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Happiness, life satisfaction and positive mental health: Investigating reciprocal effects over four years in a Chinese student sample ☆

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ABSTRACT

Positive factors are increasingly recognized in the field of psychology, however, few studies have investigated the longitudinal measurement invariance (LMI) and reciprocal associations of positive core constructs, such as happiness, life satisfaction and positive mental health. This study evaluated the LMI of these constructs over four years in a Chinese Student Sample (n = 4400) using the Subjective Happiness Scale (SHS), the Satisfaction with Life Scale (SWLS) and the Positive Mental Health Scale (PMH-scale). The longitudinal reciprocal associations of the constructs were examined within a random intercept cross-lagged panel model (RI-CLPM). The results show that the SHS, SWLS and PMH-scale are measurement invariant over time and that the constructs are positively inter-related, but show different reciprocal patterns over time.

1. Introduction

There has been a recent shift in psychology from the focus on problems and deficits to a more holistic perspective, including positive factors. For decades, the field of psychology has mainly focused on negative aspects of mental health (Seligman & Csikszentmihalyi, 2000). Thus, the temporal relationships between negative factors have been clearly defined in clinical psychology. For example, rumination is a preceding factor (risk factor) of depressive disorders (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008) and anxiety sensitivity for panic disorder (McNally, 2002). Neuroticism has been shown to be a general risk factor for depressive and anxiety disorders (Aldinger et al., 2014; Hengartner, Ajdacic-Gross, Wyss, Angst, & Rössler, 2016). Since positive factors and their temporal associations are still understudied, their direct and reciprocal relationships over time are less clear. However, individual differences in happiness, life satisfaction and positive mental health[1] are strongly associated with the development and course of diverse mental disorders (Lambert D'raven, Moliver, & Thompson, 2015; Wood & Tarrier, 2010). The absence of positive factors enhances vulnerability to psychological disorders and is critical for remission (Lukat, Becker, Lavallee, van der Veld, & Margraf, 2017; Ryff & Singer, 1998; Trumpf, Becker, Vriends, Meyer, & Margraf, 2009; Wood & Tarrier, 2010). Thus, mental health promotion should not merely focus on reducing symptoms and distress, but also aim to strengthen peoples' personal resources and mental health. To this end, it is necessary to clarify how positive constructs are interconnected, especially in terms of their longitudinal direct and reciprocal relationships. This would promote the understanding of functioning of positive constructs (identifying protective factors) and help to develop effective interventions to increase positive mental health.

Especially, mental health during young adulthood is critical. Blanco and colleagues (2008) found that 7.0% of college students suffered from major depression, 11.9% from any anxiety disorder, and 5.1% from a substance use disorder in the previous 12 months. These prevalence rates are higher than in the general population

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[1] We will use the term positive mental health instead of the term general well-being. Even if the term positive mental health is used less frequently, it better represents the construct used in this study and is less confusing for the reader because the questionnaire assessing the construct of positive mental health is named Positive Mental Health Scale (PMH-scale;Lukat et al., 2016) and assesses emotional, psychological and social components of well-being.

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(Alonso et al., 2004). Regarding birth cohorts, psychopathology among college students increased (Twenge et al., 2010). The burden of mental health problems in pupils and students cannot be completely reduced by diminishing the symptoms of stress, anxiety or depression, but rather by also promoting positive mental health.

1.1. Longitudinal measurement invariance (LMI)

An essential step before examining the influence of positive factors on mental health and mental illness and promoting mental health is to investigate the constructs themselves, for example their convergent or discriminant validity, stability over time and longitudinal measurement invariance (LMI). A construct has to be shown reliable by at least satisfying psychometric properties. The assessment of constructs is mostly based on rating scales, whose scores are added up to an overall score. Differences in sum-scores over time are often taken to reflect changes in the underlying construct. LMI is a useful tool for interpreting mean differences meaningfully across different measurement points. Simply put, LMI indicates that people ascribe the same meaning to items regardless of time. If LMI of the construct is not given, this means that people change their idea of the construct and rate an item differently over time. Although mean differences of scales are generally considered meaningful, for most scales longitudinal invariance has not been tested yet. LMI is tested standardly in three steps (Vandenberg & Lance, 2000): Configural invariance implies that the structure of the scale is equal across time. Weak measurement invariance refers to equal item loadings across time and implies that structural relationships between latent variables can be meaningfully compared at different measurement occasions. Strong measurement invariance refers to equal intercepts across time. It enables the comparison of relationships between variables, but also comparisons of latent means on a single construct over time (Hirschfeld & von Brachel, 2014; Meredith, 1993). Thus, strong invariance of a construct is the precondition for meaningful comparison of means across time. Another step in testing measurement invariance focuses on the level of residual invariance. If the condition of strict invariance is met, all variations across time are due only to differences in the constructs. However, strict invariance is difficult to establish and not needed for practical applications of scales and is therefore beyond the scope of the present paper.

By establishing weak LMI for all constructs, it is possible to examine the interplay and causal relationships between the constructs over time. In the following section, we describe the constructs of happiness, life satisfaction and positive mental health that are core constructs in the research of mental health. Then, we will review findings regarding their LMI and finally in terms of their longitudinal interplay.

1.2. Happiness, life satisfaction and positive mental health

In this study we followed the definition of happiness by Bradburn (1969) and Lyubomirsky, King, and Diener (2005) who define happiness as the experience of more frequent positive affective states than negative ones. Argyle, Martin, and Crossland (1989) expand the frequency and degree of the predominance of positive affect by considering the dimension of an average level of satisfaction over a specific period of time. Happiness is a hedonic feeling characterized by moderate levels of arousal and is often used interchangeably with joy (de Rivera, Possell, Verette, & Weiner, 1989; Lazarus, 1991). Thus, happiness is predominately affect-based but different from positive affect (Lü, Wang, Liu, & Zhang, 2014; Singh & Jha, 2008). Lyubomirsky et al. (2005) found that happiness is positively associated with employment and quality of work, income, social relationships and mental and somatic health outcomes. Specifically, people with high levels on happiness are more relaxed, can regulate their emotions better and are more capable of facing and accepting problems (Yiengprugsawan, Somboonsook, Seubsman, & Sleigh, 2012). Happiness correlates negatively with anxiety, depression and rumination (Eldeleklioglu, 2015; Iani, Lauriola, Layous, & Sirigatti, 2014). Regarding stability over time, happiness is seen as a state construct with a higher temporal instability, whereas the construct satisfaction of life is considered to be more stable (Veenhoven, 1994). Kaczmarek, Bujacz and Eid (2015) found happiness not to be more occasion-specific compared to life-satisfaction. However, the items measuring happiness in their study were not solely affect-based, a cognitive component was included.

Life satisfaction is defined here as an overall "conscious cognitive judgement of one's life in which the criteria for judgment are up to the person" (Pavot & Diener, 1993, p. 164). Life satisfaction has an affective dimension that, however, is not identical with positive affect or happiness. Hence, life satisfaction should not be conceived as an overarching or superordinate concept of overall mental health but rather as one important aspect of positive mental health (Kjell, Daukantaite, Hefferon, & Sikstrom, 2016). Life satisfaction is positively associated with gratitude, social support, self-efficacy, continuous planning and consideration of future consequences (Azizli, Atkinson, Baughman, & Giammarco, 2015; Kong, Ding, & Zhao, 2015) and negatively associated with psychological distress, depression and anxiety (Beutel et al., 2016; Marum, Clench-Aas, Nes, & Raanaas, 2014). It has been shown to be an indicator and predictor of functioning and presence of clinical symptoms and comorbidity in college students (Renshaw & Cohen, 2014). Regarding stability, between 30% and 50% of the between-person variation in life satisfaction is attributable to a stable trait factor (Lucas & Donnellan, 2007, 2012; Schimmack, Krause, Wagner, & Schupp, 2010; Schimmack & Lucas, 2010). Eid and Diener (2004) likewise found that 12–16% of the variance in satisfaction with life was due to occasion-specific influences, whereas 74–83% of the variance was determined by stable trait differences. However, life satisfaction is not as stable as personality factors. Anusic and Schimmack (2016) found that changing life factors had a greater influence on life satisfaction than on personality factors. This finding underlines the affective component of life satisfaction. However, in their study happiness was as stable as life satisfaction. Furthermore, happiness and life satisfaction are often linked to markedly different causes and consequences (Schimmack, Schupp, & Wagner, 2008). For example, life events such as bereavement or unemployment have a stronger effect on life satisfaction than on happiness, whereas childbirth has a stronger effect on happiness (Luhmann, Hofmann, Eid, & Lucas, 2012).

Positive mental health, as defined here, includes emotional and psychological components of well-being and indicates positive functioning (Lukat, Margraf, Lutz, van der Veld, & Becker, 2016). While happiness and life satisfaction are often subsumed under the term subjective well-being or hedonic well-being, the psychological component of positive mental health refers to eudaimonic concepts such as self-acceptance or meaning in life. Positive mental health is often used interchangeably with satisfaction of life or quality of life. However, it is a multidimensional construct and can be regarded as a component of quality of life including constructs of happiness and life satisfaction (Brown, Bowling, and Flynn, 2004). Positive mental health is often tested by the tripartite model proposed by Keyes (2007), which includes emotional, psychological and social aspects of well-being. However, the stability of the construct has been rarely investigated. Positive mental health and personality traits are closely related (Steel, Schmidt, & Shultz, 2008). Indeed, the stability of positive mental health in

middle adulthood is high (r_{tt} = 0.84; Kokko, Korkalainen, Lyyra, & Feldt, 2013). Similarly, it was high for a nine-month interval r_{tt} = 0.65–0.68 (Lamers, Westerhof, Bohlmeijer, ten Klooster, & Keyes, 2011) and for a one-week and four-week interval (r_{tt} = 0.81 and r_{tt} = 0.74; Lukat et al., 2016).

