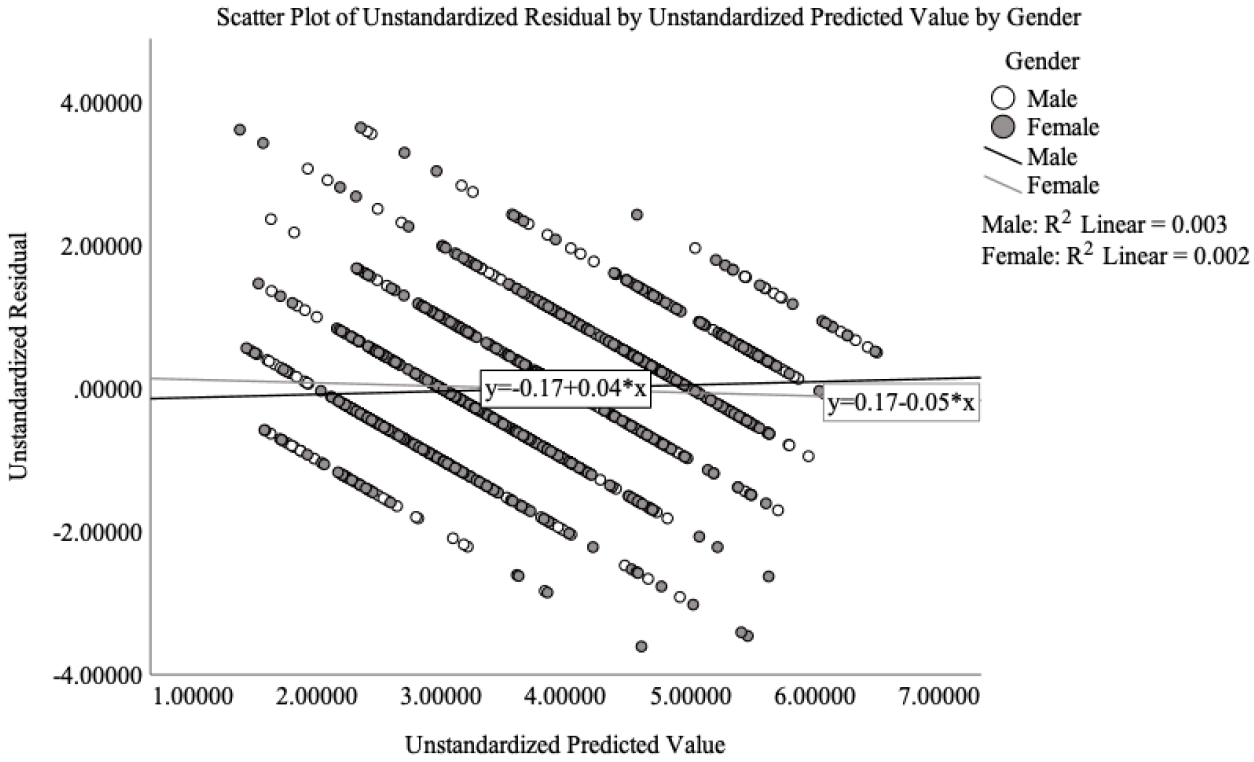


Figure B2

Scatterplot of Unstandardised Residuals and Unstandardised Predicted Values by Gender of the Hierarchical Multiple Regression Model for Psychopathology (N = 1223)



Appendix C

Histograms

Figure C1

Histogram of the Unstandardised Residuals of the Hierarchical Multiple Regression Model for Positive Mental Health (N = 1223)

