

The EPOCH Measure of Adolescent Well-Being

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Abstract

We introduce the EPOCH Measure of Adolescent Well-being, which assesses five positive psychological characteristics (Engagement, Perseverance, Optimism, Connectedness, and Happiness) that might foster well-being, physical health, and other positive outcomes in adulthood. To create the measure, a pool of 60 items was compiled, and a series of ten studies with 4,480 adolescents (age 10-18) from the United States and Australia were used to develop and test the measure, including the factor structure, internal and test-retest reliability, and convergent, discriminant, and predictive validity. The final 20-item measure demonstrated adequate psychometric properties, although additional studies are needed to further validate the measure, extend to other population groups, and examine the extent to which it predicts long-term outcomes. As a brief multidimensional measure, the EPOCH measure contributes to the empirical testing and application of well-being theory, and offers a valuable addition to batteries designed to assess adolescent positive psychological functioning.

Keywords: Positive psychological functioning, Well-being, Flourishing, Adolescents, Assessment, Measure development

The EPOCH Measure of Adolescent Well-Being

Positive psychology is becoming increasingly relevant at individual, community, national, and international levels, with considerable focus on monitoring and building subjective psychological well-being. From the positive psychology perspective, good functioning is more than the absence of mental illness; it focuses on what goes right, not simply what goes wrong (Seligman & Csikszentmihalyi, 2000). It is certainly important to deal with problems, but greater benefit may arise from cultivating personal strengths. Measurement plays a key role, as “what we measure affects what we do” (Stiglitz, Sen, & Fitoussi, 2009, p. 7). Much of the focus on the measurement of positive psychological function has focused on adults; children and adolescents have unique perspectives and can be key informants (Casas, 2011). We thus introduce the EPOCH Measure of Adolescent Well-being, which assesses five positive psychological characteristics: Engagement, Perseverance, Optimism, Connectedness, and Happiness.

Well-being Theory

Flourishing generally refers to the good life – feeling good and functioning effectively (Huppert & So, 2013). Although there are no universal definitions of well-being and other positive psychological functioning terms (Coleman, 2009), numerous models of flourishing have been proposed. For example, Seligman (2011) introduced the PERMA model, in which flourishing is defined in terms of five pillars: Positive emotion, Engagement, Relationships, Meaning, and Accomplishment. Diener and colleagues (2010) developed a brief eight-item measure of flourishing, designed to assess psychosocial success across several areas of life and to complement measures that focus on affect and life satisfaction. Huppert and So (2013)

suggested 10 components of flourishing that are the opposite of depression and anxiety (competence, emotional stability, engagement, meaning, optimism, positive emotion, positive relationships, resilience, self-esteem, vitality). For adolescents, Scales, Benson, Leffert, and Blyth (2000) included seven indicators of thriving behaviors: school success, leadership, helping others, maintenance of physical health, delay of gratification, valuing diversity, and overcoming adversity. Benson and Scales (2009) described thriving as a dynamic interplay between multiple dimensions of the person and multiple aspects of the developmental context across time.

For our purposes here, we refer to flourishing as an outcome indicated by positive functioning across multiple biopsychosocial domains. Importantly, we do not define positive function as the mere absence of psychological or behavioral problems, but also as the presence of strengths and wellness (Seligman & Csikszentmihalyi, 2000). Like plants thriving in a garden, positive domains must be cultivated over time. Positive characteristics, attitudes, and behaviors – many of which are developed in adolescence – are assets that promote flourishing, and need to be nurtured to produce flourishing throughout life. Eccles and Gootman (2002) noted such developmental assets across physical, intellectual, psychological, and social domains. Similarly, positive youth development (PYD), a strengths-based framework of developmental processes, strategies, and systems that promote the development of positive assets in youth, includes five core assets: competence, confidence, character, caring, and connection (the 5 Cs; Lerner, Phelps, Forman, & Bowers, 2009).

The EPOCH Model of Adolescent Well-being

The PYD model arose from applied work with youth, and focuses on developmental assets that promote achievement, extracurricular involvement, civic engagement, and

adjustment. Complementing this perspective, our theoretical model arises from Seligman's (2011) PERMA theory of flourishing. Seligman defines well-being in terms of five separate but inter-related domains: Positive emotion, Engagement, positive Relationships with others, a sense of Meaning or purpose in life, and Accomplishment. Recent studies have provided support for the model (Hone, Jarden, Schofield, & Duncan, 2014; Kern, Waters, Adler, & White, in press; Kern, Waters, White, & Adler, 2014), and Butler and Kern (2014) developed the PERMA-Profiler as a brief measure of flourishing for adults. Extending the PERMA model to adolescents, our theoretical model defines five positive characteristics in youth that we believe influence the PERMA domains in adulthood. That is, our model focuses on positive adolescent characteristics that support adult flourishing as defined by Seligman's model.

Our model is comprised of five factors: Engagement, Perseverance, Optimism, Connectedness, and Happiness (EPOCH). By *Engagement*, we mean the capacity to become absorbed in and focused on what one is doing, as well as involvement and interest in life activities and tasks. Very high levels of engagement have been referred to as "flow" (Csikszentmihalyi, 1997). *Perseverance* refers to the ability to pursue one's goals to completion, even in the face of obstacles. It is a sub-facet of the Big Five personality trait of conscientiousness, and comprises the drive component of "grit" (which includes both perseverance and passion for long-term goals; Duckworth, Peterson, Matthews, & Kelly, 2007). *Optimism* is characterized by hopefulness and confidence about the future, a tendency to take a favorable view of things, and an explanatory style marked by evaluating negative events as temporary, external, and specific to situation. *Connectedness* refers to the sense that one has satisfying relationships with others, believing that one is cared for, loved, esteemed, and

valued, and providing friendship or support to others. *Happiness* is conceptualized as steady states of positive mood and feeling content with one life, rather than momentary emotion.

Our model complements PYD models and measures. Although the two perspectives overlap to a significant degree, there are also important differences between them. First, PYD incorporates a systems perspective, whereas our model, stemming from the positive psychology perspective, focuses on individual strengths (Lerner et al., 2009). Second, our definition of positive functioning is deliberately non-developmental, such that normative immaturity is not spuriously associated with lower well-being. Third, whereas models of PYD focus mainly on characteristics that promote achievement, engagement, and adjustment, our model focuses on characteristics that promote Seligman's PERMA model. Finally, in contrast to prevailing models of PYD, our model ignores context-specificity. Thus, we do not distinguish, for instance, between a sense of engagement that describes an adolescent's experience in the classroom and a comparably strong sense of engagement that characterizes another adolescent's experience playing video games. That is, it is the capacity to become engaged or the capacity to connect with others, not what one is engaged in or who a youth connects with, that marks positive psychological functioning. In this sense, our model differs substantially from prevailing models of PYD, which explicitly value some sorts of activities (e.g., community service) over others (e.g., surfing the Internet).