1.3. Relationships between happiness, life satisfaction and positive mental health

Most studies investigate the constructs and levels of happiness, life satisfaction and positive mental health separately and cross-sectionally. Therefore, longitudinal studies focusing on the temporal stability, sequence and interplay of these constructs are needed. Furthermore, the relationships between these variables over time have not been investigated so far.

Due to high cross-sectional covariations, it is likely that positive factors covary strongly across time (Steger, Kashdan, & Oishi, 2008). Thus, increases or decreases in one positive construct may lead to subsequent increases or decreases in another positive construct. For example, higher levels of positive affect predict greater life satisfaction and positive mental health (Coffey, Warren, & Gottfried, 2015; Datu & King, 2016). Lyubomirsky et al. (2005) found that happiness precedes numerous positive outcomes in work life, income, social relationships, physical well-being and coping. Life satisfaction is often used as an outcome measure (Chou & Chi, 1999; Coffey et al., 2015), only rarely as a predictor. It is assumed that happiness, when seen as positive affect, is associated with later life satisfaction. There is indeed evidence for such a relationship (Coffey et al., 2015), but the reversed relationship has not been extensively tested yet. Likewise, positive mental health is often used as an outcome measure. However, it has not been tested whether positive mental health can predict happiness and life satisfaction over a certain course of time. According to the broaden-and-build theory (Fredrickson, 2001), the constructs could mutually influence each other over time. A few cross-sectional studies have examined positive association between happiness and life satisfaction (Chui & Wong, 2016; Lin, Lin, & Wu, 2010). However, there is no study including positive mental health as well as examining these associations in a prospective manner.

1.4. Lack of LMI

The Subjective Happiness Scale (SHS) measuring the construct of happiness is a widely and well-validated scale (Iani, Rubichi, Ferraro, Nicoletti, & Gallese, 2013; Swami et al., 2009). However, its measurement invariance was only tested across cultures so far (Bieda, Hirschfeld, Schönfeld, Brailovskaia, Zhang, & Margraf, 2017); research into measurement invariance across time is lacking.

The LMI of life satisfaction, often measured by the satisfaction with life scale (SWLS), was tested in two small student samples over two and six months. In the general group of students, the SWLS was strong measurement invariant. In the athlete students' sample, partial measurement invariance was found. Items 2, 3 and 4 were invariant over time (Wu, Chen, & Tsai, 2009).

Positive mental health is often measured by the Mental Health Continuum Short Form MHC-SF (Keyes, 2002). The Positive Mental Health Scale PMH-scale (Lukat et al., 2016), which we used in the present study, also assesses positive mental health and is a brief, unidimensional and person-centered measure including emotional and psychological well-being aspects. It exhibited strong measurement invariance over time (one week in a patient sample to 17 months in young women; Lukat et al., 2016). In sum, there is a great lack of evidence concerning constructs' LMI over a period longer than one year in student samples.

1.5. Aim of the study

In the present study, we first tested the assumed unidimensionality and LMI of the constructs happiness (SHS), life satisfaction (SWLS) and positive mental health (PMH-scale). If at least weak LMI could be established, the examination of the stability and interplay of the constructs of happiness, life satisfaction and/or positive mental health over time was possible. We examined the reciprocal relationships among the constructs in a student sample with a four-wave random intercept cross-lagged panel model. A better understanding of the time course and interplay of positive and probable protective factors is crucial for the development of interventions to promote positive mental health. We expected happiness, life satisfaction and positive mental health to be interrelated (Chui & Wong, 2016; Lin et al., 2010), but distinct constructs. Further, we expected the relationships among the positive constructs to be reciprocal: Happiness would predict life satisfaction and positive mental health at every preceding time point, but life satisfaction and positive mental health could also predict happiness.

2. Methods

2.1. Participants and procedure

Participants were recruited within the longitudinal ongoing project BOOM (Bochum Optimism and Mental Health Studies) which aims to identify protective factors related to positive mental health across several countries. Data for this study were collected annually in four subsequent years (2011–2015) in student populations. Time interval between measurement points was held constant. Participants gave their consent after being assured of anonymity and of the voluntary nature of the study. The Ethics Committee of the Faculty of Psychology of the Ruhr-Universität Bochum approved the study that was not preregistered.[2]

The present study analyzed a sample consisting of 4400 Chinese university students from Capital Normal University Beijing, Hebei United University and Nanjing University. First year students were recruited via e-mail during their first month of study and were invited to participate again in the following three years. Data was gathered by an online or a paper-pencil questionnaire administered in a group testing session. Participants received no financial compensation. Participant characteristics of the four waves are displayed in Table 1.

In comparison with the participants who provided complete data for all four waves (n = 4400), non-continuers (n = 2313, i.e., participants who did not provide complete data at all four waves and dropped out after the first measurement occasion) were older (M = 20.8 vs. M = 19.09, p < .001, d = 0.75) and were more likely to be male ($\chi^2(1) = 11.734$, p < .001, $\eta^2 = 0.051$). In terms of the positive constructs, the non-continuers were comparable with the continuers on positive mental health (M = 21.96 vs. M = 22.25, p = .062, d = 0.06), but lower on happiness (M = 22.29 vs. M = 22.73, p < .001, d = 0.1) and higher on life satisfaction (M = 24.70 vs. M = 24.07, p < .01, d = 0.1).

2.2. Measures

Chinese versions of the SHS and SWLS were developed from the validated English versions. A Chinese version of the PMH-scale was developed from the validated German version. For translation, the translation-back-translation method recommended by Brislin

[2] The BOOM Studies were not preregistered and are still ongoing and analyzed. Data for these analyses are shared.

Table 1
Demographic characteristics of the participants for T1.

Variable	
Age (mean ± sd; range)	19.98 ± 2.45; 14–38
Sex	
Male	2419 (55)
Female	1977 (45)
Semester (mean ± sd; range)	1 ± 0.128; 1–8
Marital status	
Single (without a steady partner)	3640 (82.8)
Single (with steady partner)	695 (15.8)
Married (not living with a partner)	18 (0.4)
Married (living with a partner)	43 (1)
Socioeconomic status	
Low	2612 (59.4)
Middle	1468 (33.4)
High	315 (7.2)

Note. Values in parentheses represent percent.

(1970) was used. In cases of discrepancies, this procedure was repeated until an agreement was reached.

2.2.1. Subjective happiness scale

Global subjective happiness was assessed using the four-item Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999). Participants respond on a 7-point Likert scale whose wording of anchor points depends on the question (e.g., Item 1: "In general, I consider myself: not a very happy person [1]/a very happy person [7]").

Responses are averaged to an overall score where high scores indicate high subjective happiness. Internal consistency was good in several countries, including also convergent and discriminant validity (Extremera & Berrocal, 2013; Iani et al., 2013; Swami et al., 2009). In the present study, the internal consistency of the SHS across the different measurement occasions was acceptable (α = 0.70–0.79; see Table 2).

2.2.2. Satisfaction with life scale

Satisfaction with one's life as a whole was measured using the 5-item Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985; Glaesmer, Grande, Braehler, & Roth, 2011). Participants indicate agreement with statements such as "In most ways my life is close to my ideal." on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The SWLS has good psychometric properties, shows convergent and discriminant validity in various samples (Pavot & Diener, 2008). In the present study, the internal consistencies of the SWLS for each measurement occasion ranged from good to excellent (α = 0.89–0.92).

2.2.3. Positive mental health scale

Positive Mental Health was assessed by the 9-item Positive Mental Health Scale (PMH-scale; Lukat et al., 2016). It assesses mainly emotional, psychological and social aspects of positive mental health without explicitly referring to well-being theories. It was developed to assess a single holistic concept of positive emotionality related to positive mental health. Participants respond to statements such as "I am in good physical and emotional condition" or "I manage well to fulfill my needs" on a scale ranging from 0 (*I disagree*) to 3 (*I agree*). In a major validation study in student samples, the PMH-scale showed convergent validity with the SHS (r = 0.81) and the Questionnaire Social Support (r = 0.52; F-SozU-22; Fydrich, Geyer, Hessel, Sommer, & Brähler, 1999)), and discriminant validity with the Depression, Anxiety and Stress Scales (*depression*: r = −0.74, *anxiety*: r = −0.51, *stress:* r = −0.56, Lovibond & Lovibond, 1995). The PMH-scale showed good psychometric properties in non-Western samples and exhibited strong cross-cultural measurement invariance across student samples from Germany, Russia and China (Bieda et al., 2017; Velten, Bieda, Scholten, Wannemüller, & Margraf, 2018). In the present study, the internal consistencies of the PMH-scale for each measurement occasion were excellent (α = 0.90–0.93).

2.3. Data analysis

Data were screened for missing values, response sets, skewness and kurtosis (Kline, 2011). Demographic variables and scale characteristics were examined using standard descriptive statistics within each sample, including means, standard deviations and internal consistencies.