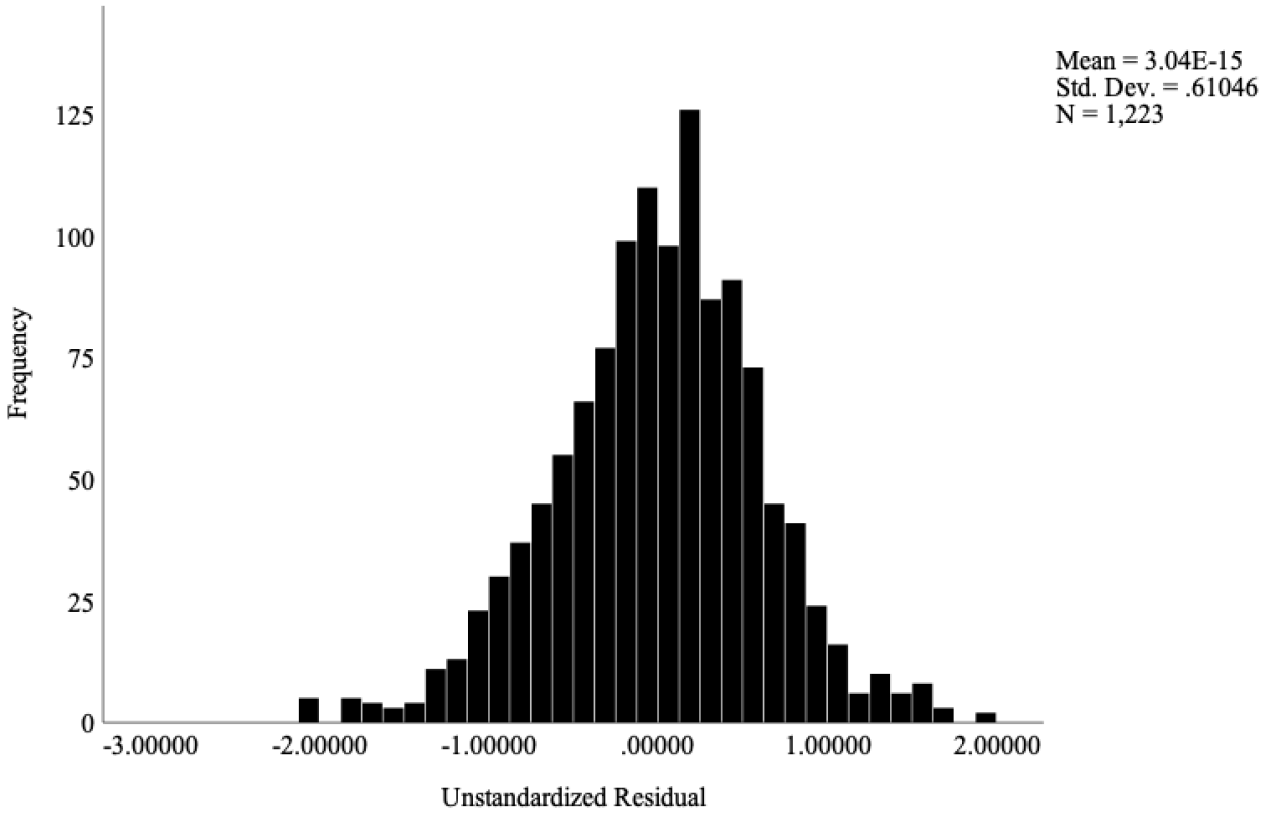
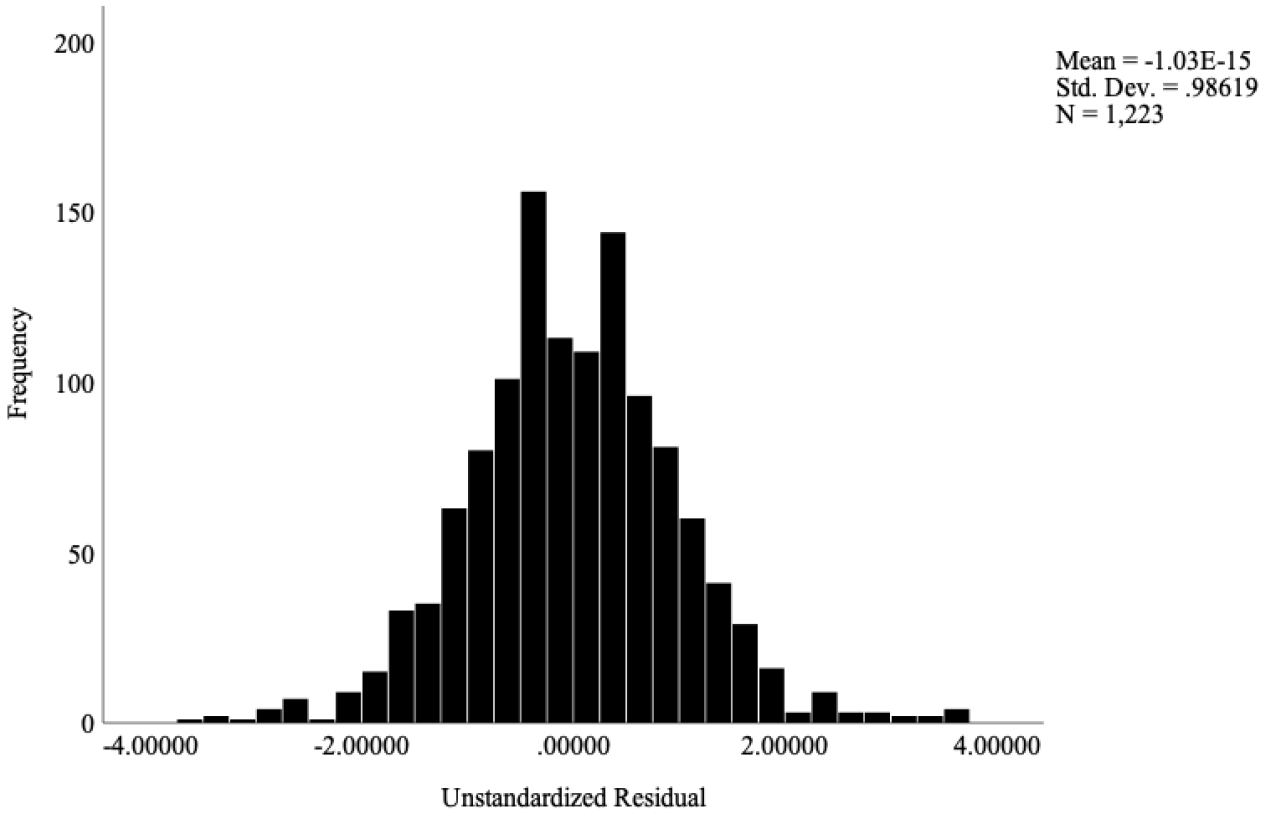