We expect that adolescent engagement, perseverance, optimism, connectedness, and happiness will foster PERMA, physical health, and other positive outcomes in adulthood, and therefore are valuable to measure and cultivate. Although few studies have considered the specific EPOCH domains as predictors of positive adult outcomes, there is some support in the

literature. For example, civic engagement in at risk youth related to higher life satisfaction, greater educational attainment and lower rates of arrest in young adulthood (Chan, Ou, & Reynolds, 2014). Across four studies, individuals high in perseverance were more likely to graduate from school, stay in their jobs, and remain married (Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014). Optimism has been related to greater satisfaction with life, more effective coping strategies, fewer symptoms of depression and psychological distress, better physical health, longer life, lower rates of cardiovascular disease, and better social relationships (Carver, Scheier, & Segerstrom, 2010). Across a 15-year period, adolescent social connectedness predicted greater adult well-being (Olsson, McGee, Nada-Raja, & Williams, 2013). Adolescent happiness related to better self-rated health and few risky behaviors in young adulthood, independently from depressive symptoms (Hoyt, Chase-Lansdale, McDade, & Adam, 2012).

The Current Study

In this paper, we introduce the EPOCH Measure of Adolescent Well-being. Our aim in developing the measure was to create a brief reliable scale that researchers, schools, or organizations could use to assess the five specific EPOCH characteristics. We conducted a series of studies to develop the measure and to establish the reliability and validity of the measure. The resulting measure is an evaluative and descriptive measure, not prescriptive (Kristjánsson, 2012); that is, the measure is designed to characterize and describe different aspects of adolescent psychological function, but does not provide specific thresholds or diagnostic criteria.

Method

Overview

To create the measure, we first compiled hundreds of items from various existing questionnaires and measures.¹ Altogether, 575 items were considered for inclusion. Each of the authors rated whether or not each item represented one of the five EPOCH factors. Items with at least one positive rating for a single construct were examined further. Overlapping items were discarded, and the wording of some items was refined to be appropriate for adolescents. The final item pool consisted of 60 items (12 per core EPOCH dimension; see Supplemental Table S1).

Using Samples 1 and 2 we first narrowed the 60 items to an initial 25-item measure based on item correlations. The initial 25-item measure was included in four independent studies (Samples 3-6) conducted by collaborators. While those studies were being conducted, we returned to the original 60 item data from Sample 1 and 2 and conducted more detailed psychometric analyses, which suggested that our initial solution was inadequate. We thus developed a refined 20-item measure, as illustrated in Figure 1. The 20-item version was then included in four additional studies conducted by us (Sample 7) or by collaborators (Samples 8-10). The psychometric properties of the 20-item measure were improved, thus it was retained as the final version.

We first describe each sample and detail how the measure was developed, and then present a series of psychometric tests with the measure. We focus predominantly on the final 20-item measure, but for completeness include psychometric information on the 25-item version in Supplemental Table S8.

Participants and Additional Measures

¹ Rather than doing a thorough review of all existing well-being measures, we built upon measures familiar to our team and colleagues.

Data came from 10 independent studies. Sample 1 was meant to be relatively nationally representative of youth across the US. Although the sample was split across ages and gender, it was mostly middle to upper-middle class youth. We thus sought additional samples to diversify our participant pool. These were by and large convenience samples, enabled through collaborations with investigators at other institutions. However, the samples vary considerably with respect to their demographic composition, including adolescents from a range of backgrounds and circumstances in the United States and Australia. Each administration included at least a version of the EPOCH measure and gender and age information, as well as various other measures, depending on the interests of our collaborators.²

Sample 1: US Internet Sample. Sample 1 was recruited through SocialSci (www.socialsci.com)³ specifically to test the EPOCH items. The sample consisted of 1,515 adolescents (801 males, 704 females, 10 unknown) from cities across the United States. Participants ranged in age from 13 to 18 ($M = 15.50$, $SD = 1.26$), were in grades 7 through 12, and from a middle to upper-middle class socioeconomic status (SES) background. Participants completed the full set of 60 items (presented first), along with measures of life satisfaction, academic achievement, school engagement, parent, teacher, and peer connectedness, anxiety, depression, aggression, physical vitality, and somatic symptoms.

Sample 2: Australian Boys School. Sample 2 consisted of male adolescents from a private independent all-boys Anglican school in Adelaide, Australia. Participants were enrolled

² We report the main constructs here. Source information for each study is provided in Supplemental Table S2.

³ SocialSci is an internet-based survey company that provides scientific survey technology and delivers participants solely for academic purposes. The company maintains diverse panels of respondents. Participants anonymously complete surveys in exchange for credit, which can be exchanged for online rewards. Adolescent panel members were invited to complete a survey on how psychological well-being is related to other aspects of life.

in grades 8 through 11 and predominantly from an upper-middle class SES background. In November 2011, 516 students completed an extensive online well-being survey, which included the 60 EPOCH items, during a single class period. Other measures included life satisfaction, school engagement, positive and negative emotion, peer relationships, growth mindset, gratitude, hope, grit, religiosity, stressful life events, physical activity, physical vitality, and somatic symptoms.

In August 2014 (2 years, 9 months later), 709 students at the school completed a second well-being survey, which included the final 20-item EPOCH measure. Participants were enrolled in grades 5 through 12. Of these, 118 boys were successfully matched across the two time points. Other measures included school engagement, growth mindset, sense of meaning/purpose, grit, depression, anxiety, physical activity, physical vitality, and somatic symptoms.⁴

In addition, the school made some academic information available. Objective academic performance (first term grade point average in 2014) was matched to the 2011 well-being data for 197 students, and to the 2014 well-being data for 679 students. Teachers provided reports on effort, cooperation, and organization, providing an assessment of observer-rated classroom engagement. Data were successfully matched to the 2011 well-being data for 197 students, and to the 2014 well-being data for 475 boys.

Sample 3: Australian Strengths-Based Program. Sample 3 consisted of 130 adolescents (53 males, 77 females) from a secondary school in Victoria, Australia. Participants ranged in age from 11 to 14 ($M = 13.03$, $SD = 0.80$) and were in grades 7 and 8. SES information was

⁴ The EPOCH items appeared first in the questionnaires at both measurement occasions. At time 1, survey fatigue appeared to be an issue, as scales occurring late in the survey were less reliable, and qualitative comments noted boredom. The second assessment was much shorter and had stronger psychometrics across all measures. Thus, we believe the second assessment with this sample provides stronger support for the EPOCH measure.

unavailable. Students took part in a 10-week strengths-based program designed to improve well-being, and completed a questionnaire before and after the program, which included the initial 25-item version of the EPOCH measure. Other measures included life satisfaction, optimism, help seeking behavior, resilience, and perceived stress.

Sample 4: Australian Grammar Students. Sample 4 consisted of 746 students (347 males, 399 females) from a highly ranked independent Anglican secondary grammar school in Victoria, Australia. Participants ranged in age from 9 to 18 ($M = 14.22$, $SD = 1.96$), were in grades 6 through 12, and predominantly upper-middle class. Students anonymously completed a questionnaire online, which included the initial 25-item version of the EPOCH measure. Other measures included life satisfaction, gratitude, teacher relationships, strengths and difficulties, and physical vitality.