First, we examined whether the proposed unidimensional factor structure for the SHS, SWLS and PMH-scale had a good fit to the data at all four measurement occasions. To evaluate the goodness of fit for the models, we used the fit indices and cut-off values recommended by Hu and Bentler (1999). Because the χ^2 is sensitive to sample size, the root mean square of approximation (RMSEA; Steiger, 1998), comparative fit index (CFI) standardized root mean square residual (SRMR) were also used for model evaluation. RMSEA values lower than 0.08 indicated a reasonable fit and values lower than 0.05 a good fit (MacCallum, Browne, & Sugawara, 1996). The 90% confidence intervals were also reported. For the comparative fit index (CFI; Bentler, 1990), values greater than 0.9 indicated a good fit. For the SRMR, values lower than 0.09 indicated a good fit. Factor loadings were also examined, with a minimum for factor loadings set at 0.40 (Ford, Maccallum, & Tait, 1986). Maximum likelihood (ML) estimation was used for model estimation. Full maximum likelihood estimation (FIML) was used to deal with missing data.

Table 2
Means, standard deviations, skewness, kurtosis and internal consistency for the SHS, SWLS and PMH-scale across measurement occasions.

Scale	M	SD	skew	kurt	α
SHS_T1	22.5	4.37	−0.91	0.81	0.7
SHS_T2	22.08	4.67	−0.85	0.84	0.77
SHS_T3	21.04	4.05	−0.53	0.93	0.75
SHS_T4	21.66	4.15	−0.44	0.33	0.79
SWLS_T1	25.08	6.55	−0.79	−0.1	0.89
SWLS_T2	23.4	6.91	−0.31	−0.53	0.89
SWLS_T3	22.61	6.96	−0.36	−0.55	0.91
SWLS_T4	23.58	6.69	−0.41	−0.37	0.92
PMH-scale_T1	22.10	5.11	−1.3	1.92	0.9
PMH-scale_T2	21.01	5.5	−0.91	−0.67	0.92
PMH-scale_T3	20.83	5.45	−0.699	0.251	0.95
PMH-scale_T4	20.62	4.95	−0.45	0.05	0.93

Note. SHS = Subjective Happiness Scale (4–28); SWLS = Satisfaction with life Scale (5–35); PMH-scale = Positive Mental Health Scale (0–27); skew = skweness; kurt = kurtosis.

Then, LMI testing was performed on the three separate scales and included a series of model comparisons across time for all of the three models. Testing for LMI followed the parameterization recommended by Widaman, Ferrer, and Conger (2010). In the baseline model (configural invariance) it is evaluated whether factor structures were the same across measurement occasions. Thus, the configural model is minimally constrained: the first loadings and intercepts of timepoint 1 serve as the reference indicators, all three other corresponding first loadings and intercepts are set to be equal across time. All other parameters are estimated freely in the model. For testing weak invariance, all factor loadings were constrained to be equal across time. If weak invariance was established, all remaining intercepts were also constrained to be equal across time (strong invariance). Imposing equality constraints on models will always lead to decrease in fit. To determine if the decrease in fit is substantial, initial studies used χ^2-difference tests, but differences in χ^2 were also sensitive to sample size (Oishi, 2007). Therefore, Cheung and Rensvold (2002) and Chen (2007) recommended a ΔCFI smaller or equal than 0.01 and a ΔRMSEA smaller or equal 0.015 to indicate measurement invariance. In addition to the χ^2-difference test, ΔCFI and ΔRMSEA were examined because of the sensitivity of χ^2 statistics.

If, at a particular step, full measurement invariance could not be established, partial invariance was examined (Byrne, 1989; Steenkamp & Baumgartner, 1998). To test partial measurement invariance, first misspecified items were identified by means of modification indices, and were then allowed to differ between measurement occasions. At least two loadings or intercepts had to be equal across measurement occasions to establish partial measurement invariance (Byrne, 1989).

Second, a random intercept cross-lagged panel model (RI-CLPM; Hamaker, Kuiper, & Grasman, 2015) was used to examine the stability and reciprocal relationships of happiness, life satisfaction and positive mental health over time. This structural equation model is an advantage over the traditional cross-lagged panel model (CLPM) that does not distinguish between the within- and the between-person level. The RI-CLPM takes into account that there are trait-like individual differences in the constructs of interest which endure over time. Thus, it divides the variance of the scores into variance between persons and variance within persons (fluctuations over time). The model is presented in Fig. 1. In order to find the most parsimonious model, the analysis proceeded in linked phases. First, we estimated the unconstrained model. Then for the sake of model parsimony, we compared the unconstrained

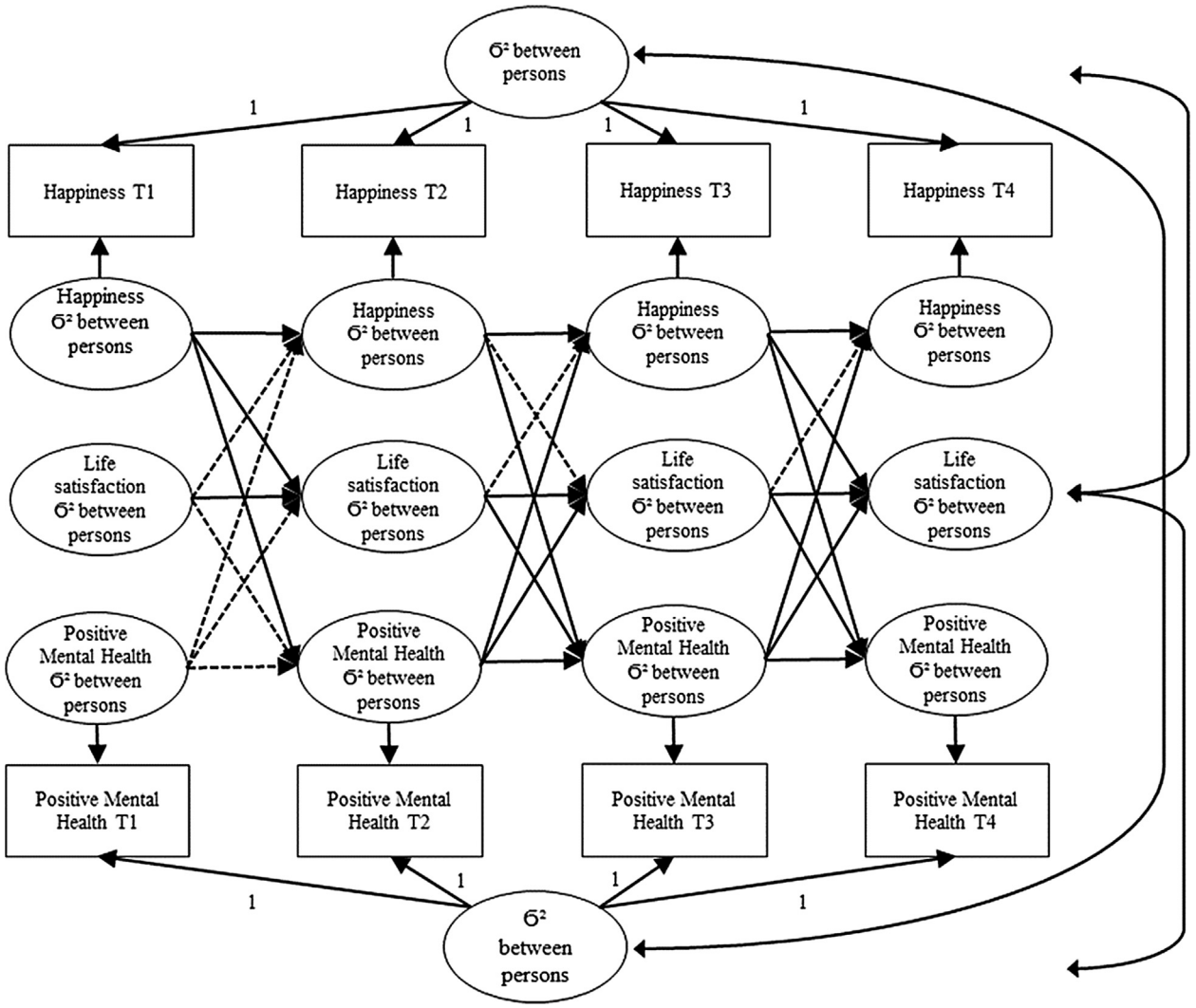

Fig. 1. A simplified random intercept cross-lagged panel model of happiness, life satisfaction and positive mental (RI-CLPM). Non-dotted arrows indicate significant paths, dotted arrows indicate non-significant paths. The conceptual depiction for the SWLS is not complete for purposes of clarity. Details on the computation can be found in Hamaker et al. (2015).

model against models in which the autoregressive paths or the cross-lagged paths were constrained to be equal over time. Model comparisons were conducted by a χ^2-difference test. All analyses were conducted with the software program R and the package LAVAAN (Rosseel, 2012).

3. Results

3.1. Descriptive statistics

Means, standard deviations, skewness, kurtosis of the sum scores and internal consistencies for each scale at each measurement point are displayed in Table 2, and correlations between the sumscores for all measurement points are reported in Table 3. None of the sum scores exhibited relevant skewness (>3) or kurtosis (>8) (Kline, 2011). The internal consistency for the SHS was at least acceptable ($\alpha > 0.7$), for the SWLS the internal consistency was at least good ($\alpha > 0.8$) and for the PMH-scale the internal consistency was excellent ($\alpha > 0.9$) for all measurement points. The correlations among the sum scores of each scale were all in the expected direction (see Table 3).

3.2. Factorial validity of the scales

3.2.1. Subjective happiness scale

The unidimensional models for the SHS are displayed in Table 4. The proposed unidimensional model of the SHS showed an acceptable model fit; merely the upper bound of the confidence interval of the RMSEA exceeded the recommended cut-off value of 0.08. All factor loadings for all four measurement points were above 0.4, except for Item 4 at timepoint 3 and timepoint 4 ($\lambda = 0.29$ and $\lambda = 0.38$, see Appendix for the factor loadings for the scales). Regarding LMI, the configural model of the SHS yielded a good fit, implying that the configural invariance assumption holds. In the next steps, factor loadings and intercepts were constrained to be equal across measurement occasions. The model fits were good, the drop in the CFI did not exceed 0.01 and the increase in the RMSEA was not higher than 0.015. Therefore, weak and strong measurement invariance of the SHS could be established.

