# **Supplemental Materials**

**Section 1: Development of an Initial Pool of Items and Its Refinement**

**Section 2: Wording of WB-Pro Items and Constructs Considered in the Present Investigation**

**Section 3: Application and Results of Exploratory and Confirmatory Structural Equation Modeling**

**Section 4: Convergent and Discriminant Validity**

**Section 5: Goodness-of-fit, Golden Rules, and Interpretation of Parameter Estimates**

**Section 6: Relations of the WB-Pro Dimensions with 10 Demographic Variables**

**Section 7: A Profile Approach to the Relation Between WB-Pro15 Factors and Selected Demographic Variables**

**Section 8: WB-Pro Short Forms: Machine Learning Using Genetic Algorithms**

**Section 9: Formative vs. Reflective Measures**

**Section 10: Additional Information on Validity of WB-Pro Short Forms**

**Section 11: Mplus Syntax and Output for Model 1A in Table S2 and Full set of Factor Loadings for Factor Analysis Results in Table S3A**

**Section 12: Mplus Syntax Used for Analyses Presented the Main Manuscript (Relations between Individual Items from the WEMWBS and The Flourishing, and the 15 WB-Pro Factors: The Multidimensionality of Unidimensional Scales)**

**Supplemental References**

**Section 1: Development of an Initial Pool of Items and Its Refinement**

***Stage 1: Initial Item Construction and Selection***

The purpose of Stage 1 was to develop a large pool of items designed to measure each of these 10 components, to trial the item pool on a large, national representative sample, and to use evolving statistical analyses to select the best items to measure each of the 10 constructs. Starting with the 10 construct definitions items, the research team constructed additional items and adapted appropriate items from existing instruments designed to measure similar constructs (see subsequent discussion). In preparing items for the present study, we started with Huppert and So's (2013) ten original constructs but asked the question whether the inverse of the DSM/ICD criteria really covered well-being adequately.

Based on our review of the literature and in discussion with several clinical psychologist colleagues, we concluded that there were five important constructs missing from the original list. The additional factors were based on our review of the well-being literature in which we included positive psychology constructs that are not well-represented in clinical taxonomies of ill-being that were the basis of the original 10 constructs. We then independently verified the importance of these additional constructs through consultations with clinical psychologists. Three of these, Competence, Self-acceptance and Autonomy, have an individual focus like the ten original constructs; while two of the new components, empathy and prosocial behavior, have an interpersonal focus.

Competence was included in Huppert and So's (2013) original list of constructs, but the most suitable item available in the European Social Survey (ESS) was subsequently classified as "clear thinking" leading us to retain that component but to still add a more traditional measure of competence. Competence is arguably a core component of general wellness and thriving (Ryan & Deci, 2017). People who feel a sense of general competence have higher self-esteem (Thøgersen-Ntoumani & Ntoumanis, 2007), and greater satisfaction with life (Meyer, Enstrom, Harstveit, Bowles, & Beevers, 2007). Conversely, individuals with anxiety and depression have difficulty achieving goals and report feeling a lack of general competence (e.g., Ryan & Deci, 2017; Wei, Philip, Shaffer, Young, Zakalik & Hansen, 2005).

Considerable theory and research based on Self-Determination Theory (see overview by Ryan & Deci, 2017) argues that a lack of autonomy underpins all of the common mental disorders, even if it is not specifically mentioned as a symptom. Depression and anxiety are associated with decrements in perceived volition and control over one’s life, and the tendency to make decisions out of shame, guilt or avoidance, rather than one’s longer term values and aspirations (Ryan & Deci, 2017). All of these tendencies are linked to an absence of autonomy, meaning a general sense of autonomy is a core component of healthy functioning (Ryan & Deci, 2017).

Empathy and prosocial behaviour were included on the basis that prosocial emotions and behaviours are central to human functioning, vitality and wellness (Eisenberg, Fabes, & Spinrad, 2007; Weinstein & Ryan, 2010). Empathy is the tendency to vicariously experience other individuals’ emotional states (Davis, 1994). Individuals with mental health disorders have difficulty feeling the emotions of others and taking the perspective of others (Baron-Cohen, 2011). In contrast, empathy is essential to positive social functioning (Batson, 1991; Eisenberg et al., 2007) and has been associated with group cohesion (Henry, Sager, & Plunkett, 1996), and relationship satisfaction (Davis & Oathout, 1987), and as such is an important feature of healthy individual functioning.

Prosocial behavior has been defined as “voluntary behavior intended to benefit another” (Eisenberg et al., 2007, p. 646). It is related to empathy but conceptually distinct from it, in that the former describes observable behaviour, whereas the latter describes an internal state (Eisenberg et al., 2007). Depression and anxiety have also been negatively linked to prosocial behaviour, including social withdrawal, and less capacity to respond to the needs of others (Eisenberg et al., 2007). Although not directly derived from the inverse of DSM/ICD classifications, all are at least indirectly related to these classifications.

This large item pool for each of the 15 WB-Pro15 components was then critiqued by an expert panel of well-being researchers (colleagues of the authors). Each item was evaluated in relation to clarity of expression and an assessment of the factor to which it belongs. These responses were used to cull potentially inappropriate items and to revise the wording of potentially ambiguous items. This revised item pool was then administered to a large, representative sample of adult participants and advanced statistical analyses was used to select the best items.

***Stage 2: Final Item Selection and Testing***

The purpose of stage 2 was two-fold. Firstly, we sought to replicate, refine, and test the generalisability of the WB-Pro15 factor structure with a new, nationally representative sample of adults. Part of this sample consisted of some of participants from Stage 1 that allowed us to evaluate the test-retest stability of the WB-Pro15 constructs in addition to reliability. Based on the WB-Pro15 items from Stage 1 on the final WB-Pro15, we used "best practice" procedures (see Marsh, Ellis, Parada, Richards & Heubeck, 2005; Marsh, Martin & Jackson, 2010) to develop a brief instrument WB-Pro15 instrument, retaining only 3 or 4 items per factor that provide a well-defined, good-fitting factor structure, items that: best measured the intended construct as inferred on the basis of corrected item-total correlations (available in most reliability procedures) and the size of standardized factor loadings in CFA (these two criteria are combined as they provide essentially the same information); had minimal cross-loadings as evidenced by Mplus’s modification indexes based on CFA and cross-loadings based on ESEM, indicating the extent to which the fit would be improved if an item were allowed to load on a factor other than the one that it was intended to measure, and expected size of the cross-loading; had minimal correlated uniquenesses, particularly with other items in the same scale (if two items within the same scale had a substantial correlated uniqueness, only one item was retained); maintained the breadth of content of the original construct (based on subjective evaluations of the content of each item); and had a sufficient number of items to maintain a coefficient α estimate of reliability of at least .80 (and to retain more items for scales found to be less reliable). Based on these selection procedures and traditional criteria of a psychometrically sound instrument, we sought to construct the WB-Pro15 instrument such that it demonstrates:

• Good reliability: Median coefficient alpha ≥ .80 across the scales (Stages 1 & 2);

• Good test-retest stability over one year: median test-retest correlation ≥ .70 across the 15 scales (repeat sample from Stages 1 & 2);

• A well-defined, replicable factor structure as shown by structural equation modelling in relation to traditional indices of fit (Marsh, Hau & Wen, 2004; Stages 1 & 2);

• A factor structure that is invariant over gender, age, level of education, and time as shown by multiple-group structural equation models (Stages 1 & 2);

• Applicability for participants across the age range from late-adolescent/young adult, middle-age, and older adults (combined sample from stages 1 and 2);

• Convergent and discriminant validity as shown by multitrait-multimethod (MTMM) studies of WB-Pro15 responses in relation to time (test-retest stability) and to selected scales from other well-being instruments and indicators of well-being (Stage 2);

**Section 2: Wording of Selected Items and Constructs Considered in the Present Investigation**

Table S1

*Wording of Selected Items and Constructs Considered in the Present Investigation*

***Construct definitions of the original 10 constructs (Huppert & So, 2013).***

Competence: Feeling that one is a capable person (e.g. thinking clearly, concentrating, making decisions).

Emotional stability: Balanced emotional responses; feeling calm or relaxed; even-tempered.

Engagement: Being actively involved or taking an interest in most activities.

Meaning: The sense that one’s activities serve a wider purpose than self-interest.

Optimism: Having a positive attitude about the future; feeling hopeful.

Positive emotion: Tendency to experience positive feelings (e.g. happy, cheerful, contented).

Positive relationships: Experiencing good connections with people; having meaningful relationships.

Resilience: Ability to manage or recover from setbacks or from anxiety and worry.

Self-esteem: Positive evaluation of oneself as a person e.g. feelings of worth.

Vitality: Having sustained energy, particularly in relation to mental energy.