Sample 5: US Juvenile Offenders. Sample 5 consisted of 654 first-time male juvenile offenders from Philadelphia, Pennsylvania; Santa Ana, California; and Jefferson Parish (near New Orleans), Louisiana. All participants had been arrested for a relatively minor offense, such as theft or simple assault. Participants ranged in age from 13 to 17 ($M = 15.30$, $SD = 1.27$). As part of a larger longitudinal study, participants completed a series of measures at baseline and six months later. The 25-item version of the EPOCH measure was included at both occasions; of the 654 adolescents who completed the measure at baseline, 494 also completed the measure at the six-month follow up. Other measures included IQ, exposure to violence, self-esteem, motivation to succeed, future orientation, psychosocial maturity, general anxiety disorder, major depressive disorder, aggression, school performance, teacher bonding, school misconduct, arrests, social consequences for using drugs or alcohol, and health care visits.

Sample 6: US Strengths-Based Study. Sample 7 consisted of 70 students (32 males, 38 females) from an urban middle school in Philadelphia, Pennsylvania. Participants ranged in age from 12 to 14 ($M = 13.07$, $SD = 0.35$), were in grade 8, and predominantly from low SES backgrounds. Students came from three classes (remedial, average, and advanced levels) in an urban charter school; two classes were randomly assigned to a five-day strengths-based program, and one class completed the measures but did not receive the training. Measures were completed at baseline, at the end of the five-day program, and three months later. At each of the three assessments, participants completed the 25-item version of the EPOCH measure. Age, gender, and treatment condition were also available.

Sample 7: US Inner City Youth. Sample 7 was specifically targeted to test the structure and cross-time stability of the final 20-item EPOCH measure. The sample consisted of 291 inner-city adolescents (72 males, 80 females, 139 unknown) from a middle school and a high school in west Philadelphia, an economically disadvantaged area of the city. Participants ranged in age from 12 to 17 ($M = 14.48$, $SD = 0.97$), were in grades 7 through 10, and predominantly from low SES backgrounds. Participants indicated their age, gender, and completed the 20 EPOCH items. Two to three weeks later, 164 youth completed the 20-item measure again. Of these, 82 individuals were successfully matched to their Time 1 score.

Sample 8: Australian Girls School. Sample 8 consisted of 327 adolescent girls from a Catholic all-girls school in Victoria, Australia. Participants ranged in age from 13 to 17 ($M = 14.71$, $SD = 1.18$), were in grades 8 to 11, and predominantly from middle to upper-middle SES backgrounds. The participants completed an online questionnaire, which included the 20-item EPOCH measure. Other measures included life satisfaction, psychological well-being (self-

acceptance, purpose in life, environmental mastery, autonomy, positive relationships), social well-being, hope, depression, anxiety, alcohol and illicit drug use, perceived stress, sleep habits, and exercise.

Sample 9: US Hospitalized Youth. Sample 9 consisted of 146 adolescents (63 males, 79 females, 4 unknown) from several US hospitals who were inpatients receiving treatment for various medical conditions. Participants ranged in age from 10 to 18 ($M = 13.73$, $SD = 2.52$). No SES information was available. Participants completed a baseline questionnaire, were randomly assigned to a positive intervention (receiving a drawing of a superhero and then drawing a superhero for another child) or control condition (receiving a drawing only), and then reported changes in emotion. The current analysis used the initial assessment from the full sample, regardless of treatment group, which included the 20-item EPOCH measure. Other measures included positive and negative emotion and meaning in life.

Sample 10: US After School Program. Sample 10 consisted of 89 students from a public school in Atlanta, New Jersey. Participants ranged in age from 13 to 15 ($M = 13.48$, $SD = 0.55$), were in 8th grade, and from low SES backgrounds. At the beginning of the term, as part of an in-class exercise, students completed the 20-item EPOCH measure and answered questions about perceived academic performance and the extent to which basic needs are met. The survey was repeated at the end of the term, with 62 participants successfully matched across the time points. In addition, objective language arts and math test scores were matched to the well-being data for 83 students at Time 1 and 67 students at Time 2.

Data Analyses

Measure development. Sample 1 (US Internet Sample) and Sample 2 (Australian Boys School) were used to develop and refine the measure. In both samples, we first conducted an exploratory principal components analysis with a five-factor structure and direct oblimin rotation ($\Delta = 0$). We retained items that overlapped across the two samples and maintained adequate item inter-correlations. For balance, we opted to include an equal number of items for each factor (five items per factor). Thus, we created an initial 25-item measure that at face value reflected the five EPOCH factors.

Collaborators from Sample 3-6 then included the 25-item measure in their studies, and provided us with the data. We estimated confirmatory factor models in each of these samples using the lavaan package (version .5.16, Rosseel, 2012) in R (version 3.0.3). Model fit was evaluated primarily using the Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Residual (SRMR), which are population-based measures that are not affected by sample size. An RMSEA of .06 or lower combined with a SRMR of .09 or lower are considered acceptable fit (Hu & Bentler, 1999). Following recommendations by Kline (2005), we also report the chi-square, the Tucker Lewis Index (TLI), and the Comparative Fit Index (CFI) as additional metrics of model fit. For comparison, we estimated a one-factor model (all items loading on a single well-being factor) and a second order model (items loading on five factors, and the five factors loading on a single higher well-being factor, where the five factors are assumed to represent a single overarching latent construct).

While our collaborators included the initial 25-item measure in their studies, we returned to the full 60 items assessed in Samples 1 and 2 for more detailed psychometric analyses. When we created the initial 25-item version, we relied predominantly on the highest

loading items on each factor across the two samples. Yet two of the Optimism items were theoretically aligned with Perseverance and Happiness (see Supplemental Table S1). Returning to the 60-item data from Samples 1 and 2, we changed the two overlapping items for more discriminating items. We examined item variances, reconsidered the factor structure, and rationally considered how well each item fit our definitions theory. In addition, we tested how factor reliability changed if each item was deleted.⁵ Twenty items appeared to adequately capture the same five constructs with equivalent or superior fit (see Figure 1). Finally, we refined the wording of a few items based on participant feedback from the first six studies. The resulting 20-item measure was then administered to Samples 7 through 10, and confirmatory models were again estimated.

Measure testing. Using the final 20-item measure with Sample 1, 2, and 7-10, we next tested reliability and validity. Four estimates of internal consistency (Cronbach's α , Guttman's λ_6 , minimum and maximum split half reliability (β and λ_4)) were estimated using the psych package (Revelle, 2015) in R, based on 10,000 random draws across the data. Cross-time correlations (Pearson's r) were calculated to estimate test-retest reliability.