3.2.2. Satisfaction with life scale

The unidimensional models and additional model specifications for the SWLS are displayed in Table 5. The fit of the unidimensional model of the SWLS was not acceptable at all measurement points, as indicated by RMSEA. Modification indices indicated correlated error terms between Item 4 and Item 5 ("If I could live my life over, I would change almost nothing.") for the unidimensional model at each measurement occasion.[3] After allowing these items to correlate, model fit improved substantially. Factor loadings for all items were above 0.5. In testing for LMI, the configural and weak invariance assumptions for the SWLS were supported, the model is showing a good fit. Next, strong invariance was tested, and the drop in the CFI was larger than the proposed cut-off. Therefore, modification indices were used to identify items that were tested for partial strong measurement invariance. Releasing the constraint of intercepts of Items 4 and 5 lead to partial strong measurement invariance, the ΔCFI was smaller than 0.01 and the ΔRMSEA smaller than 0.015.

3.2.3. Positive mental health scale

The unidimensional models and additional model specifications for the PMH-scale are displayed in Table 6. Again initial fit was poor, indicated by RMSEA values exceeding 0.08. Inspecting the modification indices, a residual correlation between Item 1 and Item 2 was added to the models at each measurement occasion.[4] With this addition, model fit improved to an acceptable level. Modification indices still indicated misspecification but because of parsimony and no theoretical justification for releasing more correlated residuals, the unidimensional model of the PMH-scale was tested for LMI. The configural, weak and strong invariance model exhibit a good fit. The ΔCFI was smaller than 0.01 and ΔRMSEA was smaller than 0.015 at all steps.

3.3. Random intercept cross-lagged panel analysis

In the first phase of the cross-lagged analysis a model without any constrained paths was estimated. This model had an acceptable fit to the data (χ^2 (2431) = 11923.968, $p < .001$, CFI = 0.945, RMSEA = 0.030, CI (0.029, 0.030), SRMR = 0.037). In the second phase a model that included constrained autoregressive effects was estimated and compared to the unconstrained model. This more complex model also fit the data well: χ^2 (2437) = 11983.838, $p < .001$, CFI = 0.945, RMSEA = 0.030, CI (0.029, 0.030), SRMR = 0.037. Critically, the χ^2-difference test indicated that the constrained model fit the data significantly worse than the unconstrained model: $\Delta\chi^2$ (6) = 59.87, $p < .001$. Furthermore, a model with constrained cross-lagged paths was estimated and compared to the unconstrained model. This model fit the data well (χ^2 (2449) = 11997.033, $p < .001$, CFI = 0.945, RMSEA = 0.030, CI (0.029, 0.030), SRMR = 0.038), but the χ^2-difference test was significant indicating a deterioration in fit: $\Delta\chi^2$ (18) = 73.07, $p < .001$. The unconstrained random intercept cross-lagged panel model is depicted in Fig. 1 and the model estimates are presented in Table 7.

The between-person correlations between the random intercept factors of SHS, SWLS and PMH-scale were high indicating that individuals who are happy are more satisfied with life and exhibit more positive mental health (b^* = 0.816 and b^* = 0.892, both $p \leq .001$). Individuals with high scores on life satisfaction have higher scores on positive mental health (b^* = 0.719).

The autoregressive effects (within-person stability) for SHS and SWLS were all weak-to-moderate ranging from 0.272 to 0.466 (SHS) and 0.054 to 0.113 (SWLS) respectively. The autoregressive effects for the PMH-Scale were not significant from T1 to T2. For the SHS, these autoregressive effects were also the largest effects in the model. Thus, happiness is best predicted from the same variable from the previous time point (SHS at first year is the best predictor for SHS one year later). However, the pattern was different for the SWLS and PMH-Scale. Here, lagged effects were weaker than the cross-lagged effects of these variables.

Generally, the cross-lagged effects (within-person) were weaker, and not entirely stable across the different measurement points (see Table 7). Happiness scores were the best predictors, showing significant, positive regressions on all later measures of positive mental health and SWLS, except for the prediction of SWLS at the third measurement point. Positive mental health positively predicted SHS and SWLS at the third and fourth measurement point. SWLS showed the overall weakest relations to the other measures and could not predict happiness at all.

The covariances between the latent variables at the same measurement point were moderate to high. They ranged from 0.432

[3] There is consistent evidence of a wording effect of Item 4 ("So far I have gotten the important things I want in life") and 5 ("If I could live my life over, I would change almost nothing."; Bai, Wu, Zheng, & Ren, 2011; Clench-Aas, Nes, Dalgard, & Aaro, 2011). Item 4 and 5 are phrased similarly and with regards to content focus on the satisfaction of one's achievement in lives.

[4] The Items 1 ("I am often carefree and in good spirits") and 2 ("I enjoy my life") have the common theme of enjoyment, to live one's life with ease.

Table 3
Correlations for SHS, SWLS and PMH-scale for all measurement occasions.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) SHS_T1	–	0.444	0.545	0.428	0.316	0.382	0.322	0.232	0.286	0.312	0.239	0.299
(2) SWLS_T1		–	0.465	0.245	0.248	0.316	0.251	0.320	0.102	0.230	0.274	0.234
(3) PMH-scale_T1			–	0.318	0.298	0.417	0.260	0.243	0.278	0.253	0.209	0.311
(4) SHS_T2				–	0.567	0.611	0.348	0.234	0.379	0.326	0.235	0.307
(5) SWLS_T2					–	0.593	0.316	0.381	0.269	0.311	0.363	0.306
(6) PMH-scale_T2						–	0.353	0.302	0.408	0.344	0.319	0.405
(7) SHS_T3							–	0.532	0.475	0.409	0.349	0.378
(8) SWLS_T3								–	0.380	0.306	0.436	0.357
(9) PMH-scale_T3									–	0.359	0.292	0.459
(10) SHS_T4										–	0.530	0.651
(11) SWLS_T4											–	0.538
(12) PMH-scale_T4												–

Note. All correlations were significant, p < .001.

Table 4
Summary of fit indices from CFA and invariance analyses across measurement occasions for the SHS.

Model – SHS	χ^2 (*df*)	RMSEA, [90% CI]	CFI	SRMR	ΔCFI	ΔRMSEA
Single group CFA-original one factor model						
SHS_T1	34.785 (2)	0.061 [0.044, 0.080]	0.992	0.012		
SHS_T2	48.079 (2)	0.076 [0.058, 0.095]	0.992	0.008		
SHS_T3	45.763 (2)	0.078 [0.060, 0.099]	0.993	0.011		
SHS_T4	26.943 (2)	0.074 [0.051, 0.100]	0.995	0.014		
LMI						
Configural	346.616 (94)	0.025 [0.022, 0.028]	0.990	0.022		
Weak	465.492 (1 0 3)	0.028 [0.026, 0.031]	0.985	0.036	0.005	0.003
Strong	648.991 (1 1 2)	0.033 [0.031, 0.035]	0.978	0.039	0.007	0.008

Note. SHS = Subjective Happiness Questionnaire; All χ^2- tests and $\Delta\chi^2$ were significant, $p < .001$; λ_4 = "Some people are generally not very happy. Although they are not depressed, they never seem as happy as they might be. To what extend does this characterization describe you?"; λ_3 = "Some people are generally very happy. They enjoy life regardless of what is going on, getting the most out of everything. To what extent does this characterization describe you?".

Table 5
Summary of fit indices from CFA and invariance analyses across measurement occasions for the SWLS.

Model – SWLS	χ^2 (*df*)	RMSEA, [90% CI]	CFI	SRMR	ΔCFI	ΔRMSEA
Single group CFA-original one factor model						
SWLS_T1	240.060 (5)	0.103 [0.092, 0.115]	0.979	0.027		
SWLS_T1 ($\Theta_{4,5}$ free)	69.761 (4)	0.061 [0.049, 0.074]	0.994	0.01		
SWLS_T2	423.382 (5)	0.145 [0.133, 0.157]	0.966	0.035		
SWLS_T2 ($\Theta_{4,5}$ free)	26.237 (4)	0.037 [0.025, 0.052]	0.998	0.007		
SWLS_T3	395.738 (5)	0.148 [0.136, 0.161]	0.97	0.036		
SWLS_T3 ($\Theta_{4,5}$ free)	8.311 (4)	0.017 [0.006, 0.034]	1.00	0.003		
SWLS_T4	334.616 (5)	0.170 [0.155, 0.186]	0.963	0.036		
SWLS_T4 ($\Theta_{4,5}$ free)	10.271 (4)	0.026 [0.006, 0.047]	0.999	0.004		
LMI						
Configural	653.135 (1 5 6)	0.027 [0.025, 0.029]	0.990	0.033		
Weak	756.676 (1 6 8)	0.028 [0.026, 0.030]	0.988	0.039	0.002	0.001
Strong	1596.422 (1 8 0)	0.042[0.040, 0.044]	0.971	0.043	0.016	0.014
Partial strong						
$T_{5\ free}$	1388.816 (1 7 7)	0.039[0.038, 0.039]	0.975	0.042	0.013	0.011
$T_{4\ free}$	923.893 (1 7 4)	0.031[0.029, 0.033]	0.984	0.039	0.004	0.003

Note. SWLS = Satisfaction With Life Scale;; All χ^2- tests and $\Delta\chi^2$ were significant, $p < .001$; Item 4 = "So far I have gotten the important things I want in life." ; Item 5 = "If I could live my life over, I would change almost nothing." .