Figure C2

Histogram of the Unstandardised Residuals of the Hierarchical Multiple Regression Model for Psychopathology (N = 1223)



Appendix D

Tables

Table D1

Model Summary of the Hierarchical Multiple Regression Results for Positive Mental Health T3

Model	*R*	R^2	Adjusted R^2	*SE* of the estimate	δR^2	δF	*df1*	*df2*	*p* δF
1	0.706a	0.498	0.498	0.62264	0.498	1213.121	1	1221	<0.001
2	0.710b	0.504	0.503	0.61949	0.005	13.456	1	1220	<0.001
3	0.719c	0.517	0.516	0.61125	0.014	34.098	1	1219	<0.001
4	0.719d	0.517	0.516	0.61150	0.000	0.003	1	1218	0.957
5	0.719e	0.517	0.515	0.61172	0.000	0.152	1	1217	0.696

Note. MHC assesses positive mental health (PMH), BSI assesses psychopathology, delta implies any change in psychopathology, δR^2 = R Square Change, δF = F Change, *p* δF = Significant F Change.

a Predictors: (Constant), MHC T2

b Predictors: (Constant), MHC T2, BSI T2

c Predictors: (Constant), MHC T2, BSI T2, Delta BSI

d Predictors: (Constant), MHC T2, BSI T2, Delta BSI, Gender

e Predictors: (Constant), MHC T2, BSI T2, Delta BSI, Gender, Moderator (gender * delta BSI)

Table D2

Coefficients of the Hierarchical Multiple Regression Results for Positive Mental Health T3