We next examined correlations with measures of similar and dissimilar constructs. In each sample, correlations (Pearson rs) were computed between the five EPOCH components and available constructs (e.g., life satisfaction, negative affect, physical vitality). Effect sizes were meta-analytically combined across samples using a fixed effects analysis. The effect sizes

⁵ We also examined the scree plot, the Kaiser criteria (using eigenvalues greater than 1 as a cutoff criteria), and Velicer's (1976) minimum average partial (MAP) test, which extracts factors until the average squared partial correlation of components is minimized. In Sample 1 the scree plot suggested four factors, 11 eigenvalues were greater than 1.00, and the MAP test suggested 7 factors. In sample 2, the scree plot suggested two to five factors, 11 eigenvalues were greater than 1.00, and the MAP test suggested 7 factors. As our theory specified five factors, we retained the five-factor solution, but we note that these clearly are strongly correlated factors.

were transformed to Fisher Z 's, average Z 's weighted by the sample size were calculated, and the resulting values were transformed back to r for presentation purposes (Rosenthal, 1991).

Finally, in Sample 2 (118 Australian private school boys) and Sample 10 (62 US public school students), several measures were included at the second assessment that permitted us to examine preliminary evidence of the predictive validity of the EPOCH factors. Partial correlations between Time 1 EPOCH factors and Time 2 variables were estimated, controlling for Time 1 values.

Results

Measure Development

Based on exploratory analyses with Samples 1 and 2, an initial 25-item measure was created and administered to Samples 3-6. Table S8 summarizes the final fit statistics and factor loadings for each sample. Across the four confirmatory samples (using Time 1 reports, in samples that completed the measure more than once), the five-factor model demonstrated acceptable model fit ($N = 1598$, RMSEA = .062 [.060, .065], SRMR = .049, $\chi^2(265) = 1914$), and fit better than the one-factor model ($\Delta\chi^2(10) = 3211$, RMSEA = .105 [.103, .108], SRMR = .079, $\chi^2(275) = 5126$) and the higher-order factor model ($\Delta\chi^2(5) = 452$, RMSEA = .070 [.067, .072], SRMR = .063, $\chi^2(270) = 2366$). In the combined sample, the five factors were strongly correlated with one another, with the strongest correlations between Happiness and Connectedness ($r = .70$), and between Perseverance and Optimism ($r = .65$).

Returning to the original 60-items in Samples 1 and 2, we further refined the measure. The resulting 20-item measure was then administered to Samples 7 through 10. Table 1 summarizes the fit statistics and factor loadings for each sample. Model fits improved through

our modifications. Across the four confirmatory samples (Samples 7-10), the five factor model demonstrated good model fit ($N = 852$, RMSEA = .053 [.048, .058], SRMR = .038, $\chi^2(160) = 545$), and fit better than the one-factor model ($\Delta\chi^2(10) = 1367$, RMSEA = .110 [.105, .114], SRMR = .076, $\chi^2(170) = 1912$) and the higher-order factor model ($\Delta\chi^2(5) = 92$, RMSEA = .058 [.053, .063], SRMR = .046, $\chi^2(165) = 637$). Although still correlated, factors were more distinct.

The final measure is provided in Table 2. Factors are computed as the mean of the four items, and an overall psychosocial function score is computed as the average of the five domain scores (range = 1 to 5). Supplemental Table S3 summarizes descriptive information combined across Samples 1, 2, and 7-10 (see Supplemental Table S5 for descriptives in each sample). The Engagement, Perseverance, and Optimism factors were relatively normally distributed, although mean values were slightly above the scale midpoint (3). Connectedness and Happiness were skewed, with some evidence of a ceiling effect. We proceed with reporting reliability and validity information, but this scaling issue should be kept in mind when interpreting the results.

Measure Testing

Using the final 20-item measure with Sample 1, 2, and 7-10, we next tested reliability and validity. For completeness, psychometric information for the initial 25-item version is provided in Supplemental Table S8.

Reliability. Internal consistency information is summarized in Table 3. Across the six samples, Engagement was the least reliable factor and Happiness tended to be the most reliable factor, although it was less consistent in the US hospitalized youth sample.

Cross-time correlations are summarized in Supplemental Table S4.⁶ Factors were relatively stable across three weeks (Sample 7, $n = 82$), with correlations ranging from $r = .55$ for Connectedness to $r = .71$ for Happiness. Across 4 months (Sample 10, $n = 62$), Perseverance was most stable ($r = .61$) and Engagement was least stable ($r = .23$). Correlations were weakest in Sample 2 (across 2 years, 9 months, $n = 118$), ranging from $r = .25$ for Perseverance to $r = .39$ for Happiness. The school introduced numerous well-being initiatives and programs over the three year time period, so it is unclear whether the lower correlations are due to lack of stability over time, actual changes due to the well-being programs, or other confounding factors.

Convergent and Divergent Validity. We next examined correlations with measures of similar and dissimilar constructs. Due to common source and method variance, as well as the fact that our analyses of the measure's structure indicated the presence of a superordinate "positivity" factor, we expected to find positive correlations between EPOCH subscale scores and all other measures of positive well-being. Table 4 summarizes our predictions for convergent and divergent associations, based on the expected pattern (positive, zero, or negative) and strength (weak, moderate, or strong) averaged across three independent raters. First, we expected that the EPOCH factors would evince relatively modest correlations with measures that do not index positive or negative well-being (e.g., age, gender, life events). Second, we expected that the EPOCH factors would be negatively correlated, but only modestly so, with measures of psychological distress or behavioral problems, consistent with the view

⁶ Cross-time correlations for the 25-item version are summarized in Supplemental Table S8. Samples 3 and 6 included an intervention between the two well-being assessments, whereas Sample 5 did not. As expected, cross-time correlations were more stable for Sample 5, suggesting that the factors are stable without intervention, but amenable to change with intervention.

that the presence of positive well-being is not the same as the absence of psychological symptoms. Third, as considerable research suggests that physical health, health-related behaviors, and academic performance relate to well-being, we expected that the EPOCH factors would be moderately correlated with physical health, health related behaviors, and academic performances, with the strongest associations between Perseverance and academic performance, between Engagement and physical activity, and between Happiness and physical vitality. Fourth, we expected that particular EPOCH subscales would be more strongly correlated with more similar constructs than with less similar ones (e.g., Perseverance and grit would be more strongly correlated than Perseverance and parental connectedness).

Meta-analytic results for the 20-item measure are summarized in Table 4, with N referring to the number of participants included in the calculation and K referring to the number of samples with a measure of the particular construct (see Supplemental Table S5 for correlations separate by sample). Generally speaking, our predictions were supported, with some exceptions.

The average scores for the EPOCH factors were unrelated to age or grade level. This indicates that the measure is not a proxy for age or maturity. Supplemental Table S6 summarizes structural invariance tests comparing country (US versus Australia) and gender (male versus female). For country, partial strong invariance was met by allowing the intercepts for two of the Engagement items to vary across country. Specifically, average scores were higher in the U.S. than in Australia on the item “When I do an activity, I enjoy it so much that I lose track of time”, while average scores were lower in the U.S. than in Australia on the item “I get so involved in activities that I forget about everything else”. The other items and factors

were not inherently biased by country. For gender, strict invariance was met, indicating that the measure is not inherently gender biased.