(SHS T2 with SWLS T4) to 0.719 (SHS T1 with SWLS T2). The significant regression weights of the cross-lagged paths ranged from 0.069 (PMH-scale T2 to SHS T3) to 0.244 (SHST1 to PMH-scale T2). These results suggest that there are small to moderate reciprocal effects between SHS, SWLS and PMH-scale.

4. Discussion

The aim of the present study was first to test the unidimensional structure and LMI of the scales assessing happiness, life satisfaction and positive mental health in a large sample of Chinese college students over four measurement points. Given at least weak LMI, a four-wave random intercept cross-lagged panel model was applied to the data and reciprocal associations were tested. This type of analysis provides a unique opportunity to show the temporal order of the relationships between these central positive constructs and to disentangle the between-person variance from the within-person variance. Our findings give overall support for the longitudinal validity of the measurement models for these three scales and show that there are in fact reciprocal relationships between happiness, life-satisfaction and positive mental health over time. Happiness emerged as the overall strongest predictor of the other constructs for the first timepoint, while positive mental health and satisfaction with life were less potent predictors. Contrary to our expectations, the lagged effects of life satisfaction and positive mental health were weak and not all cross-lagged

Table 6
Summary of Fit Indices from CFA and Invariance Analyses across Measurement Occasions for the PMH-scale.

Model – PMH-scale	χ^2 (*df*)	RMSEA, [90% CI]	CFI	SRMR	ΔCFI	ΔRMSEA
Single group CFA-original one factor model						
PMH_T1	1290.922 (27)	0.103 [0.090, 0.100]	0.938	0.040		
PMH-scale_T1 ($\Theta_{1,2}$ free)	848.034 (26)	0.085 [0.080, 0.090]	0.960	0.032		
PMH_T2	1541.103 (27)	0.119 [0.114, 0.124]	0.932	0.038		
PMH-scale_T2 ($\Theta_{1,2}$ free)	1046.118 (26)	0.099 [0.094, 0.104]	0.954	0.031		
PMH_T3	1240.359 (27)	0.112 [0.107, 0.118]	0.953	0.028		
PMH-scale_T3 ($\Theta_{1,2}$ free)	672.811 (26)	0.084 [0.078, 0.085]	0.975	0.022		
PMH-scale_T4	422.453 (27)	0.080 [0.074, 0.087]	0.971	0.023		
PMH-scale_T4 ($\Theta_{1,2}$ free)	338.365 (26)	0.073 [0.066, 0.080]	0.977	0.021		
LMI						
Configural	4056.324 (5 7 5)	0.037 [0.036, 0.038]	0.960	0.023		
Weak	4243.741 (6 0 2)	0.037 [0.036, 0.038]	0.958	0.025	-0.002	0.000
Strong	5177.314 (6 2 6)	0.041[0.040, 0.042]	0.948	0.032	-0.01	0.004

Note. PMH-scale = Positive Mental Health Scale; All χ^2- tests and $\Delta\chi^2$ were significant, $p < .001$; Item 1 = "I enjoy my life."; Item 2 = "I often feel relaxed and happy."

Table 7
Cross-lagged and stability effects of happiness, life satisfaction and positive mental health.

	b	SE	ß	95%CI
Cross-lagged effects				
Happiness T1 → Life Satisfaction T2	0.281	0.037	0.226***	0.169–0.283
Happiness T1 → Positive Mental Health T2	0.131	0.016	0.241***	0.185–0.297
Life Satisfaction T1 → Happiness T2	−0.023	0.023	−0.023	−0.087–0.016
Life Satisfaction T1 → Positive Mental Health T2	0.040	0.011	0.089	0.041–0.137
Positive Mental Health T1 → Happiness T2	−0.086	0.063	−0.036	−0.209–0.038
Positive Mental Health T1 → Life Satisfaction T2	0.128	0.070	0.051	−0.004–0.105
Happiness T2 → Life Satisfaction T3	0.023	0.038	0.021	−0.045–0.087
Happiness T2 → Positive Mental Health T3	0.040	0.015	0.085**	0.022–0.148
Life Satisfaction T2 → Happiness T3	0.049	0.030	0.055	−0.011–0.121
Life Satisfaction T2 → Positive Mental Health T3	0.063	0.015	0.144***	0.076–0.211
Positive Mental Health T2 → Happiness T3	0.140	0.070	0.069*	0.000–0.137
Positive Mental Health T2 → Life Satisfaction T3	0.290	0.086	0.120**	0.122–0.459
Happiness T3 → Life Satisfaction T4	0.122	0.042	0.108**	0.034–0.182
Happiness T3 → Positive Mental Health T4	0.058	0.017	0.129**	0.056–0.202
Life Satisfaction T3 → Happiness T4	−0.007	0.028	−0.009	−0.007–0.058
Life Satisfaction T3 → Positive Mental Health T4	0.037	0.013	0.098**	0.028–0.167
Positive Mental Health T3 → Happiness T4	0.248	0.069	0.127***	0.058–0.196
Positive Mental Health T3 → Life Satisfaction T4	0.418	0.083	0.184***	0.113–0.255
Lagged effects				
Happiness T1 → Happiness T2	0.546	0.035	0.466***	0.412–0.520
Happiness T2 → Happiness T3	0.255	0.033	0.272***	0.204–0.341
Happiness T3 → Happiness T4	0.327	0.038	0.340***	0.266–0.413
Life Satisfaction T1 → Life satisfaction T2	0.056	0.027	0.054*	0.003–0.105
Life Satisfaction T2 → Life Satisfaction T3	0.119	0.039	0.113**	0.041–0.183
Life Satisfaction T3 → Life Satisfaction T4	0.106	0.034	0.112**	0.041–0.184
Positive Mental Health T1 → Positive Mental Health T2	0.049	0.031	0.045	−0.011–0.010
Positive Mental Health T2 → Positive Mental Health T3	0.116	0.035	0.115**	0.046–0.184
Positive Mental Health T3 → Positive Mental Health T4	0.197	0.033	0.219***	0.148–0.289

Standardized coefficients and standardized confidence interval.
*** $p \leq 0.001$.
** $p \leq 0.01$.
* $p < .05$.

paths between the three constructs were significant, demonstrating different relationships among the constructs over time. Furthermore, happiness had a higher within-person stability over time than life satisfaction and positive mental health. We will discuss each of these findings in turn before mentioning several limitations and drawing general conclusions.

4.1. Findings on LMI

The validity of the scales was supported by the results of separate confirmatory factor analyses for each measurement point. For all scales, a model with one latent factor showed a good fit to the data, at least after minor adaptions in form of correlated error terms of the model. Looking at the individual scales, for the SHS only the factor loadings of Item 4 ("Some people are generally not very happy. Although they are not depressed, they never seem as happy as they might be. To what extent does this characterization describe you?") were below the recommended threshold of 0.4. This item showed the lowest loadings also in other validity studies (Extremera & Berrocal, 2013; Jovanovic & Zuljevic, 2013; Moghnie & Kazarian, 2012). The reverse wording and ambigous content of Item 4 seems to be generally problematic to understand and to answer (O'Connor, Crawford, & Holder, 2015). The results of the first testing of the LMI analyses showed that the SHS is strong measurement invariant: means across time could be meaningfully compared. Thus, the SWLS seems to show a limited use for cross-cultural comparisons but is very well applicable for longitudinal comparisons (Bieda et al., 2017). For the SWLS, we had to include

an additional correlation between Item 4 (“So far I have gotten the important things I want in life”) and Item 5 (“If I could live my life over, I would change almost nothing.”). In previous studies, Item 4 and Item 5 also showed a wording effect, low factor loadings and measurement non-invariance (Oishi, 2006; Whisman & Judd, 2016; Zanon, Bardagi, Layous, & Hutz, 2014). However, these studies focused on cross-cultural comparisons. Only one other study has tested the LMI of the SWLS. Wu et al. (2009) found partial strong measurement invariance in student samples over a time period of six months. Our study extends this time period, whereby the SWLS showed partially strong LMI over the four years. The intercepts of Item 4 and Item 5 were not invariant over time. Thus, students respond to the items in an unstable way over time. Life as a student is a very demanding and quickly changing period of life, and important attainments in life cannot be judged in a stable way. The PMH-scale, measuring positive mental health, showed satisfactory psychometric properties. A residual correlation of Item 1 (“I am often carefree and in good spirits.”) with Item 2 (“I enjoy my life.”) existed. The constraint was released with regard to item content referring to enjoyment of life. Since the scale is originally German, it could be that the Chinese translation does not distinguish as clearly between personal ascription of a cheerful personality and the attitude how the person encounters life. Regarding measurement invariance, strong LMI for the PMH-scale could be established, which replicates and extends the results from Lukat and colleagues (Lukat et al., 2016).