**15 Dimensions and 48 items for the WB-Pro**

|  |  |
| --- | --- |
| Autonomy | I feel free to do whatever I decide to do. |
| Autonomy | I feel free to make my own choices. (A) |
| Autonomy | I feel I can decide for myself how to live my life. |
| Clear Thinking | I am able to think clearly |
| Clear Thinking | I am able to stay focused when I need to. |
| Clear Thinking | I am easily able to concentrate when necessary. (A) |
| Competence | I am competent and capable in the activities that are important to me. |
| Competence | Most things I do, I do well. (A) |
| Competence | I am able to perform well and be successful in most things that I do |
| Emotional Stability | I do not get easily upset. (A) (B) |
| Emotional Stability | I usually maintain my composure. |
| Emotional Stability | I am emotionally balanced and even-tempered. |
| Empathy | My heart goes out to people who are unhappy. |
| Empathy | I feel others’ emotions. |
| Empathy | Other people’s misfortunes usually disturb me a great deal. |
| Empathy | I easily get caught up in other people’s feelings. (A) |
| Engagement | Most of the time I am really interested in what I am doing. (A) |
| Engagement | I am almost always engaged and interested in my daily activities. |
| Engagement | I feel excited by many of the things I do. |
| Meaning | I lead a purposeful and meaningful life. |
| Meaning | I feel I have a sense of direction in my life. |
| Meaning | My life has a clear sense of purpose. (A) |
| Optimism | I feel very optimistic about my future. (A) |
| Optimism | My future looks very bright to me. |
| Optimism | I am always optimistic about my future. (B) |
| Positive Emotions | I generally feel cheerful. |
| Positive Emotions | I am happy most of the time. |
| Positive Emotions | All things considered, I would describe myself as a happy person. (A) |
| Positive Relationships | There are people in my life who really care about me. (A) |
| Positive Relationships | I have close and secure relationships. |
| Positive Relationships | There are people with whom I can discuss intimate and personal matters. (B) |
| Positive Relationships | I receive help and support from others when I need it. |
| Prosocial Behavior | I frequently offer help to others. |
| Prosocial Behavior | I willingly give of my time to others in need. (A) |
| Prosocial Behavior | If a person needs help, I would do almost anything I could to assist. (B) |
| Resilience | I tend to bounce back quickly after hard times. |
| Resilience | It does not take me long to recover from a stressful event. |
| Resilience | I quickly get over and recover from significant life difficulties. (A) |
| Self-Acceptance | I am accepting of my own flaws and inadequacies. |
| Self-Acceptance | I can admit my shortcomings without shame or embarrassment. (A) |
| Self-Acceptance | I can see my own problems and shortcomings without getting distressed by them. |
| Self-Acceptance | I am accepting of who I am. |
| Self-Esteem | I feel that I’m a person of worth. (A) |
| Self-Esteem | A lot of things about me are good. |
| Self-Esteem | I feel that I have a number of good qualities. (B) |
| Vitality | I feel full of energy most of the time. |
| Vitality | I generally have a lot of energy. (A) |
| Vitality | I generally feel active and vigorous. |
| **14 WEMWBS Items** | |
| WMWB1 | I've been feeling optimistic about the future. |
| WMWB2 | I've been feeling useful. |
| WMWB3 | I've been feeling relaxed. |
| WMWB4 | I've been feeling interested in other people. |
| WMWB5 | I've had energy to spare. |
| WMWB6 | I've been dealing with problems well. |
| WMWB7 | I've been thinking clearly. |
| WMWB8 | I've been feeling good about myself. |
| WMWB9 | I've been feeling close to other people. |
| WMWB10 | I've been feeling confident. |
| WMWB11 | I've been able to make up my own mind about things. |
| WMWB12 | I've been feeling loved. |
| WMWB13 | I've been interested in new things. |
| WMWB14 | I've been feeling cheerful. |
| **8 Flourishing Items** | |
| FLOURISHING1 | I lead a purposeful and meaningful life. |
| FLOURISHING2 | My social relationships are supportive and rewarding. |
| FLOURISHING3 | I am engaged and interested in my daily activities. |
| FLOURISHING4 | I actively contribute to the happiness and well-being of others. |
| FLOURISHING5 | I am competent and capable in the activities that are important to me. |
| FLOURISHING6 | I am a good person and live a good life. |
| FLOURISHING7 | I am optimistic about my future. |
| FLOURISHING8 | People respect me. |

*Note*. A = Item included in 15 item WB-Pro scale. B = Item included in 5 item WB-Pro scale.

**Section 3: Application and Results of Exploratory and Confirmatory Structural Equation Modeling**

Full- and Set-Exploratory Structural Equation Modeling (ESEM) parameters can be identified with the maximum likelihood (ML), weighted least square, or with robust alternatives. Within a given model, is possible to posit a combination of Confirmatory Factor Analysis **(**CFA), Full-ESEM and Set-ESEM factors within the same model. If the model contains only a single factor, then CFA, Set-ESEM and Full-ESEM are equivalent.

In ESEM models when there is more than one factor (m > 1) with cross-loadings, model identification requires additional constraints (see Asparouhov & Muthén 2009; Marsh et al., 2009; Marsh, Martin & Martin, 2010; Sass & Schmitt, 2010). The initial (unrotated) unconstrained factor structure requires a total of m2 constraints to achieve identification. This initial, unrotated solution is then rotated using any one of a wide set of orthogonal and oblique rotations (Asparouhov & Muthén, 2009, Sass & Schmitt, 2010). Because the fit of the ESEM model does not depend on the particular rotation, goodness-of-fit does not provide a basis for choosing a particular rotation (Sass & Schmitt, 2010; also see Marsh, Morin, Parker & Kaur, 2014; Marsh, Guo et a., in press). However, comparison of fit with alternative model is facilitated by the fact that the traditional CFA model is nested under the Set-ESEM model which is nested under the Full-ESEM model. Geomin ration was used in early applications of ESEM (Marsh et al., 2009, 2010). However, more recently target rotation has been used to provide a compromise between the mechanical approach to EFA rotation and the a priori CFA model, based on partial knowledge of the factor structure. This is consistent with the emphasis of ESEM as a confirmatory tool rather than an exploratory tool.

Full- and Set-ESEM are highly flexible but, as initially operationalized, many CFA analyses could not be done with ESEM. Marsh, Lüdtke, Nagengast, Morin & Von Davier (2013; Morin, Marsh, & Nagengast, 2013) proposed ESEM within CFA (EwC) to resolve most of these limitations of ESEM. Identification of the ESEM requires m2 constraints where M = number of factors. Marsh and colleagues (2013) proposed that this could be accomplished that by retaining parameters estimates in the final ESEM solution, and fixing m2 factor loadings in initial solution. Thus, for example, fixing the all the factor loadings for the item with the highest factor loading for each factor for all the factors results in m2 constraints (i.e., there are m constraints associated with each of the m factors). The EwC solution is equivalent to the ESEM solution in terms of *df*, goodness of fit, and parameter estimates. However, the EwC is actually a CFA model based on the ESEM solution, thereby facilitating further models that are possible with CFA. Although previously applied in relation to Full-ESEM the some rationale can be applied to each set of ESEM factors within a Set-ESEM analysis (Marsh, Guo et a., in press), as illustrated in in the present investigation.

***Results of Factor Analyses in the Present Investigation***

Two sets of factor analyses—CFA and ESEM—were conducted on the entire set of 2,559 responses from participants at T1 and T2. Critical features of these analyses were the goodness-of-fit indices (see Models 1A & 1B in Table S2, below) and parameter estimates for both ESEM and CFA models (shown in Table S3A & S3B, below).

For the ESEM solution, all items load more highly on the factor that it was designed to measure (target loadings) than on other factors (non-target loadings; target loading are shown in Table S3A, and the full set of target and non-target loadings is presented in Section 6, below). The target loadings are all substantial, varying from .520 to .909 (median = .710). Nevertheless, some of the factor correlations are substantial, varying from .011 to .815 (Mean *r* = .476), with 8 of the 105 correlations greater than .700. Thus, the ESEM solution is well-defined.

For the CFA solution (see Table S3B, below), all the factor loadings are substantial, varying from .691 to .910 (Mean = .831; non-target loadings are all constrained to be zero in the CFA). However, the factor correlations are very high, varying from .284 to .918 (Mean *r* = .692), with 66 of 105 being greater than .700. Hence, although CFA structure is well-defined and well-fitting, the large factor correlations detract from the potential usefulness of the factors.

Both the ESEM and CFA solutions are well-defined in terms of goodness-of-fit and well-defined factors. Although the CFA solution is preferable in terms of parsimony, the ESEM solution is better fitting and resulted in more distinct factors. However, both CFA and ESEM solutions provide support for the a priori factor structure relating the 48 items to the WB-Pro factors.