As predicted, EPOCH scores were negatively related to scores on measures of emotional distress and behavior problems, but the correlations were relatively modest in magnitude. Happiness and Optimism demonstrated the strongest correlations with negative affect, depression, anxiety, and aggression, ranging from $r = -.29$ for Optimism and anxiety to $r = -.53$ for Happiness and depression. The EPOCH factors were related to higher self-reported physical vitality and fewer somatic symptoms. Whereas all of the EPOCH factors related to subjective academic performance, Perseverance was most relevant to objective and teacher-rated academic performance.

As expected, the EPOCH factors were related to other well-being variables, with the strongest correlations with the most similar constructs. The Engagement subscale was designed to assess a general tendency for psychological involvement and absorption in activities. It demonstrated the weakest correlations with other well-being constructs, but was moderately correlated with life satisfaction, having a sense of meaning/ purpose, hope, positive affect, school engagement, and feeling connected to peers. The Perseverance subscale was designed to assess tenacity in the face of challenge. Perseverance was strongly correlated with Engagement, and demonstrated a similar, though more pronounced, pattern of associations. Most notably, Perseverance was very strongly related to grit.

The Optimism subscale was designed to assess a sense of hope and positive expectations for the future. It demonstrated very strong correlations with life satisfaction, having a sense of meaning/ purpose, positive affect, and feeling connected to parents,

teachers, and peers. The Connectedness subscale was designed to assess feeling loved and supported by others. Connectedness was strongly related to positive relationships with parent, peers, and teachers. It was also strongly correlated with life satisfaction, positive affect, and meaning/purpose. The Happiness subscale was designed to assess relatively stable positive mood, including being generally cheerful, feeling happy, and loving life, rather than momentary positive emotion. It was very strongly correlated with life satisfaction, positive affect, and sense of meaning/ purpose. It was also very strongly correlated with peer connectedness, suggesting that peers might be a key contributor to happiness.

Predictive validity. Finally, we examined preliminary evidence for predictive validity in Samples 2 (Australian boys school) and 10 (US public school). Correlations and partial correlations (controlling for Time 1 scores) are summarized in Supplemental Table S7.⁷ In Sample 2, Time 1 Engagement predicted greater grit (partial correlation, $r_p = .19$) and teacher rated cooperation ($r_p = .16$). Perseverance predicted higher levels of grit ($r_p = .29$), objective academic performance (GPA, $r_p = .17$), and teacher rated cooperation ($r_p = .15$), effort ($r_p = .16$), and organization ($r_p = .15$). Happiness predicted higher GPA ($r_p = .15$). Optimism and Connectedness were not significantly related to Time 2 outcomes, after controlling for Time 1 values. In Sample 10, Perseverance predicted better self-rated academic performance ($r_p = .38$). Connectedness predicted better self-rated academic performance ($r_p = .29$) and objective language arts test scores ($r_p = .25$). None of the EPOCH factors significantly related to Time 2 math test scores, after controlling for Time 1 scores.

⁷ Cross-time correlations for the 25-item version are summarized in Table S8. In Sample 5 (first time US juvenile offenders, $N = 494$), the five factors each significantly related to better school performance, higher self-esteem, stronger motivation to succeed, better relationships with teachers, and fewer symptoms of depression. All but Engagement related to less anxiety and fewer arrests, and Perseverance, Optimism, and Connectedness related to fewer social consequences from substance use.

Discussion

We developed and tested the EPOCH Measure of Adolescent Well-being across ten samples and 4,480 adolescents. Through the course of developing the measure, we first created an initial 25-version, which we refined to the final 20-item version. The measure appears psychometrically sound, although additional research is needed to further validate the measure, extend to other population groups, and examine whether and to what extent it predicts concurrent and long-term outcomes associated with flourishing in adolescence.

The EPOCH measure purposely delineates multiple factors. Across an array of correlates, the different factors generally demonstrated a similar pattern (i.e., unrelated to variables that do not reflect well-being, positively related to more positive indicators of functioning, and negatively or unrelated to psychological and behavioral problems), but the strength of correlations varied considerably across the factors. For example, Happiness was strongly negatively related to depression, whereas Engagement was not. The patterning across the EPOCH factors for different outcomes is interesting to consider. For example, although grit was most associated with Perseverance, it was also related to Engagement and Optimism. Grit includes passion for long-term goals (Duckworth et al., 2007), and it is plausible that individuals who are pessimistic and disengaged would have difficulty pursuing such goals. Similarly, although all of the EPOCH factors were related to greater life satisfaction and less depression, Optimism, Connectedness, and Happiness were more strongly related to these outcomes than Engagement or Perseverance. Physical activity was more strongly related to Perseverance, Optimism, and Happiness than to Engagement and Connectedness. These findings suggest that future research should consider profiles across the EPOCH domains in relation to outcomes.

By separating items into the five theoretically based factors, it may allow more targeted approaches to intervention. For example, single score well-being metrics may point to general interventions designed to increase overall happiness or life satisfaction, but lack the specificity needed for change (Huppert & So, 2013). In contrast, assessing psychological function across several dimensions can highlight particular strengths and weaknesses, allowing more targeted interventions. For example, if a youth reports low connectedness, efforts can be made to connect the youth to a mentor, peer group, or social-based activity; a youth with high perseverance can help their peers learn to press on through difficulty. Such multidimensional assessments may also be helpful for examining subgroup differences, identifying areas of need, and shaping subsequent policy or intervention. However, at this time, the measure is merely descriptive, and further testing is needed to determine any sort of diagnostic thresholds. Further, in several of the samples, the Connectedness, Optimism, and Happiness factors were very strongly correlated with one another, such that these might better represent a single domain, such as positive sociability. Future research should further test the predictive ability and practical applicability of using separate versus combined domains.

The EPOCH model defines characteristics or attitudes that are often perceived as positive in nature. However, taken to an extreme, the domains could lead to negative outcomes. For example, high capacity to connect with others provides a foundation for building positive social relationships with others, but could be maladaptive if those connections are made with delinquent peers. Perseverance and related characteristics are linked to greater achievement (e.g., Duckworth et al., 2007; Dweck, Walton, & Cohen, 2014), but persevering at any cost may lead to high levels of stress, anxiety, and less well-being.

In developing the measure, we included a diverse set of participants, including ten different samples, two countries, repeated assessments, and a variety of other measures, but several issues should be considered. The EPOCH items were often included early in the survey, but for the samples collected by collaborators, we did not have control over question order, such that survey fatigue may have occurred. Order effects need to be tested. Although we included some special populations, the samples were mostly convenience samples, and the extent to which the measure will be valid in other population groups needs to be tested. Future work should consider how the measure might translate to other languages, cultures, and groups. Further, sensitivity to change over time and threshold levels for intervention purposes need to be established.