4.2. Relationships between happiness, life satisfaction and positive mental health

In the subsequent random intercept cross-lagged panel analysis, significant lagged (within-person stability) effects and significant cross-lagged (within-person correlations) effects were found. Despite the significant lagged paths that indicate within-person stability over time of the constructs of happiness, life satisfaction and positive mental health, the presence of significant cross-lagged effects indicated that the constructs are interrelated on a within-person level. Two aspects are noteworthy. First, the between-person correlation, the significant lagged and cross-lagged effects observed were generally positive. The positive between- and within-person relations between happiness, life satisfaction and positive mental health are in line with basic assumptions derived from Frederickson‘s broaden-and-build theory (Fredrickson, 2001): if individuals experience positive emotions, they think and act more openly, engage in approach behavior, take on more opportunities, and, consequently, experience life in general more positively. In turn, these positive experiences contribute to future happiness, leading to an upward spiral of positive emotions and experiences. In our study, over time higher levels of happiness, life satisfaction and positive mental health led to higher levels of happiness, life satisfaction and positive mental health one year later. Second, contrary to our expectations, happiness was a stronger cross-lagged predictor of satisfaction and positive mental health in the first year of studies than vice versa. The beginning of studies is a challenging time; even if one is satisfied with life and in positive mental health, it is not guaranteed that this will lead to positive affect in the second year of studies. A closer look reveals that happiness and positive mental health have a reciprocal relationship over time, however, such a relationship between happiness and life satisfaction does not exist. Furthermore, over time, there is a positive predicted course of life satisfaction and positive mental health. On the balance, being happy at the beginning of studies was shown to directly promote life satisfaction and positive mental health one year later. Since recruitment took place within the first month of studies, early experiences may have already had an impact on very affective measures while more reflective measures such as satisfaction and positive mental health do not pick up on such short-term changes.

In many previous studies, happiness was used a predictor which we also confirmed in this study (Coffey et al., 2015; Martínez-Martí & Ruch, 2016). Furthermore, the results showed that investigating life satisfaction and positive mental health exclusively as an outcome falls short. Life satisfaction had a significant lagged effect on positive mental health at later measurement occasions.

At each time point all constructs covaried, thus the constructs are related. However, the covariances did not exceed 0.75 which in turn underlines the separability of the constructs and their significance in the area of general well-being. This finding fits the broaden-and-build theory and other well-being theories that postulate that there are several inter-related positive constructs, but that these constructs are distinguishable (Fredrickson, 2001; Keyes, 2002).

Regarding stability, against our expectations, happiness had the highest within-person stability paths. This means that happiness is relatively stable in Chinese students. Life satisfaction and positive mental health, on the other hand, had a lower within-person stability coefficient, which indicates a more variance in satisfaction with life and positive mental health over four years in Chinese students. This finding shows that presumed “state” measures such as happiness can be reliably applied in longitudinal studies and can be even more stable than the presumed “trait” measures, such as satisfaction with life and positive mental health. Cognitive judgements regarding life satisfaction and positive mental health can vary because of the challenging and demanding circumstances in students’ private or work lives in this phase.

The present findings offer potential practical implications. Clinical interventions which focus on positive affect and mental health are needed given the high prevalence rates of depression and anxiety disorders among students. Due to the high interrelations among the constructs, it can be assumed that a specific intervention to enhance happiness will also influence an individual’s life satisfaction and positive mental health later. Happiness could be used as an early marker to indicate the success of an intervention, whereas positive mental health and satisfaction with life may be measures that only pick up on the effect of interventions at a later point in time. Vice versa, cognitive interventions to enhance life satisfaction will also lead to increased positive affect later. As happiness was the strongest predictor, especially in the first year of studies, interventions should focus on enhancing positive affect. Given the mixed effects of significant and non-significant paths in the model, at least two well-being measures should be included when determining longitudinal overall well-being.

It is important to acknowledge several limitations when interpreting the results. Not all respondents participated at all measurement occasions, and happiness and life satisfaction were associated with dropout. Unhappier people were more likely to dropout, however, those who dropped out reported more satisfaction with life than completers. Regarding sociodemographic data, non-completers were more likely to be married, were older and had a higher socioeconomic background. Even though they were not as happy as the completers, they reported more stable and financially higher living conditions, evaluating those as more positive. Second, students are often insecure about the future (Saw, Berenbaum, & Okazaki, 2013). This could also explain why life satisfaction was a more time-variant predictor than happiness. Cognitive judgement about one‘s life at the beginning of studies or generally at a younger age is not as stable as positive affect. Third, it is possible that also other positive factors – which were not addressed in this study – have reciprocal associations with

happiness, life satisfaction and positive mental health. Thus the mechanics underlying the effects remain unclear. Other processes between measurement occasions may have influenced the associations between the constructs. Resilience, self-efficacy or optimism could be possible mediators that might have influenced the results and could reduce causal conclusions (Antonakis, Bendahan, Jacquart, & Lalive, 2010; Schönfeld, Brailovskaia, Bieda, Zhang, & Margraf, 2016). Fourth, the results are limited to the specific operationalizations of happiness, life satisfaction and positive mental health within this study. Fifth, China has an educational system with very high academic pressure. Even if one fifth of the world's student population is studying in China, the results should be replicated in a cross-cultural framework (Chu, Khan, Jahn, & Kraemer, 2015). Last but not least, data collection took place in a classroom situation. Due to the self-report nature of the administered measures, their validity might be somewhat compromised, for example, by socially desirable responding.

4.3. Conclusion

The study provides first insights into the reciprocal relationships between happiness, life satisfaction and positive mental health over time. We found that these constructs can be measured over time with very efficient unidimensional scales. Furthermore, we confirmed the general idea of an upward spiral between these constructs and showed that happiness compared to life satisfaction and positive mental health may be an early marker for positive change in the critical period in students' lifes. We hope that these findings provide useful evidence for developing and evaluating interventions that aim at increasing and promoting well-being and mental health.

Author contributions

Conceived and designed the experiments: AB JM. Performed the experiments: AB GH JM. Analyzed the data: AB GH. Wrote the paper: AB GH PS JB ML JM.

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Appendix A

Standardized factor loadings from single-group CFAs over four measurement occasions for the SHS.

	Time point 1	Time point 2	Time point 3	Time point 4
Item 1	0.69	0.75	0.78	0.83
Item 2	0.7	0.77	0.76	0.83
Item 3	0.56	0.68	0.85	0.9
Item 4	0.51	0.51	0.33	0.4

Standardized factor loadings from single-group CFAs over four measurement occasions for the SWLS

	Time point 1	Time point 2	Time point 3	Time point 4
Item 1	0.74	0.81	0.85	0.87
Item 2	0.91	0.92	0.93	0.93
Item 3	0.88	0.87	0.92	0.91
Item 4	0.7	0.7	0.74	0.77
Item 5	0.5	0.63	0.62	0.67

Standardized factor loadings from single-group CFAs over four measurement occasions for the PMH

	Time point 1	Time point 2	Time point 3	Time point 4
Item 1	0.63	0.69	0.84	0.77
Item 2	0.71	0.78	0.88	0.82
Item 3	0.78	0.8	0.85	0.79
Item 4	0.74	0.77	0.87	0.78
Item 5	0.73	0.8	0.89	0.82
Item 6	0.8	0.78	0.89	0.81
Item 7	0.76	0.78	0.89	0.8
Item 8	0.74	0.77	0.89	0.79
Item 9	0.51	0.59	0.77	0.65

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jrp.2018.11.012.

References

Aldinger, M., Stopsack, M., Ulrich, I., Appel, K., Reinelt, E., Wolff, S., ... Barnow, S. (2014). Neuroticism developmental courses-implications for depression, anxiety and everyday emotional experience; a prospective study from adolescence to young adulthood. *BMC Psychiatry, 14*(1), 210.

Alonso, J., Angermeyer, M. C., Bernert, S., Bruffaerts, R., Brugha, T. S., Bryson, H., ... EsemeD/Mhedea Investigators, E. S. o. t. E. o. M. D. P. (2004). Prevalence of mental disorders in Europe: results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) project. Acta Psychiatrica Scandinavica Supplementum (420), 21–27. doi: 10.1111/j.1600-0047.2004.00327.x.

Antonakis, J., Bendahan, S., Jacquart, P., & Lalive, R. (2010). On making causal claims: A review and recommendations. *The Leadership Quarterly, 21*(6), 1086–1120. https://doi.org/10.1016/j.leaqua.2010.10.010.

Anusic, I., & Schimmack, U. (2016). Stability and change of personality traits, self-esteem, and well-being: Introducing the meta-analytic stability and change model of retest correlations. *Journal of Personality and Social Psychology, 110*(5), 766–781. https://doi.org/10.1037/pspp0000066.

Argyle, M., Martin, M., & Crossland, J. (1989). Happiness as a function of personality and social encounters. In J. P. Forgas & M. Innes (Eds.), Recent advances in social psychology: an international perspective. North Holland.

Azizli, N., Atkinson, B. E., Baughman, H. M., & Giammarco, E. A. (2015). Relationships between general self-efficacy, planning for the future, and life satisfaction. *Personality and Individual Differences, 82*, 58–60. https://doi.org/10.1016/j.paid.2015.03.006.

Bai, X. W., Wu, C. H., Zheng, R., & Ren, X. P. (2011). The psychometric evaluation of the satisfaction with life scale using a nationally representative sample of China. *Journal of Happiness Studies, 12*(2), 183–197. https://doi.org/10.1007/s10902-010-9186-x.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*(2), 238–246.

Beutel, M. E., Junger, C., Klein, E. M., Wild, P., Lackner, K. J., Blettner, M., ... Brahler, E. (2016). Depression, anxiety and suicidal ideation among 1(st) and 2(nd) generation migrants – Results from the Gutenberg health study. *BMC Psychiatry, 16*(1), 288. https://doi.org/10.1186/s12888-016-0995-2.

Bieda, A., Hirschfeld, G., Schonfeld, P., Brailovskaia, J., Zhang, X. C., & Margraf, J. (2017). Universal happiness? Cross-cultural measurement invariance of scales assessing positive mental health. *Psychological Assessment, 29*(4), 408–421. https://doi.org/10.1037/pas0000353.