Table S2

*Goodness of Fit for Models in the Present Investigation*

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Model | N Parms | CHI | df | RMSEA | CFI | TLI | Description | | |  | | |
| 1 Total (stacked) Group Analysis | | | | | | | | |  | | |
| 1A | 711 | 1207 | 513 | .023 | .994 | .986 | ESEM-Total Group | | |  | | |
| 1B | 249 | 4397 | 975 | .037 | .968 | .963 | CFA-Total Group | | |  | | |
| 1C | 30 | 10128 | .90 | .236 | .613 | .548 | HO Factor Analysis\* | | |  | | |
| 2 Multiple Group Invariance over Four Stacked Groups | | | | | | | |  | | |
| 2A | 2844 | 3498 | 2052 | .035 | .976 | .946 | Configural-4 groups | | |  | | |
| 2B | 1359 | 4531 | 3537 | .021 | .985 | .981 | Metric-4 groups | | |  | | |
| 2C | 1260 | 4744 | 3636 | .022 | .984 | .980 | Scalar -4 groups | | |  | | |
| 3 Multiple Group Invariance over Three Educational Groups | | | | | | | |  | | |
| 3A | 2133 | 2543 | 1539 | .028 | .984 | .965 | Configural-3 Educ Groups | | |  | | |
| 3B | 1143 | 3264 | 2529 | .018 | .988 | .984 | Metric-3 Educ Groups | | |  | | |
| 3C | 1077 | 3358 | 2595 | .019 | .988 | .984 | Scalar -3 Educ Groups | | |  | | |
| 4 Multiple Group Invariance over Four Age Groups | | | | | | | |  | | |
| 4A | 2844 | 3358 | 2052 | .032 | .981 | .958 | Configural-4 Age Groups | | |  | | |
| 4B | 1359 | 4588 | 3537 | .022 | .985 | .980 | Metric-4 Age Groups | | |  | | |
| 4C | 1260 | 4747 | 3636 | .022 | .984 | .980 | Scalar -4 Age Groups | | |  | | |
| 5 Multiple Group Invariance over Two Gender Groups | | | | | | | |  | | |
| 5A | 1422 | 1599 | 1026 | .021 | .98 | .979 | Configural-2 Gender Groups | | |  | | |
| 5B | 927 | 1988 | 1521 | .016 | .992 | .988 | Metric-2 Gender Groups | | |  | | |
| 5C | 894 | 2042 | 1554 | .016 | .992 | .988 | Scalar -2 Gender Groups | | |  | | |
| 6 Longitudinal Invariance & Multitrait-Multimethod Analyses | | | | | | | |  | | |
| 6A | 1695 | 5522 | 3057 | .02 | .978 | .967 | Configural-2 Waves | | |  | | |
| 6B | 1200 | 6335 | 3552 | .019 | .975 | .968 | Metric-2 Waves | | |  | | |
| 6C | 1152 | 6686 | 3600 | .02 | .973 | .965 | Scalar -2 Waves | | |  | | |
| 7 Total (stacked) Group Analysis Relating Demographic Variables to WB-Pro 15 Factors | | | | | | | |  | | |
| 7 | 926 | 1186 | 843 | .015 | .995 | .99 | Demographic Variables | | |  | | |
| 8 Tests of Unidimesionality of WEMWBS & Flourishing Instruments | | | | | | | |  | | |
| 8A | 24 | 190 | 20 | .075 | .955 | .937 | Deiner (D) 8-item (1 Factor) | | |  | | |
| 8B | 42 | 641 | 77 | .069 | .934 | .921 | Warwick (W) 14-Item (1 Factor) | | |  | | |
| 8C | 67 | 1589 | 208 | .066 | .906 | .891 | W+D 22 items (2 factors) | | |  | | |
| 9 WB-Pro 15 + Unidimentional WEMWBS & Flourishing Instruments | | | | | | | |  | | |
| 9A | 750 | 2891 | 902 | .038 | .955 | .923 | D+WB- Pro 15 (1+15 Factors) | | |  | | |
| 9B | 768 | 3911 | 1247 | .037 | .947 | .920 | W+WB- Pro 15 (2+15 Factors) | | |  | | |
| 9C | 807 | 6396 | 1748 | .042 | .921 | .891 | W+D+WB- Pro 15 (2+15 Factors) | | | | | |
| 10 WB-Pro 15 Absorbing WEMWBS & Flourishing Items | | | | | | | |  | | |
| 10A | 847 | 1491 | 805 | .024 | .984 | .970 | D+WB-Pro 15 (15 Factors) | | |  | | |
| 10B | 949 | 1723 | 1066 | .020 | .987 | .977 | W+WB- Pro 15 (15 Factors) | | |  | | |
| 10C | 1085 | 2554 | 1470 | .022 | .982 | .970 | W+D+WB- Pro 15 (15 Factors) | | |  | | |

*Note*. Summary of Goodness-of-fit statistics for the different factor analyses considered in the present investigation. ESEM = exploratory factor analysis; CFA = confirmatory factor analysis; Parms = number of freely estimated parameters; *Chi* = chi-square; df = degrees of freedom ratio; CFI = Comparative fit index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation. Model. Models 1-6 were based on stacked (long format) data, using robust maximum likelihood estimator and type = complex to account for fact that some students had two sets of responses.

Table S3A

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Comp etence | Clear  Thinking | Emot Stablity | Engage ment | Mean ing | Optim ism | Pos Emot | Pos Relat | Resil ience | Self-  Esteem | Vitality | Self-Accep | Auton omy\* | Emp athy | Pro- Social |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | CO | CT | ES | EN | ME | OP | PE | PR | RE | SE | VI | AC | AU | EM | PS |
| Target Factor Loadings | | | | | | | | | | | | | | | | |
| Item 1 |  | .520 | .534 | .803 | .678 | .557 | .766 | .656 | .807 | .732 | .581 | .819 | .855 | .755 | .564 | .775 |
| Item 2 |  | .687 | .809 | .666 | .656 | .57 | .661 | .668 | .755 | .744 | .58 | .909 | .923 | .909 | .788 | .821 |
| Item 3 |  | .607 | .902 | .723 | .476 | .66 | .598 | .720 | .784 | .848 | .596 | .665 | .546 | .681 | .78 | .733 |
| Item 4 |  |  |  |  |  |  |  |  | .791 |  |  |  | .544 |  | .872 |  |
| Factor Correlations | | | | | | | | | | | | | | | | |
| CO |  | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CT |  | .536 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ES |  | .259 | .685 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |
| EN |  | .075 | .518 | .627 | 1 |  |  |  |  |  |  |  |  |  |  |  |
| ME |  | .724 | .448 | .284 | .013 | 1 |  |  |  |  |  |  |  |  |  |  |
| OP |  | .032 | .441 | .612 | .799 | .137 | 1 |  |  |  |  |  |  |  |  |  |
| PE |  | .689 | .533 | .446 | .114 | .815 | .244 | 1 |  |  |  |  |  |  |  |  |
| PR |  | .436 | .677 | .601 | .514 | .523 | .555 | .600 | 1 |  |  |  |  |  |  |  |
| RE |  | .372 | .638 | .751 | .515 | .441 | .545 | .555 | .584 | 1 |  |  |  |  |  |  |
| SE |  | .086 | .547 | .619 | .760 | .011 | .707 | .169 | .584 | .444 | 1 |  |  |  |  |  |
| VI |  | .365 | .558 | .579 | .505 | .494 | .529 | .583 | .518 | .644 | .318 | 1 |  |  |  |  |
| AC |  | .632 | .722 | .669 | .383 | .611 | .381 | .659 | .690 | .685 | .460 | .559 | 1 |  |  |  |
| AU |  | .487 | .695 | .607 | .528 | .464 | .522 | .529 | .696 | .598 | .540 | .522 | .713 | 1 |  |  |
| EM |  | .345 | .381 | .349 | .279 | .323 | .217 | .339 | .542 | .289 | .268 | .301 | .490 | .405 | 1 |  |
| PS |  | .324 | .47 | .415 | .378 | .263 | .318 | .295 | .535 | .389 | .402 | .313 | .508 | .431 | .731 | 1 |
| Higher-Order Factor Loadings and Residual Variances | | | | | | | | | | | | | | | | |
| Loading |  | .563 | .829 | .793 | .615 | .580 | .617 | .680 | .825 | .787 | .621 | .695 | .856 | .812 | .520 | .571 |
| Residual |  | .683 | .313 | .371 | .622 | .664 | .620 | .538 | .320 | .381 | .614 | .517 | .268 | .341 | .729 | .674 |

*WB-Pro15 Factor Structure: Exploratory Structural Equation Model (ESEM)*

*Note*. Presented are target loadings relating each of the 48 items to the factor that it was designed to measure. Items 1 to 3 (or 4) refer to the three or four items designed to measure each factor. Cross-loadings are not shown here but are available in Supplemental Materials, section 6. The higher-order factor analysis was based on fitting a single factor to the latent correlation matrix of correlations among the 15 first-order factors shown here. Whereas all 15 factors loaded substantially on the higher-order factor (loadings .520 to .856), much of the variance in each of the factors could not be explained by the higher-order factor (residual variance components = .268 to .729). We also note that the fit of the higher-order factor model was extremely poor (RMSEA = 236; CFI = .613; TLI = .548)