The EPOCH items are on a five-point scale, as is typical of many children and adolescent measures. However, the Connectedness and Happiness factors seemingly demonstrated ceiling effects. There is disagreement across the literature in both adults and youth over the ideal number of scale points. Comparing different response options, Leung (2011) found no differences in the internal response structure across four, five, six, and 11-point scales, but only the six and 11-point versions were normally distributed. Alternative scalings may be more appropriate and should be tested in the future.

Finally, the EPOCH items are all positively worded. Although it is often argued that negatively worded questions should be included to avoid response set biases, this assumes that both positive and negative items assess the same construct. From the positive psychology perspective, positive functioning is not simply the absence of negative function, and thus positive wording are qualitatively different than negatively worded items. Further, reversed-

scored items often cluster on a separate factor, and the benefits of disrupting response biases need to be weighed against possible method-induced biases (e.g., Carlson et al., 2011; Dunbar, Ford, Hunt, & Der, 2000; Marsh, 1986). For instance, Borgers, Hox, and Sikkel (2004) found that although adolescents responded consistently on negatively worded items over time, the interpretation of responses was different for negatively versus positively worded questions. Marsh (1996) suggested that if negatively worded items are included in a scale, additional analyses are needed to separate response versus method biases. In practice, as the questionnaire is relatively brief, it may be valuable to include some additional negatively worded items, which are not scored as part of the EPOCH items, but are used to disrupt and test for response biases.

Although the EPOCH measure focuses on positive psychological characteristics, this is not to say that consideration of negative characteristics should be avoided – both are needed (Norrish & Vella-Brodrick, 2009; Pawelski, in press). The EPOCH measure offers a valuable addition to batteries designed to assess adolescent mental health and function, such that the entire psychological spectrum—from negative to positive—can be measured.

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Table 1

Latent factor loadings and fit indices in confirmatory factor analysis for the final 20-item measure, by sample (see Figure 1 for estimated model)

Factor/ Question		Sample				
		7	8	9	10	Combo
Engagement						
I get completely absorbed in what I am doing.	λ_{e1}	.55	.85	.54	.80	.71
When I am learning something new, I lose track of how much time has passed.	λ_{e2}	.54	.84	.61	.51	.66
When I do an activity, I enjoy it so much that I lose track of time.	λ_{e3}	.68	.81	.55	.60	.69
I get so involved in activities that I forget about everything else.	λ_{e4}	.59	.80	.79	.56	.68
Perseverance						
I finish whatever I begin.	λ_{p1}	.61	.79	.50	.72	.67
I keep at my schoolwork until I am done with it.	λ_{p2}	.57	.81	.42	.73	.66
Once I make a plan to get something done, I stick to it.	λ_{p3}	.72	.88	.73	.73	.79
I am a hard worker.	λ_{p4}	.61	.80	.66	.76	.72
Optimism						
I am optimistic about my future.	λ_{o1}	.62	.77	.54	.50	.66
I think that good things are going to happen to me.	λ_{o2}	.77	.85	.75	.68	.79
I believe that things will work out, no matter how difficult they seem.	λ_{o3}	.71	.79	.70	.73	.75
In uncertain times, I expect the best.	λ_{o4}	.56	.66	.67	.79	.65
Connectedness						
When something good happens to me, I have people in my life that I like to share the good news with.	λ_{c1}	.60	.79	.67	.60	.70
I have friends that I really care about.	λ_{c2}	.66	.68	.56	.43	.64
There are people in my life who really care about me.	λ_{c3}	.71	.85	.67	.68	.75
When I have a problem, I have someone who will be there for me.	λ_{c4}	.73	.89	.66	.72	.78
Happiness						
I have a lot of fun.	λ_{h1}	.66	.86	.44	.74	.73
I feel happy.	λ_{h2}	.73	.91	.58	.78	.80
I love life.	λ_{h3}	.60	.91	.52	.79	.74
I am a cheerful person.	λ_{h4}	.67	.83	.70	.68	.74
Latent Factor Covariances						
Engagement ~ Perseverance	$\phi_{e,p}$	.48	.65	.43	.71	.59
Engagement ~ Optimism	$\phi_{e,o}$	.49	.61	.62	.77	.60
Engagement ~ Connectedness	$\phi_{e,c}$	.51	.48	.51	.56	.51
Engagement ~ Happiness	$\phi_{e,h}$	.55	.53	.50	.64	.54
Perseverance ~ Optimism	$\phi_{p,o}$	.81	.75	.66	.83	.76
Perseverance ~ Connectedness	$\phi_{p,c}$	.60	.58	.49	.70	.56
Perseverance ~ Happiness	$\phi_{p,h}$	.61	.55	.56	.61	.54
Optimism ~ Connectedness	$\phi_{o,c}$	.78	.68	.74	.80	.72
Optimism ~ Happiness	$\phi_{o,h}$	.85	.84	.84	.83	.81
Connectedness ~ Happiness	$\phi_{c,h}$	.74	.76	.79	.86	.78

Model Fit					
N	291	327	146	88	852
RMSEA	.066	.058	.051	.095	.053
RMSEA 90% confidence interval	.057, .075	.049, .067	.033, .066	.075, .111	.048, .058
SRMR	.056	.037	.059	.075	.038
χ^2 (df = 160)	360.4	335.8	220.2	283.0	545.3
CFI	0.891	0.964	0.921	0.841	0.947
TLI	0.871	0.957	0.907	0.811	0.937

Note. Confirmatory factor analysis estimated using the lavaan package (version 0.5.16) in R (version 3.0.3), using Time 1 measurement occasions. RMSEA = Root Mean Square Error of Approximation, SRMR = Standardized Root Mean Residual, CFI = Comparative Fit Index, TLI = Tucker Lewis Index. For sample, 7 = inner city youth, 8 = Australian Catholic girls school, 9 = US hospitalized youth, 10 = US public school, Combo = combined across these 4 samples.

Table 2

Final 20-item EPOCH measure

Item	Question
C1	When something good happens to me, I have people who I like to share the good news with.
P1	I finish whatever I begin.
O1	I am optimistic about my future
H1	I feel happy.
E1	When I do an activity, I enjoy it so much that I lose track of time.
H2	I have a lot of fun.
E2	I get completely absorbed in what I am doing.
H3	I love life.
P2	I keep at my schoolwork until I am done with it.
C2	When I have a problem, I have someone who will be there for me.
E3	I get so involved in activities that I forget about everything else.
E4	When I am learning something new, I lose track of how much time has passed.
O2	In uncertain times, I expect the best.
C3	There are people in my life who really care about me.
O3	I think good things are going to happen to me.
C4	I have friends that I really care about.
P3	Once I make a plan to get something done, I stick to it.
O4	I believe that things will work out, no matter how difficult they seem.
P4	I am a hard worker.
H4	I am a cheerful person.

Directions to participants: This is a survey about you! Please read each of the following statements. Circle how much each statement describes you. Please be honest - there are no right or wrong answers!