Blanco, C., Okuda, M., Wright, C., Hasin, D. S., Grant, B. F., Liu, S. M., & Olfson, M. (2008). Mental health of college students and their non-college-attending peers: Results from the National Epidemiologic Study on Alcohol and Related

Conditions. *Archives of General Psychiatry, 65*(12), 1429–1437. https://doi.org/10.1001/archpsyc.65.12.1429.
Bradburn, N. M. (1969). *The structure of psychological well-being*. Oxford, England: Aldine.
Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of Cross-Cultural Psychology, 1*(3), 185–216. https://doi.org/10.1177/135910457000100301.
Brown, J., Bowling, A., & Flynn, T. (2004). Models of Quality of Life: A Taxonomy, Overview and Systematic Review of the Literature. In C. Department of Primary & U. C. L. R. F. C. R. H. S. L. N. W. P. F. Population Sciences (Eds.), (pp. 102). London: European Forum on Population Ageing Research/European Group on Quality of Life Extending quality of life in old age (EQUAL) (Walker 2002).
Byrne, R. M. (1989). Suppressing valid inferences with conditionals. *Cognition, 31*(1), 61–83.
Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14*(3), 464–504. https://doi.org/10.1080/10705510701301834.
Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*(2), 233–255. https://doi.org/10.1207/S15328007sem0902_5.
Chou, K. L., & Chi, I. (1999). Determinants of life satisfaction in Hong Kong Chinese elderly: A longitudinal study. *Aging & Mental Health, 3*(4), 328–335. https://doi.org/10.1080/13607869956109.
Chu, J. J., Khan, M. H., Jahn, H. J., & Kraemer, A. (2015). Only-child status in relation to perceived stress and studying-related life satisfaction among university students in China: A comparison with international students. *PLoS One, 10*(12), e0144947. https://doi.org/10.1371/journal.pone.0144947.
Chui, W. H., & Wong, M. Y. H. (2016). Gender differences in happiness and life satisfaction among adolescents in Hong Kong: relationships and self-concept. *Social Indicators Research, 125*(3), 1035–1051. https://doi.org/10.1007/s11205-015-0867-z.
Clench-Aas, J., Nes, R. B., Dalgard, O. S., & Aaro, L. E. (2011). Dimensionality and measurement invariance in the Satisfaction with Life Scale in Norway. *Quality of Life Research, 20*(8), 1307–1317. https://doi.org/10.1007/s11136-011-9859-x.
Coffey, J. K., Warren, M. T., & Gottfried, A. W. (2015). Does infant happiness forecast adult life satisfaction? Examining subjective well-being in the first quarter century of life. *Journal of Happiness Studies, 16*(6), 1401–1421.
de Rivera, J., Possell, L., Verette, J. A., & Weiner, B. (1989). Distinguishing elation, gladness, and joy. *Journal of Personal and Social Psychology, 57*(6), 1015–1023.
Datu, J. A. D., & King, R. B. (2016). Prioritizing positivity optimizes positive emotions and life satisfaction: A three-wave longitudinal study. *Personality and Individual Differences, 96*, 111–114. https://doi.org/10.1016/j.paid.2016.02.069.
Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13.
Eid, M., & Diener, E. (2004). Global judgments of subjective well-being: Situational variability and long-term stability. *Social Indicators Research, 65*(3), 245–277. https://doi.org/10.1023/B:SOCI.0000003801.89195.bc.
Eldeleklioglu, J. (2015). Predictive effects of subjective happiness, forgiveness, and rumination on life satisfaction. *Social Behavior and Personality, 43*(9), 1563–1574. https://doi.org/10.2224/sbp.2015.43.9.1563.
Extremera, N., & Berrocal, P. (2013). Fernández-Inteligencia emocional en adolescentes [Emotional intelligence in adolescents]. Padres y Maestros. 352 SRC – GoogleScholar, 34–39.
Ford, J. K., Maccallum, R. C., & Tait, M. (1986). The application of exploratory factor-analysis in applied-psychology – A critical-review and analysis. *Personnel Psychology, 39*(2), 291–314. https://doi.org/10.1111/j.1744-6570.1986.tb00583.x.
Fredrickson, B. L. (2001). The role of positive emotions in positive psychology. The broaden-and-build theory of positive emotions. *American Psychologist, 56*(3), 218–226.
Fydrich, T., Geyer, M., Hessel, A., Sommer, G., & Brähler, E. (1999). Fragebogen zur Sozialen Unterstützung (F-SozU): Normierung an einer repräsentativen Stichprobe. *Diagnostica, 45*(4), 212–216. https://doi.org/10.1026//0012-1924.45.4.212.
Glaesmer, H., Grande, G., Braehler, E., & Roth, M. (2011). The German version of the Satisfaction with Life Scale (SWLS): Psychometric properties, validity, and population-based norms. *European Journal of Psychological Assessment, 27*(2 SRC – GoogleScholar), 127–132.
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.
Hengartner, M. P., Ajdacic-Gross, V., Wyss, C., Angst, J., & Rössler, W. (2016). Relationship between personality and psychopathology in a longitudinal community study: A test of the predisposition model. *Psychological Medicine, 46*(8), 1693–1705. https://doi.org/10.1017/S0033291716000210.
Hirschfeld, G., & von Brachel, R. (2014). Multiple-Group confirmatory factor analysis in R-A tutorial in measurement invariance with continuous and ordinal indicators. *Practical Assessment, Research and Evaluation, 19*(7), 2.
Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118.
Iani, C., Rubichi, S., Ferraro, L., Nicoletti, R., & Gallese, V. (2013). Observational learning without a model is influenced by the observer's possibility to act: Evidence from the Simon task. *Cognition, 128*(1), 26–34. https://doi.org/10.1016/j.cognition.2013.03.004.
Iani, L., Lauriola, M., Layous, K., & Sirigatti, S. (2014). Happiness in Italy: translation, factorial structure and norming of the subjective happiness scale in a large community sample. *Social Indicators Research, 118*(3), 953–967. https://doi.org/10.1007/s11205-013-0468-7.
Jovanovic, V., & Zuljevic, D. (2013). Psychometric evaluation of the serbian version of the multidimensional Students' Life Satisfaction Scale. *Social Indicators Research, 110*(1), 55–69. https://doi.org/10.1007/s11205-011-9916-4.
Kaczmarek, L. D., Bujacz, A., & Eid, M. (2015). Comparative latent state-trait analysis of satisfaction with life measures: The Steen Happiness index and the Satisfaction with Life Scale. *Journal of Happiness Studies, 16*(2), 443–453. https://doi.org/10.1007/s10902-014-9517-4.
Keyes, C. L. (2002). The mental health continuum: From languishing to flourishing in life. *Journal of Health and Social Behavior, 43*(2), 207–222.
Keyes, C. L. (2007). Promoting and protecting mental health as flourishing: A complementary strategy for improving national mental health. *American Psychologist, 62*(2), 95–108. https://doi.org/10.1037/0003-066X.62.2.95.
Kjell, O. N. E., Daukantaite, D., Hefferon, K., & Sikstrom, S. (2016). The harmony in life scale complements the satisfaction with life scale: Expanding the conceptualization of the cognitive component of subjective well-being. *Social Indicators Research, 126*(2), 893–919. https://doi.org/10.1007/s11205-015-0903-z.
Kline, R. B. (2011). *Principles and Practice of Structural Equation*. Modeling: Guilford Press.
Kokko, K., Korkalainen, A., Lyyra, A. L., & Feldt, T. (2013). Structure and continuity of well-being in mid-adulthood: A longitudinal study. *Journal of Happiness Studies, 14*(1), 99–114. https://doi.org/10.1007/s10902-011-9318-y.
Kong, F., Ding, K., & Zhao, J. J. (2015). The relationships among gratitude, self-esteem, social support and life satisfaction among undergraduate students. *Journal of Happiness Studies, 16*(2), 477–489. https://doi.org/10.1007/s10902-014-9519-2.
Lambert D'raven, L. T., Moliver, N., & Thompson, D. (2015). Happiness intervention decreases pain and depression, boosts happiness among primary care patients. *Primary Health Care Research and Development, 16*(2), 114–126. https://doi.org/10.1017/S146342361300056X.
Lamers, S. M., Westerhof, G. J., Bohlmeijer, E. T., ten Klooster, P. M., & Keyes, C. L. (2011). Evaluating the psychometric properties of the Mental Health Continuum-Short Form (MHC-SF). *Journal of Clinical Psychology, 67*(1), 99–110. https://doi.org/10.1002/jclp.20741.
Lazarus, R. S. (1991). Cognition and motivation in emotion. *American Psychologist, 46*(4), 352–367.
Lin, J. D., Lin, P. Y., & Wu, C. L. (2010). Wellbeing perception of institutional caregivers working for people with disabilities: Use of subjective happiness scale and satisfaction with life scale analyses. *Research in Developmental Disabilities, 31*(5), 1083–1090. https://doi.org/10.1016/j.ridd.2010.03.009.
Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behavioral Research and Therapy, 33*(3), 335–343.
Lü, W., Wang, Z., Liu, Y., & Zhang, H. (2014). Resilience as a mediator between extraversion, neuroticism and happiness, PA and NA. *Personality and Individual Differences, 63*, 128–133. https://doi.org/10.1016/j.paid.2014.01.015.
Lucas, R. E., & Donnellan, M. B. (2007). How stable is happiness? Using the STARTS model to estimate the stability of life satisfaction. *Journal of Research in Personality, 41*(5), 1091–1098. https://doi.org/10.1016/j.jrp.2006.11.005.
Lucas, R. E., & Donnellan, M. B. (2012). Estimating the reliability of single-item life satisfaction measures: Results from four national panel studies. *Social Indicators Research, 105*(3), 323–331. https://doi.org/10.1007/s11205-011-9783-z.
Luhmann, M., Hofmann, W., Eid, M., & Lucas, R. E. (2012). Subjective well-being and adaptation to life events: A meta-analysis. *Journal of Personal and Social Psychology, 102*(3), 592–615. https://doi.org/10.1037/a0025948.
Lukat, J., Becker, E. S., Lavallee, K. L., van der Veld, W. M., & Margraf, J. (2017). Predictors of incidence, remission and relapse of axis I mental disorders in young women: A transdiagnostic approach. *Clinical Psychology and Psychotherapy, 24*(2), 322–331. https://doi.org/10.1002/cpp.2026.
Lukat, J., Margraf, J., Lutz, R., van der Veld, W. M., & Becker, E. S. (2016). Psychometric properties of the positive mental health scale (PMH-scale). *BMC Psychology, 4*, 8. https://doi.org/10.1186/s40359-016-0111-x.
Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin, 131*(6), 803–855.
Lyubomirsky, S., & Lepper, H. S. (1999). A measure of subjective happiness: Preliminary reliability and construct validation. *Social Indicators Research, 46*(2), 137–155. https://doi.org/10.1023/A:1006824100041.
MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling (Vol. 1 SRC – GoogleScholar).
Martínez-Martí, M. L., & Ruch, W. (2016). Character strengths predict resilience over and above positive affect, self-efficacy, optimism, social support, self-esteem, and life satisfaction. *The Journal of Positive Psychology*, 1–10.
Marum, G., Clench-Aas, J., Nes, R. B., & Raanaas, R. K. (2014). The relationship between negative life events, psychological distress and life satisfaction: A population-based study. *Quality of Life Research, 23*(2), 601–611.
McNally, R. J. (2002). Anxiety sensitivity and panic disorder. *Biological Psychiatry, 52*(10), 938–946. https://doi.org/10.1016/S0006-3223(02)01475-0.
Meredith, W. (1993). Measurement invariance, factor-analysis and factorial invariance. *Psychometrika, 58*(4), 525–543. https://doi.org/10.1007/Bf02294825.