Table S3B

*Summary of Confirmatory Factor Analysis (CFA) Model*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Comp etence |  | | Clear  Thinking | Emot Stablity | Engage ment | Mean ing | Optim ism | Pos Emot | Pos Relat | Resil ience | Self-Esteem | Vitality | Self-  Accep | Auton omy | Emp athy | Pro- social | |
|  |  | CO |  | | CT | ES | EN | ME | OP | PE | PR | RE | SE | VI | AC | AU | EM | PS | |
|  |  | | | Factor Loadings | | | | | | | | | | | | | | |
| item 1 |  | .855 |  | | .837 | .788 | .816 | .888 | .91 | .91 | .766 | .879 | .853 | .927 | .77 | .825 | .724 | .837 | |
| Item 2 |  | .798 |  | | .832 | .865 | .846 | .879 | .901 | .901 | .831 | .859 | .827 | .918 | .706 | .871 | .784 | .857 | |
| item 3 |  | .848 |  | | .809 | .742 | .796 | .894 | .891 | .891 | .74 | .887 | .843 | .882 | .853 | .815 | .664 | .815 | |
| Item 4 |  |  |  | |  |  | .852 |  |  |  | .744 |  |  |  |  |  | .691 |  | |
|  |  | | | Factor Correlations | | | | | | | | | | | | | | |
| CO |  | 1 |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| CT |  | .861 |  | | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| ES |  | .733 |  | | .775 | 1 |  |  |  |  |  |  |  |  |  |  |  |  | |
| EN |  | .86 |  | | .798 | .771 | 1 |  |  |  |  |  |  |  |  |  |  |  | |
| ME |  | .806 |  | | .739 | .748 | .918 | 1 |  |  |  |  |  |  |  |  |  |  | |
| OP |  | .78 |  | | .698 | .732 | .878 | .916 | 1 |  |  |  |  |  |  |  |  |  | |
| PE |  | .782 |  | | .748 | .827 | .889 | .88 | .889 | 1 |  |  |  |  |  |  |  |  | |
| PR |  | .727 |  | | .711 | .675 | .786 | .797 | .758 | .785 | 1 |  |  |  |  |  |  |  | |
| RE |  | .751 |  | | .721 | .786 | .792 | .771 | .762 | .799 | .65 | 1 |  |  |  |  |  |  | |
| SE |  | .889 |  | | .819 | .766 | .84 | .833 | .794 | .831 | .798 | .732 | 1 |  |  |  |  |  | |
| VI |  | .667 |  | | .655 | .685 | .825 | .754 | .778 | .777 | .59 | .726 | .632 | 1 |  |  |  |  | |
| AC |  | .836 |  | | .799 | .787 | .808 | .792 | .748 | .782 | .739 | .752 | .882 | .641 | 1 |  |  |  | |
| AU |  | .792 |  | | .755 | .686 | .797 | .761 | .736 | .737 | .717 | .687 | .766 | .616 | .786 | 1 |  |  | |
| EM |  | .405 |  | | .361 | .379 | .432 | .394 | .342 | .359 | .504 | .282 | .433 | .284 | .424 | .375 | 1 |  | |
| PS |  | .587 |  | | .528 | .501 | .582 | .555 | .496 | .504 | .59 | .478 | .583 | .429 | .565 | .496 | .756 | 1 | |

**Section 4: Convergent and Discriminant Validity**

***Multitrait-Multimethod Approach: A Supplemental Rationale***

The multitrait-multimethod (see Campbell & Fiske, 1959) design is used widely to assess convergent and discriminant validity, and also is a standard criterion for evaluating psychological instruments. Although Campbell and Fiske’s original guidelines are still widely used to evaluate MTMM data, important problems with their guidelines are well known (see reviews by Marsh, 1988, 1993; Marsh & Grayson, 1995). Ironically, even in highly sophisticated CFA approaches to MTMM data, a single scale score—often an average of multiple items—is typically used to represent each trait–method combination. Marsh (1993; Marsh et al., 2005; Marsh & Hocevar, 1988), however, argued that it is stronger to incorporate the multiple indicators explicitly into the MTMM design. When multiple indicators are used to represent each scale, CFAs and ESEMs at the item level results in a MTMM matrix of latent correlations, thereby eliminating many of the objections to the Campbell–Fiske guidelines. We argue that because our analysis starts with a latent correlation matrix in which factors are represented by multiple items, our approach overcomes most of the limitations widely attributed to the original Campbell & Fiske (1959) guidelines. For this reason, the actual summary of the MTMM results based on the latent MTMM correlation matrix better represents the logic and intuitive appeal of the original Campbell-Fiske guidelines than do most current approaches to MTMM data.

***Multitrait-Multimethod Approach: Supplemental Discussion of Results***

The 30x30 correlation matrix based on this factor analysis (see Table 3 in the main manuscript) represents a MTMM matrix with 15 traits (the WB-Pro factors) and two methods (T1 and T2). The 15 test-retest correlations (.73 to .85; Mn = .80; the main diagonal in Table 3) represent convergent validities. These results provide good support for convergent validity in relation to time. The remaining correlations between T1 and T2 responses (.02 to .56; Mean *r* = .29; off-diagonal correlations in Table 3) represent heterotrait-heteromethod correlations in Campbell-Fiske terminology. Correlations among T1 factors (Mean *r* = .34) and among T2 factors (Mean *r* = .35) represent heterotrait-monomethod correlations (not shown to conserve space, but see Table 2, above). Because the convergent validities are substantially higher than the either heterotrait-heteromethod or heterotrait-monomethod correlations, there is good support for divergent validity.

Because the correlations among different factors at each wave (Mean *r*s = .34 & .35) are slightly higher than correlations among different factors for different waves (Mean *r* = .29), there is some evidence for a small method-halo effect associated with each wave considered separately.

***Relations with Other Constructs***

Here, we discuss results (presented in Table 2 of the manuscript) of our tests of convergent and divergent validity of the 15 WB-Pro dimensions with other relevant scales.

**PERMA.** Four of the five PERMA factors (engagement, meaning, positive emotions and positive relations—all but accomplishment) directly parallel four of the WB-Pro factors. In support of the convergent validity of these four factors, correlations among each pair of PERMA and WB-Pro factors (.834 to .899) are extremely high. Correlations between these four PERMA factors and other WB-Pro factors are substantial, but systematically lower. The fifth PERMA factor, accomplishment, is highly correlated with WB-Pro factors to which it is most logically related (competence, engagement, meaning, optimism, and positive emotions—correlations of .721 to .808). Although correlations between PERMA and WB-Pro factors support the validity of the factors, we note that correlations among the five PERMA factors are very high (.768 to .937), meaning they are not ideally suited to testing discriminant validity in relation to other measures, or differentiating between the five PERMA factors.

**Basic Psychological Needs.** This instrument measures need satisfaction and need frustration in relation to three basic psychological needs—a total of 6 (3 needs x 2 directions). Each of the three psychological needs (autonomy, relatedness, and competence) matches a corresponding WB-Pro (autonomy, positive relations, and competence). Logically, the positively oriented WB-Pro factors should be most strongly (positively) related to the corresponding need satisfaction factors, and less strongly (negatively) related to the corresponding need frustration factors. Consistent with a priori predictions, the correlations between matching need satisfaction and WB-Pro factors are substantial (.700, .812, .786), whereas the corresponding correlations for need frustration are smaller in size and negative in direction (-.500, -.585, -.582). In each case, the WB-Pro factor is more positively related with the matching need satisfaction factor than to any other psychological need factor, and more negatively correlated with the matching need frustration factor than to any other psychological need factor. These results provide strong support for the convergent and discriminant validity of responses to both instruments.

**Big-Five Personality.** As noted earlier, there is not such a clear a priori matching of Big-Five personality and WB-Pro factors. Highlighted in Table S6 are the WB-Pro factors that are logically most related and highly correlated with each Big-Five personality factor. Thus, openness is most strongly related to engagement and prosocial behavior; conscientiousness is most highly correlated with competence and clear thinking; extraversion is most highly correlated with engagement and positive emotions; agreeableness is most highly correlated with empathy and prosocial behavior; and neuroticism is most highly correlated (negatively) with particularly emotional stability, but also with positive emotions, resilience, and self-acceptance. Particularly the correlations of agreeableness with prosocial behavior and empathy are larger than the correlations of between these WB-Pro factors and any of the PERMA or Psychological Needs factors (or any of the additional single-scale measures that were considered). This is not surprising as these well-being factors are not represented in the other measures, but the correlations between Big-Five and WB-Pro factors provide support for the convergent as well as discriminant validity of particularly these two WB-Pro factors. In summary, although not strictly a priori, this logical pattern of relations between Big-Five personality factors and WB-Pro factors provides support for the convergent and discriminant validity of the responses to the WB-Pro.

**Single-Scale Measures.** Next we evaluate convergent and discriminant validity in relation to selected single-scale measures (but see analyses of WEMWBS and flourishing, described below). Two multi-item single-factor instruments (CES-D and stress) reflect widely used measures of ill-being. Hence, it is logical that these measures are negatively correlated with most of the WB-Pro measures of well-being. Interestingly, the exception is the empathy scale that is nearly uncorrelated with these measures of ill-being. Logically and empirically, these two measures of ill-being are most negatively correlated with emotional stability (particularly stress) and positive emotions (particularly depression).

Life satisfaction and happiness are sometimes used as single-item constructs (or single construct if based on multiple items). Not surprisingly, both these measures are positively related with all WB-Pro factors. Although we did not postulate a priori predictions about the pattern of correlations, correlations greater than .700 are highlighted in Table S7. Life satisfaction tends to be more correlated with WB-Pro factors, with seven correlations greater than .700 (the highest being optimism, .812; and positive emotions, .799). In contrast, happiness is only correlated greater than .700 with positive emotions. Nevertheless, the pattern of correlations relating these two measures to WB-Pro is very similar (the profile similarity index, the correlation between the 15 correlations with happiness and the corresponding 15 correlations with life satisfaction, is .970).