Scaling: 1 to 5 scale: Almost never, Sometimes, Often, Very often, Almost always

Scoring EPOCH: Each item is scored on a 1 to 5 scale (almost never/ not at all like me = 1; almost always/ very much like me = 5). Scores are computed as the average of the four items, and results can be presented as a profile across domains (see sample image below).

Engagement = mean(E1,E2,E3,E4).
 Perseverance = mean(P1,P2,P3,P4)
 Optimism = mean(O1,O2,O3,O4)
 Connectedness = mean(C1,C2,C3,C4)
 Happiness = mean(H1,H2,H3,H4)

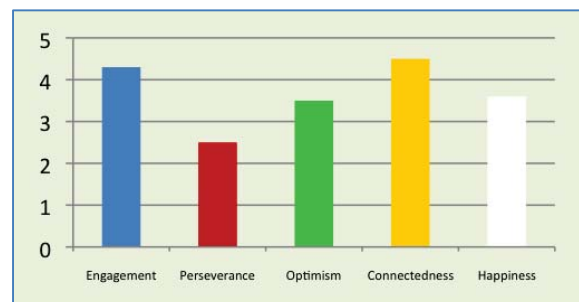


Table 3*Reliability for the final 20-item EPOCH measure by sample.*

	E	P	O	C	H	Overall
Internal Reliability						
1 US internet sample (n = 1515)						
Cronbach's α	.76	.79	.82	.81	.87	.90
Guttman's λ_6	.71	.74	.78	.78	.84	.91
Minimum split half (λ_4)	.74	.77	.81	.79	.86	.74
Maximum split half (β)	.78	.80	.84	.83	.88	.94
2 Aus boys school T1 (n = 516)						
Cronbach's α	.63	.81	.73	.74	.84	.89
Guttman's λ_6	.57	.77	.68	.69	.80	.90
Minimum split half (λ_4)	.60	.79	.70	.73	.83	.79
Maximum split half (β)	.67	.83	.76	.75	.86	.93
2 Aus boys school T2 (n = 730)						
Cronbach's α	.78	.80	.77	.77	.85	.92
Guttman's λ_6	.74	.75	.72	.72	.82	.93
Minimum split half (λ_4)	.74	.79	.75	.74	.84	.82
Maximum split half (β)	.82	.82	.79	.80	.87	.95
7 US inner city T1 (n = 291)						
Cronbach's α	.68	.72	.75	.76	.75	.87
Guttman's λ_6	.62	.67	.70	.71	.70	.88
Minimum split half (λ_4)	.66	.66	.73	.73	.74	.75
Maximum split half (β)	.70	.76	.78	.78	.76	.92
7 US inner city T2 (n = 164)						
Cronbach's α	.70	.74	.65	.75	.73	.89
Guttman's λ_6	.66	.69	.60	.71	.68	.91
Minimum split half (λ_4)	.61	.70	.59	.71	.70	.80
Maximum split half (β)	.77	.78	.72	.78	.75	.94
8 Aus girls school (n = 327)						
Cronbach's α	.89	.89	.85	.87	.93	.94
Guttman's λ_6	.87	.86	.82	.85	.91	.96
Minimum split half (λ_4)	.87	.88	.84	.85	.92	.79
Maximum split half (β)	.92	.90	.87	.89	.94	.97
9 US hospitalized youth (n = 146)						
Cronbach's α	.72	.69	.76	.75	.65	.85
Guttman's λ_6	.68	.64	.72	.70	.59	.87
Minimum split half (λ_4)	.64	.62	.70	.69	.63	.72
Maximum split half (β)	.77	.73	.80	.78	.68	.92

	E	P	O	C	H	Overall
10 US public school T1 (<i>n</i> = 89)						
Cronbach's α	.72	.82	.75	.70	.83	.91
Guttman's λ_6	.68	.78	.73	.65	.80	.94
Minimum split half (λ_4)	.65	.81	.70	.68	.80	.80
Maximum split half (β)	.77	.84	.80	.72	.86	.97
10 US public school T2 (<i>n</i> = 68)						
Cronbach's α	.79	.85	.84	.79	.84	.95
Guttman's λ_6	.76	.83	.81	.78	.84	.97
Minimum split half (λ_4)	.75	.78	.82	.68	.79	.83
Maximum split half (β)	.82	.90	.85	.86	.89	.98
Combined samples T1 (<i>n</i> = 2893)						
Cronbach's α	.74	.80	.81	.81	.86	.90
Guttman's λ_6	.68	.75	.76	.77	.82	.91
Minimum split half (λ_4)	.73	.78	.79	.79	.85	.75
Maximum split half (β)	.76	.81	.82	.82	.87	.93
Combined samples T2 (<i>n</i> = 933)						
Cronbach's α	.77	.79	.76	.77	.83	.92
Guttman's λ_6	.72	.74	.71	.72	.79	.92
Minimum split half (λ_4)	.75	.76	.73	.75	.82	.83
Maximum split half (β)	.80	.82	.77	.79	.85	.95
Test-Retest Reliability (Pearson <i>r</i>)						
2 Aus boys school (3 years; <i>n</i> = 118)	.26	.25	.24	.36	.39	.31
7 US inner city (3 week; <i>n</i> = 82)	.63	.69	.70	.55	.71	.75
10 US public school (4 months; <i>n</i> = 62)	.23	.61	.51	.36	.40	.44
Combined samples (<i>n</i> = 262)	.37	.47	.46	.42	.49	.48

Note. Samples are numbered in order; see method for sample details. Combined includes participants across all samples. E = Engagement, P = Perseverance, O = Optimism, C = Connectedness, H = Happiness, Overall = full set of 20 items, Aus = Australia, T1 = Time 1, T2 = Time 2. Minimum and maximum split halves are based on 10,000 random draws across the data, estimated with the psych package (Revelle, 2015) in R.

Table 4

Evidence for convergent and divergent validity: predicted and observed EPOCH correlations with other variables using the final 20-item measure

	<u>Expected Pattern of Results</u>					<u>Observed Correlations</u>					N	K
	E	P	O	C	H	E	P	O	C	H		
Epoch factors												
Engagement		++	+	+	+		.46**	.46**	.39**	.43**	3096	6
Perseverance	++		++	+	+	.46**		.61**	.48**	.51**	3094	6
Optimism	+	++		++	+++	.46**	.61**		.57**	.70**	3094	6
Connectedness	+	+	++	++	++	.39**	.48**	.57**		.64**	3095	6
Happiness	+	+	+++	++		.43**	.51**	.70**	.64**		3095	6
Demographics												
Age	0	+	0	0	0	0.00	0.00	0.01	0.02	-0.05*	2273	6
Gender	0	0	0	0	0	-0.04	0.01	-0.06*	.09**	-0.04	1828	4
Grade	0	0	0	0	0	-0.02	0.00	-0.02	0.01	-.06**	1960	3
Life conditions												
Stress	-	-	-	-	--	-0.07	-0.08	-0.10	-.16**	-.16**	327	1
Basic needs met	+	+	++	+	++	0.12	.21*	0.09	0.17	0.10	88	1
Health and behavior												
Physical vitality	++	+	++	+	++	.34**	.49**	.52**	.40**	.58**	2231	2
Somatic symptoms	-	-	-	-	-	-0.04	-.21**	-.25**	-.24**	-.30**	2243	2
Physical activity	+	+	+	+	++	.13**	.24**	.24**	.21**	.26**	972	2
Sleep	0	+	+	+	++	-0.10	-0.03	-0.06	-0.12	-0.04	327	1
Substance use	--	--	-	-	-	-0.04	-0.06	-0.06	-0.04	-0.03	327	1
Academic performance												
Self-rated academic performance	+	++	+	0	+	.29**	.53**	.40**	.33**	.36**	1603	2
Objective academic performance	+	++	+	0	+	.08*	.21**	.08*	.10**	-0.01	761	2
Teacher rated effort	++	+++	+	+	+	.09*	.36**	.16**	.16**	.15**	475	1
Psychological symptoms												
Negative affect	-	-	--	-	--	-0.06	0.03	-.26**	0.03	-.31**	145	1