Moghnie, L., & Kazarian, S. S. (2012). Subjective happiness of Lebanese college youth in Lebanon: Factorial structure and invariance of the Arabic Subjective Happiness Scale. *Social Indicators Research, 109*(2), 203–210. https://doi.org/10.1007/s11205-011-9895-5.

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

O'Connor, B. P., Crawford, M. R., & Holder, M. D. (2015). An item response theory analysis of the subjective happiness scale. *Social Indicators Research, 124*(1), 249–258. https://doi.org/10.1007/s11205-014-0773-9.

Oishi, S. (2006). The concept of life satisfaction across cultures: An IRT analysis. *Journal of Research in Personality, 40*(4), 411–423. https://doi.org/10.1016/j.irp.2005.02.002.

Oishi, S. (2007). The application of structural equation modeling and item response theory to cross-cultural positive psychology research. *Oxford Handbook of Methods in Positive Psychology*, 126–138.

Pavot, W., & Diener, E. (1993). Review of the satisfaction with life scale. *Psychological Assessment, 5*(2), 164.

Pavot, W., & Diener, E. (2008). The satisfaction with life scale and the emerging construct of life satisfaction. *The Journal of Positive Psychology, 3*(2 SRC – GoogleScholar), 137–152.

Renshaw, T. L., & Cohen, A. S. (2014). Life satisfaction as a distinguishing indicator of college student functioning: further validation of the two-continua model of mental health. *Social Indicators Research, 117*(1), 319–334. https://doi.org/10.1007/s11205-013-0342-7.

Rosseel, Y. (2012). Lavaan: an R package for structural equation modeling. *Journal of Statistical Software, 48*(2), 1–36.

Ryff, C. D., & Singer, B. (1998). The contours of positive human health. *Psychological Inquiry, 9*(1), 1–28. https://doi.org/10.1207/s15327965pli0901_1.

Saw, A., Berenbaum, H., & Okazaki, S. (2013). Influences of personal standards and perceived parental expectations on worry for Asian American and White American college students. *Anxiety Stress Coping, 26*(2), 187–202. https://doi.org/10.1080/10615806.2012.668536.

Schimmack, U., Krause, P., Wagner, G. G., & Schupp, J. (2010). Stability and change of well being: An experimentally enhanced latent state-trait-error analysis. *Social Indicators Research, 95*(1), 19–31. https://doi.org/10.1007/s11205-009-9443-8.

Schimmack, U., & Lucas, R. E. (2010). Environmental influences on well-being: A dyadic latent panel analysis of spousal similarity. *Social Indicators Research, 98*(1), 1–21. https://doi.org/10.1007/s11205-009-9516-8.

Schimmack, U., Schupp, J., & Wagner, G. G. (2008). The influence of environment and personality on the affective and cognitive component of subjective well-being. *Social Indicators Research, 89*(1), 41–60. https://doi.org/10.1007/s11205-007-9230-3.

Schönfeld, P., Brailovskaia, J., Bieda, A., Zhang, X. C., & Margraf, J. (2016). The effects of daily stress on positive and negative mental health: Mediation through self-efficacy. *International Journal of Clinical and Health Psychology, 16*(1), 1–10. https://doi.org/10.1016/j.ijchp.2015.08.005.

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

Singh, K., & Jha, S. D. (2008). Positive and negative affect, and grit as predictors of happiness and life satisfaction. *Journal of the Indian Academy of Applied Psychology, 34*(2), 40–45.

Steel, P., Schmidt, J., & Shultz, J. (2008). Refining the relationship between personality and subjective well-being. *Psychol Bulletin, 134*(1), 138–161. https://doi.org/10.1037/0033-2909.134.1.138.

Steenkamp, J. B. E., & Baumgartner, H. (1998). Assessing measurement invariance in cross-national consumer research. *Journal of Consumer Research, 25*(1), 78–90.

Steger, M. F., Kashdan, T. B., & Oishi, S. (2008). Being good by doing good: Daily eudaimonic activity and well-being. *Journal of Research in Personality, 42*(1), 22–42. https://doi.org/10.1016/j.jrp.2007.03.004.

Steiger, J. H. (1998). A note on multiple sample extensions of the RMSEA fit index. *Structural Equation Modeling-a Multidisciplinary Journal, 5*(4), 411–419. https://doi.org/10.1080/10705519809540115.

Swami, V., Stieger, S., Voracek, M., Dressler, S. G., Eisma, L., & Furnham, A. (2009). Psychometric evaluation of the Tagalog and German subjective happiness scales and a cross-cultural comparison. *Social Indicators Research, 93*(2), 393–406. https://doi.org/10.1007/s11205-008-9331-7.

Trumpf, J., Becker, E. S., Vriends, N., Meyer, A. H., & Margraf, J. (2009). Rates and predictors of remission in young women with specific phobia: A prospective community study. *Journal of Anxiety Disorders, 23*(7), 958–964. https://doi.org/10.1016/j.janxdis.2009.06.005.

Twenge, J. M., Gentile, B., DeWall, C. N., Ma, D., Lacefield, K., & Schurtz, D. R. (2010). Birth cohort increases in psychopathology among young Americans, 1938–2007: A cross-temporal meta-analysis of the MMPI. *Clinical Psychological Review, 30*(2), 145–154. https://doi.org/10.1016/j.cpr.2009.10.005.

Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 3*(1), 4–70. https://doi.org/10.1177/109442810031002.

Veenhoven, R. (1994). Is happiness a trait? *Social Indicators Research, 32*(2), 101–160.

Velten, J., Bieda, A., Scholten, S., Wannemüller, A., & Margraf, J. (2018). Lifestyle choices and mental health: A longitudinal survey with German and Chinese students. *BMC Public Health, 18*, 632. https://doi.org/10.1186/s12889-018-5526-2.

Widaman, K. F., Ferrer, E., & Conger, R. D. (2010). Factorial invariance within longitudinal structural equation models: Measuring the same construct across time. *Child Development Perspectives, 4*(1), 10–18.

Whisman, M. A., & Judd, C. M. (2016). A cross-national analysis of measurement invariance of the Satisfaction With Life Scale. *Psychological Assessment, 28*(2), 239–244. https://doi.org/10.1037/pas0000181.

Wood, A. M., & Tarrier, N. (2010). Positive clinical psychology: A new vision and strategy for integrated research and practice. *Clinical Psychological Review, 30*(7), 819–829. https://doi.org/10.1016/j.cpr.2010.06.003.

Wu, C. H., Chen, L. H., & Tsai, Y. M. (2009). Longitudinal invariance analysis of the satisfaction with life scale. *Personality and Individual Differences, 46*(4), 396–401. https://doi.org/10.1016/j.paid.2008.11.002.

Yiengprugsawan, V., Somboonsook, B., Seubsman, S. A., & Sleigh, A. C. (2012). Happiness, mental health, and socio-demographic associations among a national cohort of Thai adults. *Journal of Happiness Studies, 13*(6), 1019–1029. https://doi.org/10.1007/s10902-011-9304-4.

Zanon, C., Bardagi, M. P., Layous, K., & Hutz, C. S. (2014). Validation of the satisfaction with life scale to Brazilians: Evidences of measurement noninvariance across Brazil and US. *Social Indicators Research, 119*(1), 443–453. https://doi.org/10.1007/s11205-013-0478-5.