Model	Variable	*B*	*SE B*	β	*t*	*p*
1	(Constant)	1.277	0.080		16.028	<0.001
	MHC T2	0.688	0.020	0.706	34.830	<0.001
2	(Constant)	1.527	0.105		14.596	<0.001
	MHC T2	0.667	0.020	0.685	32.698	<0.001
	BSI T2	-0.045	0.012	-0.077	-3.668	<0.001
3	(Constant)	1.674	0.106		15.752	<0.001
	MHC T2	0.658	0.020	0.676	32.572	<0.001
	BSI T2	-0.074	0.013	-0.127	-5.673	<0.001
	Delta BSI	-0.102	0.017	-0.126	-5.839	<0.001
4	(Constant)	1.671	0.119		13.998	<0.001
	MHC T2	0.658	0.020	0.675	32.546	<0.001
	BSI T2	-0.074	0.013	-0.127	-5.656	<0.001
	Delta BSI	-0.102	0.017	-0.126	-5.824	<0.001
	Gender	0.002	0.035	0.001	0.053	0.957
5	(Constant)	1.671	0.119		13.992	<0.001
	MHC T2	0.658	0.020	0.675	32.532	<0.001
	BSI T2	-0.074	0.013	-0.127	-5.649	<0.001
	Delta BSI	-0.082	0.054	-0.101	-1.524	0.128
	Gender	0.002	0.035	0.001	0.049	0.961
	Moderator (gender * delta BSI)	-0.013	0.033	-0.026	-0.390	0.696

Note. MHC assesses positive mental health (PMH), BSI assesses psychopathology, delta implies any change in psychopathology.

Table D3

Model Summary of the Hierarchical Multiple Regression Results for Psychopathology T3

Model	*R*	R^2	Adjusted R^2	*SE* of the estimate	δR^2	δF	*df1*	*df2*	*p* δF
1	0.737a	0.544	0.544	1.005	0.544	1456.037	1	1221	<0.001
2	0.739b	0.547	0.546	1.003	0.003	7.705	1	1220	0.006
3	0.748c	0.559	0.558	0.989	0.012	34.098	1	1219	<0.001
4	0.749d	0.561	0.559	0.988	0.001	3.926	1	1218	0.048
5	0.749e	0.561	0.559	0.988	0.000	0.827	1	1217	0.363

Note. MHC assesses positive mental health (PMH), BSI assesses psychopathology, delta implies any change in PMH, δR^2 = R Square Change, δF = F Change, *p* δF = Significant F Change.

a Predictors: (Constant), BSI T2

b Predictors: (Constant), BSI T2, MHC T2

c Predictors: (Constant), BSI T2, MHC T2, Delta MHC

d Predictors: (Constant), BSI T2, MHC T2, Delta MHC, Gender

e Predictors: (Constant), BSI T2, MHC T2, Delta MHC, Gender, Moderator (gender * delta MHC)

Table D4

Coefficients of the Hierarchical Multiple Regression Results for Psychopathology T3

Model	Variable	*B*	*SE B*	β	*t*	*p*
1	(Constant)	1.019	0.078		13.025	<0.001
	BSI T2	0.728	0.019	0.737	38.158	<0.001
2	(Constant)	1.436	0.169		8.478	<0.001
	BSI T2	0.713	0.020	0.722	36.074	<0.001
	MHC T2	-0.092	0.033	-0.056	-2.776	0.006
3	(Constant)	1.844	0.181		10.180	<0.001
	BSI T2	0.701	0.020	0.710	35.750	<0.001
	MHC T2	-0.180	0.036	-0.109	-5.018	<0.001
	Delta MHC	-0.267	0.046	-0.123	-5.839	<0.001
4	(Constant)	2.011	0.200		10.073	<0.001
	BSI T2	0.699	0.020	0.709	35.670	<0.001
	MHC T2	-0.178	0.036	-0.108	-4.957	<0.001
	Delta MHC	-0.266	0.046	-0.122	-5.824	<0.001
	Gender	-0.112	0.057	-0.038	-1.981	0.048
5	(Constant)	2.002	0.200		10.010	<0.001
	BSI T2	0.699	0.020	0.708	35.637	<0.001
	MHC T2	-0.177	0.036	-0.107	-4.913	<0.001
	Delta MHC	-0.150	0.136	-0.069	-1.104	0.270
	Gender	-0.109	0.057	-0.037	-1.915	0.056
	Moderator (gender * delta MHC)	-0.076	0.083	-0.056	-0.910	0.363

Note. MHC assesses positive mental health (PMH), BSI assesses psychopathology, delta implies any change in PMH.