Although sleep problems, general health, and exercise are not highly correlated with any of the WB-Pro factors, each of these three items are most highly correlated with the WB-Pro factor of vitality-- particularly general health (.559) and exercise (.394).

**Section 5: Goodness-of-fit, Golden Rules, and Interpretation of Parameter Estimates**

In applied CFA/SEM studies, applied researchers have sought universal “golden rules” as to what constitutes an acceptable goodness of fit (Marsh, Balla & McDonald, 1988; Marsh, Hau, & Wen, 2004). Generally, given the known sensitivity of the chi-square test to sample size, to minor deviations from multivariate normality, and to minor misspecifications, applied SEM research focuses on indices that are relatively sample-size independent (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004; Marsh, Hau, & Grayson 2005), such as the Root Mean Square Error of Approximation (RMSEA), the Tucker-Lewis Index (TLI), and the Comparative Fit Index (CFI). Population values of TLI and CFI vary along a 0-to-1 continuum, in which values greater than .90 and .95 typically reflect acceptable and excellent fits to the data, respectively. Values smaller than .08 and .06 for the RMSEA support acceptable and good model fits respectively.

The chi-square difference test can be used to compare two nested models, but this approach suffers from even more problems than does the chi-square test for single models—problems that led to the development of other fit indices (see Marsh, Hau et al., 2005). Cheung and Rensvold (2002) and Chen (2007) suggested that if the decrease in fit for the more parsimonious model is less than .01 for incremental fit indices such as the CFI, there is reasonable support for the more parsimonious model. For indices that incorporate a penalty for lack of parsimony, such as the RMSEA and the TLI, it is also possible for a more restrictive model to result in a better fit than would a less restrictive model. However, it is emphasized that these cut-off values constitute rough guidelines only, rather than “golden rules” (Marsh et al., 2004). Indeed, this emphasis of treating these cut-off values as rough guideline rather than golden rules applies even more strongly to Full- and Set-ESEM where there has not been a sufficient history of application to fully support the usefulness of cut-offs based on CFA models.

The basic CFA model is nested under the corresponding Set-ESEM, and the Set-ESEM is nested under the Full-ESEM. This nested structure facilitated conventional model comparisons which can be used to compare the fit of three models– along with a detailed evaluation of parameter estimates based on the three approaches. The Set- and Full-ESEMs are most appropriate when they fit the data better than the corresponding CFA model, the multiple ESEM factors are well-defined in the measurement model, and there are substantively important differences in parameter estimates based on the CFA and the ESEM models. Starting with the initial ESEM publications (Asparouhov & Muthén, 2009; Marsh et al., 2009), Marsh et al. (2014) argued that factor correlations were typically positively biased unless the CFA assumption is met (all cross-loadings are exactly equal to zero in the population). Indeed, even when the ICM-CFA model apparently fits well, CFA factor correlations tend to be larger than ESEM factor correlations. Importantly, simulation studies show that ESEM is typically better at recovering known factor correlations and that even small cross-loadings can result in biased estimates of factor correlations when based on CFAs (Marsh et al., 2014). If ESEMs are sufficiently similar to CFA results, then there is robust support for the factor structure based on the CFA solution. Thus, it is always appropriate to test ESEMs even when CFA models are retained.

Marsh et al. (2014) also acknowledged that ESEM might lack parsimony (particularly in large, complex models based on moderate sample sizes). Set-ESEM was developed in part to achieve a better balance between the goodness-of-fit for the Full-ESEM and the parsimony of the CFA. However, because of the nesting relationship between the three models, parsimony based on the number of freely estimated parameters will always be best for CFA, followed by Set-ESEM, and then Full-ESEM, whereas the goodness of fit for indices that do not control for parsimony (e.g., the chi-square statistics and indices like the CFI that are monotonic with it) will always be better for ESEM, followed by Set-ESEM, and then CFA. However, for indices that control for parsimony (e.g., TLI and RMSEA), it is possible for the CFA model to fit better than the ESEM models, or for Set-ESEM to fit better than the Full-ESEM. Nevertheless, when these three models vary substantially in relation to parsimony, model evaluation should not rely solely—or even primarily—on the basis of goodness of fit.

**Section 6: Relations of the WB-Pro Dimensions with 10 Demographic Variables**

In support for our multidimensional perspective (but also substantively relevant), we found distinct patterns of relations between the 15 WB-Pro factors and 10 demographic variables. These patterns of relations appear in Table 4, below, and demonstrate a complex pattern of associations between the 15 WB-Pro dimensions and various demographic factors. For example, males reported more vitality, resilience and emotional stability than females, whereas females reported greater empathy than males. Similarly, there were positive correlations with age for self-acceptance, positive emotions, clear thinking and autonomy, while other WB-Pro factors (e.g., optimism) showed weaker or even negative relations with age. Further, there were also some quadratic effects associated with age. For example, competence initially increased, levelled out and then declined in older age (i.e. an inverted ‘U-shape’), whereas optimism, engagement, positive relations, vitality and resilience initially declined, levelled out and then increased in older age (i.e., a ‘U-shape’). Although most WB-Pro factors were positively related to education (the strongest were emotional stability, vitality, clear thinking, optimism, positive relations, self-esteem and engagement), others had little or no association. Lastly, being married was positively related to many WB-Pro factors (the largest associations were optimism, engagement and self-esteem) but were uncorrelated with other factors. Although these complex patterns of relations are substantively important in their own right, the overarching issue for present purposes is that these patterns of relations support our multidimensional approach to well-being. In particular, the complex multidimensional pattern of relations could not be represented with a single global measure of well-being.

Table S4

*Association between 15 WB factors and Background/Demographic Variables*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Predictor  Variables | Comp etence | clear  thinking | Emot Stablity | Engage ment | Mean ing | Optim ism | Pos Emot | Pos Relat | Resil ience | Self-  Esteem | Vitality | Self- Accept | Auton omy\* | Emp athy | Pro- social |
| CO | CT | ES | EN | ME | OP | PE | PR | RE | SE | VI | AC | AU | EM | PS |
| Demographic | | | | | | | | | | | | | | | |
| Married | -.106 | .088 | .***131*** | .***247*** | -.048 | ***.287*** | -.031 | .***157*** | .***136*** | .***204*** | .***100*** | .035 | .041 | .038 | .042 |
| Male | .***088*** | .057 | .***115*** | -.018 | .066 | -.003 | .052 | -.033 | .***140*** | -.***056*** | .***156*** | .***120*** | .045 | -.***140*** | -.***095*** |
| Education | .054 | .***143*** | ***.161*** | .***123*** | .081 | .***136*** | .044 | .***125*** | .***082*** | .***130*** | .***148*** | .***058*** | .052 | .***066*** | .023 |
| English Fluency | -.***104*** | -.***119*** | -.054 | -.020 | -.022 | -.029 | -.055 | -.079 | -.***052*** | -.***081*** | -.028 | -.***082*** | -.***093*** | -.***048*** | -.***096*** |
| AGE-linear | ***.097*** | .***143*** | .***083*** | -.033 | .***091*** | -.***135*** | .***131*** | .042 | .046 | .***08***9 | ***-.058*** | .***143*** | .***101*** | -.018 | .020 |
| AGE-quad | -.***082*** | .011 | .058 | .***091*** | -.021 | .**115** | -.001 | .***066*** | .***059*** | .011 | .***065*** | -.031 | .034 | .038 | .005 |
| Married x AGE | -.049 | -.029 | -.022 | -.035 | -.005 | .003 | -.025 | -.011 | -.029 | -.053 | -.004 | -.039 | -.048 | -.042 | -.037 |
| Education x AGE  Male x Age | .039  -.026 | -.019  -.028 | -.***057***  -.***071*** | -.009  -.065 | .015  -.042 | -.047  -.004 | .010  -.058 | -.034  -.051 | -.032  -.***066*** | -.***062***  -.012 | .019  -.***087*** | -.001  -.***096*** | -.004  -.045 | -.011  -.***1***01 | .011  -.***056*** |
| Married x Male | -.013 | .016 | .024 | .***080*** | -.013 | .053 | -.026 | .***059*** | .028 | .060 | .021 | -.003 | .033 | .041 | .***077*** |
| Life Event Changes | | | | | | | | | | | | | | | |
| Negative | 0.07 | ***-0.42*** | ***-0.52*** | ***-0.38*** | ***-0.23*** | ***-0.56*** | ***-0.36*** | ***-0.34*** | ***-0.56*** | ***-0.28*** | ***-0.4*** | ***-0.32*** | ***-0.24*** | ***0.26*** | 0.2 |
| Neutral | 0.08 | -0.04 | -0.36 | 0.05 | -0.09 | 0.15 | -0.17 | 0.04 | -0.2 | 0.01 | -0.08 | -0.11 | 0.02 | ***0.26*** | 0.12 |
| Positive | 0.17 | 0.09 | -0.05 | 0.21 | 0.19 | ***0.33*** | 0.24 | ***0.28*** | 0.15 | 0.1 | ***0.28*** | 0.16 | 0.17 | 0.35 | ***0.37*** |

*Note*. In the structural equation model, each of the WB-Pro15 scales was represented by a latent factor and regressed on the eight predictor variables. To facilitate interpretation all first-order predictor variables were standardized and all interaction terms were the product of standardized predictor variables (but not restandardized). A separate analysis was done predicting each WB-Pro 15 factor from the set of three life event change scores. Statistically significant (p < .05) coefficients are presented in bold and underlined.