	Expected Pattern of Results					Observed Correlations					N	K
	E	P	O	C	H	E	P	O	C	H		
Depression	-	-	--	--	--	-.13**	-.29**	-.41**	-.41**	-.53**	2562	3
Anxiety	-	0	-	-	-	-0.02	-.21**	-.29**	-.25**	-.36**	2558	3
Aggression	-	-	-	--	-	-0.04	-.22**	-.34**	-.32**	-.44**	1515	1
Related well-being constructs												
Life satisfaction	++	+	++	++	++	.36**	.51**	.64**	.59**	.83**	1842	2
Autonomy	+	+	+	0	+	0.07	0.09	.12*	0.04	0.08	327	1
Environmental mastery	+	+	+	+	+	.18**	.31**	.28**	.27**	.25**	327	1
Personal growth	+	+	+	+	+	.18**	.24**	.25**	.29**	.25**	327	1
Self acceptance	0	0	+	+	++	.22**	.26**	.25**	.27**	.33**	327	1
Meaning/ purpose	+	+	+	++	++	.38**	.48**	.57**	.49**	.55**	1195	3
Relationships	+	+	+	+++	++	0.05	0.07	0.05	.20**	.15**	327	1
Grit	++	+++	+	+	+	.21**	.78**	.30**	.30**	.28**	730	1
Growth mindset	+	++	++	+	+	.08*	.28**	.23**	.26**	.22**	716	1
Hope	+	++	+++	++	++	.32**	.32**	.31**	.28**	.30**	327	1
Positive affect	+	++	++	++	+++	.33**	.33**	.58**	.41**	.59**	146	1
School engagement	+++	++	+	++	+	.40**	.58**	.50**	.37**	.44**	2235	2
Parental connectedness	+	+	+	+++	++	.27**	.43**	.47**	.52**	.53**	1515	1
Teacher connectedness	+	+	+	+++	++	.26**	.41**	.41**	.42**	.39**	1515	1
Peer connectedness	+	+	++	+++	++	.36**	.48**	.53**	.66**	.63**	1515	1

Note. Predictions are based on the expected pattern, averaged across three independent raters (+++ = strong positive correlation, ++ = moderate positive correlation, + = weak positive correlation, 0 = no correlation, - = weak negative correlation, -- = moderate negative correlation, --- = strong negative correlation). Observed correlations are based on a fixed effects meta-analysis, with sample effect sizes weighted by sample size. Effects are based on Time 1 correlations within each sample, except Sample 2, which uses the Time 2 effect sizes. N = number of participants included in effect size; K = number of samples; E = Engagement, P = Perseverance, O = Optimism, C = Connectedness, H = Happiness. See Supplemental Table S2 for scales used and Table S5 for descriptives and correlations in each sample.

* $p < .05$, ** $p < .01$

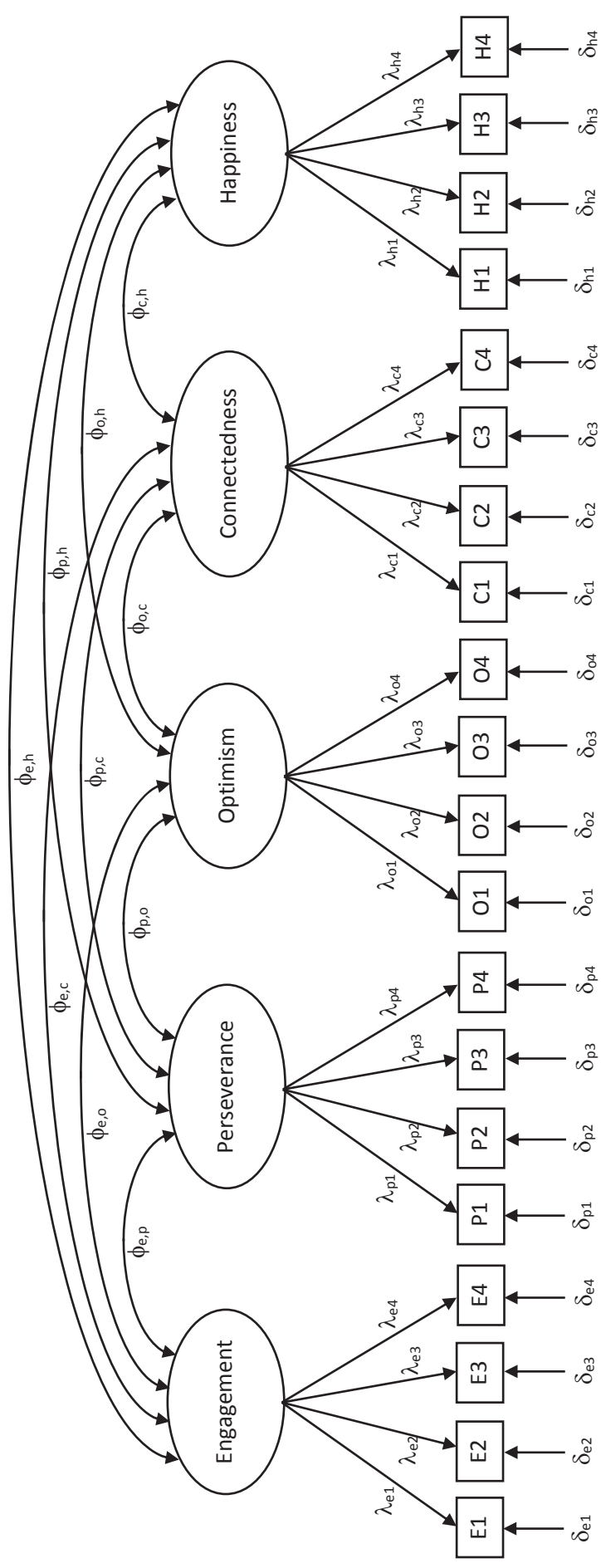


Figure 1. Five factor EPOCH model with 20 indicator items. See Table 1 for estimated confirmatory factor loadings, covariances, and model fit by sample.

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