**Section 7: A Profile Approach to the Relation Between WB-Pro15 Factors and Selected Demographic Variables**

In this section (see Table 6) we evaluate a multidimensional profile approach to the representation of the WB-Pro15 scales in relation to three demographic variables (Married, Male, and Age) and compare it to a unidimensional approach.

The effect of being married was positive for life satisfaction (.228); however, it was even more positive for optimism, but less positive for all the other WB-Pro factors (significantly so for 11 factors). This differentiated profile of effects of being married on WB-Pro factors cannot be explained in terms of global Life Satisfaction.

Gender differences (male) were weakly positive for life satisfaction (.063); however, they were significantly more positive for vitality, emotional stability, and acceptance, but significantly negative for self-esteem, positive relations, optimism, engagement, and particularly empathy, pro-social behaviour. This differentiated profile of gender differences on WB-Pro factors cannot be explained in terms of global Life Satisfaction.

Age was not significantly related to life satisfaction (.016); however, age effects were significantly more positively for clear thinking, emotional stability, positive relations, positive emotions, reliance, acceptance and autonomy, but more negative for optimism and vitality. This differentiated profile of age effects on WB-Pro factors cannot be explained in terms of global Life Satisfaction.

In summary, this profile approach to the relation between the WB-Pro15 factors and selected demographic variables provides strong support for the multidimensional perspective underpinning the WB-Pro15 instrument. The differentiated effects of these demographic variables could not be explained in terms of a unidimensional perspective of well-being.

**Section 8: WB-Pro Short Forms: Machine Learning Using Genetic Algorithms**

To create a short-form of the WB-Pro, we utilized the latest advances in machine-learning methods in psychometrics employing genetic algorithms (GA). First introduced by Holland (1975) as optimization tools for game theory and pattern recognition problems, the GA have recently gained popularity in psychometrics for being highly convenient optimization tools for efficiently finding a short form of a long form (Sahdra, Ciarrochi, Parker & Scrucca, 2016; Schroeders, Wilhelm, & Olaru, 2016; Yarkoni, 2010). The GA implement the principles of biological evolution (e.g., mutation, crossover, and selection based on fitness) in a computational framework to find a suitable short form of the long form that is reliable, valid, and preserves most of the variance in the data of the original questionnaire (Sahdra et al., 2016; Yarkoni, 2010). The GA have been employed to abbreviate long forms of several psychological constructs, including personality traits (Yarkoni, 2010), psychopathy (Eisenbarth, Lilienfeld & Yarkoni, 2015), experiential avoidance (Sahdra et al., 2016) and body image (Basarkod, Sahdra & Ciarrochi, 2018).

We implemented the GA method in R, an open source statistical computing environment (R Core Team, 2018), using the GAabbreviate package (Scrurra & Sahdra, 2015). The details of the genetic algorithms procedure for questionnaire abbreviation are described in Yarkoni (2010), and the details of the GAabbreviate package can be found in Sahdra et al. (2016). Briefly, the GAabbreviate aims to minimise the ‘cost’ of an item in the abbreviated scale based on the ‘fitness function’ below, as described by Sahdra et al. (2016):

Here, *I* is the item cost, *k* is the number of items to be retained, *s* is the number of subscales in the measure (if applicable), *wi* are the weights associated with the each subscale (if applicable), and *R2* is the variance that a linear combination of individual item scores can explain in the *i*th subscale or the original full scale if there are no subscales or the multidimensional structure is ignored. Consistent with the cross-validation recommendations for machine learning applications to minimize over-fitting (James, Witten, & Hastie, 2014), the GAabbreviate implements cross-validation by default by training the GA on 50% of the sample and testing the variance-explained criterion on the remaining 50%.

In our case, the GA procedure of finding a 15-item measure from the pool of 48 items of WB-Pro began with a random selection of several sets consisting of 15 items. Borrowing the terminology from genetics, the items of the original full scale represent the genes and the item sets of randomly selected short forms represent chromosomes. Two of the selected item sets represent two parents of an offspring, a short form that is a product of several computational procedures analogous to natural selection in biological evolution. Subsetting and recombining item sets is analogous to two chromosomes exchanging one or more of their genetic sequences. As in biological evolution, in which spontaneous changes in the genes alter the gene sequence, in the GA method, the mutated items are replaced with items of the initial item pool to alter the short forms. After such manipulations, the next generation of the short versions were evaluated using a fitness function (as described above). The best performing offspring was selected, representing ‘survival of the fittest’ in evolutionary terms. We following the same procedure for generating the 5-item measure, expect no constraint was set for item selection within subscales. The correlation of the 15-item short form with the long form (in the validation subset) was .90, and that of the 5-item version with the full form was .96.

**Section 9: Formative vs. Reflective Measures**

A starting point of the present investigation is that understanding the causes of well-being and how to enhance it requires clear conceptual framework and definitions for the multiple well-being factors. This multidimensional approach is in sharp contrast to unidimensional approaches. In one of the unidimensional approaches well-being is inferred from responses to a single item (e.g., "happiness" or "life satisfaction") or a tightly worded set of items designed to measure a narrowly defined construct. Such an approach is truly unidimensional, highly parsimonious and expedient. However, this approach provides a very narrowly defined measure of well-being and does not provide useful information about the profile of different components that make up well-being. In a second unidimensional approach, illustrated by the widely used Flourishing and WEMWBS measures, well-being is based on responses to a set of items implicitly designed to cover more broadly the breadth of the well-being construct. Clearly this approach results in a more broadly defined measure of well-being. However, because well-being is still represented by a single score, it does not provide useful information about the profile of different components that make up well-being, not even the components used to construct the measure. Furthermore, although purportedly unidimensional, the explicit logic of the design of these instruments is multidimensional, covering a range of different components of well-being. At best, the rationale underlying these measures is an expedient—not entirely satisfactory—compromise between a truly unidimensional and multidimensional measures of well-being.

Indeed, Flourishing and WEMWBS measures (as well as our WB-PRO15 short measures) should be considered formative rather than reflective measures of well-being, and this has caused considerable confusion in their appropriate description and application. The rationale for a formative measure (for further discussion see Bollen & Lennox, 1991; Edwards & Bagozzi, 2000) is to provide a composite index constructed from independent, albeit correlated indicators. In the factor structure the causal flow (the direction of the arrows in the path diagram) is from indicators to the composite construct. For a reflective the construct the causal flow is from the latent construct to the indicators so that correlations among indicators are zero once the after partialing out the latent factor. The theoretical rationale for reflective measures is that the indictors are essentially interchangeable so that deletion or addition of indicators does not change the nature of the construct, whereas for formative constructs "omitting an indicator is omitting a part of the construct" (Bollen & Lennox, 1991). For formative constructs, unidimensionality and internal consistency are inappropriate—even counter-productive—criteria for assessing a formative measure. Particularly if indicators for a formative construct are selected so as to be internally consistent and form a unidimensional construct, it is likely that the breadth of the construct has been compromised and that potentially important indicators of the formative construct have been excluded.

We argue that the Flourishing and WEMWBS measures should be considered formative rather than reflective measures. Support for this argument comes from the manner in which the measures were constructed, the nature of the items, and the results of our analyses showing that the measures reflect diverse components of well-being rather than a unidimensional construct. However, we do not argue that they are "bad" measures, but only that the internal consistency and undimensionality criteria used to support their usefulness are inappropriate. The critical evaluation of a formative measure is how well the indicators cover the breadth of content the index is intended to cover. This was an explicit basis of the selection of items for the WB-Pro15 short forms (see earlier discussion), but appears to be implicit at best in the construction of the Flourishing and WEMWBS measures. Furthermore, the use of internal consistency and undimensionality to reduce the length of the 14-item WEMWBS measure to the more widely used 7-item version (Stewart-Brown et al., 2009) is completely antithetical of the theoretical rationale of a formative measure and is likely to compromised the breadth of the measure. For example, WEMWBS item 5 (I've had energy to spare) was the only item that was a priori and empirically related to the WB-Pro15 vitality factor (see Table 6). However, this item was excluded from the 7-item version, apparently on the basis of providing a better fit to a unidimensional scale—removing the most misfitting items. Although a full evaluation of the construct validity of the Flourishing, and WEMWBS measures (or WB-Pro15 short measures) from the perspective of a formative measure is beyond the scope of the present investigation, this is an important direction for further research.

**Section 10: Additional Information on Validity of WB-Pro Short Forms**

Here, we provide supplementary presentation of the results of the development and validation of 5- and 15-item versions of the WB-Pro, in which these versions were validated against the WB-Pro (48-items) and selected external validation scales (see Table S5 below). Not surprisingly, the WB-Pro global 5- and 15-item scales are highly correlated with the single-scale measures designed to reflect a global sense of well-being (i.e., WEMWBS, Flourishing, life satisfaction: *r*s = .660 to .800). It is also interesting to note that the global scores are also highly correlated with the five PERMA factors (*r*s = .700 to .814) even though PERMA is designed to reflect distinct factors. This reflects, in part, the observation that correlations among the PERMA factors are very high. Nevertheless, the correlations between PERMA factors and the most logically related WB-Pro factor (*r*s = .808 to .899) are systematically higher. In contrast, the psychological needs satisfaction factors are less correlated with the WB-Pro global scales (*r*s = .652 to .695) due in part to the fact that the needs satisfaction factors are more distinct than the PERMA factors. However, the basic psychological need satisfaction factors are also somewhat more highly correlated with the mostly logically related WB-Pro factor (*r*s = .700 to .812) than with either of the WB-Pro global scales. It is also interesting to note that the pattern of results with psychological need frustration factors is similar to the pattern for need satisfaction factors. However, the sizes of the correlations with need satisfaction are systematically higher than the corresponding correlations with need frustration.

Table S5

*Comparisons between WB-Pro Short Global Measures and the full WB-Pro Scale. Correlations between each of the WB-Pro measures and existing measures of well-being and related constructs*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Well-Being Correlates |  | | WB-Pro-Short Global Summary Scores | | | Predicted Highest Correlating WB-Pro15 Factor | |
|  |  | | 15 item | 5 item | Factor | Corr |
| **PERMA** | | | | | |  | |
| Positive Emotion |  |  | | .820 | .745 | Positive emotions | .899 |
| Engagement |  |  | | .779 | .697 | Engagement\* | .842 |
| Pos Relationships |  |  | | .700 | .644 | Pos relationships\* | .834 |
| Meaning |  |  | | .814 | .733 | Meaning\* | .899 |
| Accomplishment |  |  | | .794 | .693 | Meaning | .808 |
| **Psychological Needs** | | | | | |  | |
| Satisf Autonomy |  |  | | .695 | .605 | Autonomy\* | .700 |
| Satisf Relation |  |  | | .652 | .620 | Pos Relations\* | .812 |
| Satisf Competence |  |  | | .693 | .634 | Competence\* | .788 |
| Frust Autonomy |  |  | | -.464 | -.408 | Autonomy\* | -.500 |
| Frust Relation |  |  | | -.454 | -.420 | Positive Relations\* | -.585 |
| Frust Competence |  |  | | -.534 | -.469 | Competence\* | -.582 |
| **Big Five** | | | | | |  | |
| Openness |  |  | | .405 | .402 | Engagement | .426 |
| Conscientiousness |  |  | | .554 | .477 | Competence | .677 |
| Extraversion |  |  | | .508 | .460 | Engagement | .511 |
| Agreeable |  |  | | .523 | .559 | Pro-Social | .664 |
| Neurotic |  |  | | -.510 | -.480 | Emotional Stability | -.617 |
| **Single Scale Measures** | | | | | |  | |
| WEMWBS |  |  | | .800 | .731 | Positive Emotions | .818 |
| Depression |  |  | | -.543 | -.480 | Positive Emotions\* | -.620 |
| Stress |  |  | | -.521 | -.468 | Emotional Stability | -.595 |
| Diener (WB) |  |  | | .763 | .699 | Meaning | .783 |
| Life Satisfaction |  |  | | .733 | .660 | Optimism | .812 |
| Happy |  |  | | .628 | .569 | Positive Emotions | .720 |
| Sleep |  |  | | .160 | .142 | Vitality | .274 |
| General Health |  |  | | .414 | .358 | Vitality\* | -.559 |
| Exercise |  |  | | .281 | .236 | Vitality\* | .394 |

*Note*. Correlations between global scores and well-being correlates are based on a large CFA with all 40 factors (15 WB-Pro plus 25 covariate factors). One short global score is based on the best 15 items, subject to the constraint that one item from each scale was included: the other is based on the best 5 items.

**Section 11: Mplus Syntax and Output for Model 1A in Table S2 and Full set of Factor Loadings for Factor Analysis Results in Table S3A**

USEVARIABLES ARE

CO2 CO5 CO6

CO9 CO10 CO11

ES2 ES4 ES7

EN2 EN3 EN7

ME1 ME5 ME9

OP2 OP3 OP5

PE2 PE3 PE7

PR2 PR6 PR7 PR8

RE3 RE5 RE6

SE1 SE2 SE3

VI1 VI4 VI7

AC1 AC4 AC7 AC9

AU2 AU3 AU5

EM1 EM2 EM4 EM5

HG1 HG3 HG5

;

define: standardize all;

ANALYSIS: ESTIMATOR = ML; ROTATION = TARGET; PROCESSORS =2;

MODEL:

CO by CO2-CO6~.80 CO9-hg5~0 (\*t1);

COx by CO9-CO11~.80 es2-hg5~0 CO2-CO6~0 (\*t1);

ES by ES2-ES7~.80 EN2-hg5~0 CO2-CO11~0(\*t1);

EN by EN2-EN7~.80 ME1-hg5~0 CO2-ES7~0(\*t1);

ME by ME1-ME9~.80 OP2-hg5~0 CO2-EN7~0(\*t1);

OP by OP2-OP5~.80 PE2-hg5~0 CO2-ME9~0(\*t1);

PE by PE2-PE7~.80 PR2-hg5~0 CO2-OP5~0(\*t1);

PR by PR2-PR8~.80 RE3-hg5~0 CO2-PE7~0(\*t1);

RE by RE3-RE6~.80 SE1-hg5~0 CO2-PR8~0(\*t1);

SE by SE1-SE3~.80 VI1-hg5~0 CO2-RE6~0(\*t1);

VI by VI1-VI7~.80 AC1-hg5~0 CO2-SE3~0(\*t1);

AC by AC1-AC9~.80 AU2-hg5~0 CO2-VI7~0(\*t1);

AU by AU2-AU5~.80 EM1-hg5~0 CO2-AC9~0(\*t1);

EM by EM1-EM5~.80 HG1-hg5~0 CO2-AU5~0(\*t1);

HG by HG1-HG5~.80 CO2-EM5~0(\*t1);

OUTPUT: stdyx mod TECH1 tech4 sval MODINDICES (ALL);

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters 711

Loglikelihood

H0 Value -120791.378

H1 Value -120187.619

Information Criteria

Akaike (AIC) 243004.756

Bayesian (BIC) 247162.237

Sample-Size Adjusted BIC 244903.196

(n\* = (n + 2) / 24)

Chi-Square Test of Model Fit

Value 1207.518

Degrees of Freedom 513

P-Value 0.0000

RMSEA (Root Mean Square Error Of Approximation)

Estimate 0.023

90 Percent C.I. 0.021 0.025

Probability RMSEA <= .05 1.000

CFI/TLI

CFI 0.994

TLI 0.986

Chi-Square Test of Model Fit for the Baseline Model

Value 108152.958

Degrees of Freedom 1128

P-Value 0.0000

SRMR (Standardized Root Mean Square Residual)

Value 0.006

MODEL RESULTS

Two-Tailed

Estimate S.E. Est./S.E. P-Value

CO BY

CO2 0.520 0.036 14.396 0.000

CO5 0.687 0.043 16.168 0.000

CO6 0.607 0.059 10.232 0.000

CO9 0.114 0.029 3.870 0.000

CO10 0.062 0.032 1.931 0.053

CO11 -0.041 0.038 -1.094 0.274

ES2 0.072 0.032 2.271 0.023

ES4 0.177 0.032 5.593 0.000

ES7 -0.027 0.030 -0.900 0.368

EN2 0.284 0.033 8.517 0.000

EN3 0.136 0.030 4.546 0.000

EN7 0.136 0.031 4.358 0.000

ME1 -0.128 0.028 -4.623 0.000

ME5 -0.059 0.027 -2.186 0.029

ME9 -0.168 0.030 -5.540 0.000

OP2 0.162 0.029 5.634 0.000

OP3 0.158 0.023 6.797 0.000

OP5 0.102 0.026 3.991 0.000

PE2 -0.118 0.028 -4.198 0.000

PE3 -0.125 0.028 -4.446 0.000

PE7 -0.094 0.025 -3.836 0.000

PR2 0.099 0.029 3.366 0.001

PR6 0.004 0.031 0.139 0.889

PR7 0.033 0.031 1.081 0.280

PR8 -0.086 0.032 -2.659 0.008

RE3 0.058 0.026 2.219 0.026

RE5 0.074 0.025 2.906 0.004

RE6 -0.043 0.028 -1.547 0.122

SE1 0.009 0.032 0.269 0.788

SE2 0.177 0.036 4.939 0.000

SE3 0.298 0.033 8.904 0.000

VI1 -0.018 0.021 -0.872 0.383

VI4 0.017 0.020 0.830 0.406

VI7 -0.005 0.023 -0.204 0.838

AC1 -0.106 0.031 -3.381 0.001

AC4 -0.053 0.035 -1.510 0.131

AC7 -0.074 0.030 -2.450 0.014

AC9 0.034 0.029 1.191 0.234

AU2 0.028 0.027 1.052 0.293

AU3 -0.051 0.026 -1.928 0.054

AU5 0.052 0.029 1.787 0.074

EM1 -0.024 0.034 -0.702 0.482

EM2 0.035 0.031 1.148 0.251

EM4 -0.067 0.033 -2.009 0.045

EM5 -0.031 0.032 -0.984 0.325

HG1 0.027 0.027 1.014 0.311

HG3 -0.023 0.026 -0.876 0.381

HG5 0.039 0.028 1.422 0.155

COX BY

CO9 0.534 0.030 17.677 0.000

CO10 0.809 0.037 21.728 0.000

CO11 0.902 0.033 27.440 0.000

ES2 -0.042 0.023 -1.794 0.073

ES4 0.038 0.029 1.329 0.184

ES7 0.074 0.024 3.058 0.002

EN2 0.059 0.032 1.846 0.065

EN3 0.040 0.027 1.488 0.137

EN7 -0.023 0.030 -0.779 0.436

ME1 -0.020 0.024 -0.812 0.417

ME5 0.088 0.025 3.574 0.000

ME9 0.001 0.027 0.031 0.975

OP2 0.046 0.025 1.856 0.063

OP3 0.019 0.020 0.985 0.324

OP5 0.000 0.024 -0.013 0.990

PE2 0.039 0.024 1.657 0.098

PE3 0.028 0.023 1.205 0.228

PE7 0.039 0.020 1.970 0.049

PR2 0.027 0.026 1.056 0.291

PR6 -0.041 0.027 -1.527 0.127

PR7 -0.025 0.028 -0.910 0.363

PR8 0.017 0.028 0.608 0.543

RE3 -0.033 0.022 -1.522 0.128

RE5 -0.014 0.020 -0.666 0.505

RE6 0.047 0.018 2.536 0.011

SE1 0.079 0.024 3.313 0.001

SE2 0.050 0.029 1.704 0.088

SE3 -0.012 0.029 -0.407 0.684

VI1 0.021 0.017 1.219 0.223

VI4 -0.003 0.015 -0.192 0.848

VI7 0.047 0.020 2.330 0.020

AC1 0.042 0.025 1.637 0.102

AC4 -0.023 0.026 -0.893 0.372

AC7 0.022 0.027 0.821 0.412

AC9 0.007 0.025 0.261 0.794

AU2 -0.031 0.022 -1.398 0.162

AU3 0.079 0.019 4.064 0.000

AU5 -0.023 0.025 -0.928 0.353

EM1 0.049 0.032 1.537 0.124

EM2 -0.011 0.028 -0.399 0.690

EM4 0.048 0.030 1.635 0.102

EM5 -0.087 0.027 -3.190 0.001

HG1 0.005 0.023 0.232 0.817

HG3 0.024 0.021 1.142 0.254

HG5 -0.054 0.024 -2.211 0.027

CO2 0.114 0.027 4.176 0.000

CO5 0.023 0.032 0.740 0.459

CO6 0.076 0.036 2.093 0.036

ES BY

ES2 0.803 0.033 24.606 0.000

ES4 0.666 0.037 18.065 0.000

ES7 0.723 0.034 21.205 0.000

EN2 -0.063 0.034 -1.854 0.064

EN3 0.087 0.025 3.508 0.000

EN7 -0.106 0.029 -3.713 0.000

ME1 0.068 0.026 2.583 0.010

ME5 0.092 0.026 3.585 0.000

ME9 0.110 0.027 4.001 0.000

OP2 -0.076 0.025 -3.071 0.002

OP3 -0.013 0.021 -0.605 0.545

OP5 0.023 0.025 0.924 0.356

PE2 0.045 0.026 1.696 0.090

PE3 0.134 0.025 5.335 0.000

PE7 0.073 0.022 3.312 0.001

PR2 -0.016 0.027 -0.594 0.553

PR6 0.010 0.027 0.360 0.719

PR7 -0.053 0.029 -1.824 0.068

PR8 0.029 0.029 1.007 0.314

RE3 -0.051 0.024 -2.149 0.032

RE5 0.093 0.022 4.162 0.000

RE6 -0.017 0.021 -0.807 0.419

SE1 -0.043 0.025 -1.684 0.092

SE2 -0.033 0.031 -1.082 0.279

SE3 -0.023 0.031 -0.722 0.470

VI1 0.036 0.018 2.060 0.039

VI4 -0.025 0.017 -1.521 0.128

VI7 0.044 0.022 2.065 0.039

AC1 -0.016 0.029 -0.570 0.569

AC4 0.003 0.029 0.087 0.930

AC7 0.096 0.029 3.328 0.001

AC9 0.033 0.027 1.234 0.217

AU2 0.038 0.024 1.596 0.111

AU3 -0.021 0.021 -0.986 0.324

AU5 -0.001 0.027 -0.053 0.958

EM1 0.051 0.034 1.508 0.132

EM2 0.000 0.029 0.008 0.993

EM4 0.073 0.032 2.267 0.023

EM5 -0.093 0.029 -3.198 0.001

HG1 -0.034 0.024 -1.392 0.164

HG3 0.046 0.023 2.012 0.044

HG5 0.018 0.026 0.690 0.490

CO2 0.074 0.027 2.708 0.007

CO5 0.096 0.031 3.130 0.002

CO6 0.090 0.031 2.916 0.004

CO9 0.167 0.027 6.158 0.000

CO10 -0.013 0.027 -0.474 0.636

CO11 -0.085 0.023 -3.628 0.000

EN BY

EN2 0.678 0.052 13.080 0.000

EN3 0.656 0.056 11.724 0.000

EN7 0.476 0.051 9.382 0.000

ME1 0.281 0.033 8.541 0.000

ME5 0.128 0.038 3.403 0.001

ME9 0.204 0.042 4.907 0.000

OP2 -0.138 0.032 -4.272 0.000

OP3 -0.072 0.028 -2.560 0.010

OP5 -0.058 0.033 -1.773 0.076

PE2 0.212 0.029 7.331 0.000

PE3 0.124 0.029 4.310 0.000

PE7 0.135 0.026 5.115 0.000

PR2 -0.169 0.032 -5.217 0.000

PR6 0.086 0.037 2.285 0.022

PR7 0.037 0.036 1.031 0.303

PR8 0.034 0.038 0.896 0.370

RE3 0.016 0.031 0.499 0.618

RE5 -0.013 0.029 -0.430 0.667

RE6 -0.002 0.029 -0.071 0.944

SE1 -0.108 0.032 -3.373 0.001

SE2 -0.132 0.037 -3.612 0.000

SE3 -0.056 0.038 -1.465 0.143

VI1 0.003 0.027 0.097 0.922

VI4 0.010 0.024 0.392 0.695

VI7 0.121 0.029 4.241 0.000

AC1 0.124 0.036 3.482 0.000

AC4 0.028 0.035 0.798 0.425

AC7 0.006 0.036 0.178 0.858

AC9 -0.050 0.034 -1.479 0.139

AU2 0.079 0.031 2.546 0.011

AU3 -0.067 0.030 -2.257 0.024

AU5 0.031 0.034 0.915 0.360

EM1 -0.079 0.041 -1.919 0.055

EM2 -0.022 0.037 -0.592 0.554

EM4 -0.029 0.040 -0.710 0.478

EM5 0.104 0.037 2.815 0.005

HG1 0.026 0.031 0.820 0.412

HG3 -0.026 0.030 -0.862 0.388

HG5 -0.010 0.033 -0.308 0.758

CO2 0.151 0.036 4.224 0.000

CO5 0.227 0.036 6.226 0.000

CO6 0.177 0.036 4.883 0.000

CO9 -0.054 0.036 -1.511 0.131

CO10 0.005 0.036 0.153 0.878

CO11 0.047 0.038 1.252 0.210

ES2 -0.087 0.035 -2.512 0.012

ES4 -0.030 0.040 -0.748 0.454

ES7 -0.058 0.034 -1.738 0.082

ME BY

ME1 0.557 0.035 15.995 0.000

ME5 0.570 0.034 16.608 0.000

ME9 0.660 0.039 16.774 0.000

OP2 0.209 0.031 6.689 0.000

OP3 0.215 0.027 7.968 0.000

OP5 0.150 0.029 5.248 0.000

PE2 -0.127 0.026 -4.928 0.000

PE3 -0.091 0.027 -3.410 0.001

PE7 -0.112 0.023 -4.871 0.000

PR2 -0.011 0.031 -0.372 0.710

PR6 -0.013 0.030 -0.430 0.668

PR7 -0.021 0.034 -0.612 0.540

PR8 0.062 0.034 1.830 0.067

RE3 -0.014 0.028 -0.490 0.624

RE5 -0.071 0.026 -2.697 0.007

RE6 0.102 0.030 3.416 0.001

SE1 0.270 0.030 8.985 0.000

SE2 0.091 0.034 2.682 0.007

SE3 0.171 0.033 5.124 0.000

VI1 -0.061 0.022 -2.753 0.006

VI4 -0.065 0.022 -2.938 0.003

VI7 0.075 0.025 3.052 0.002

AC1 -0.023 0.035 -0.667 0.505

AC4 -0.146 0.032 -4.501 0.000

AC7 0.014 0.032 0.417 0.677

AC9 0.013 0.031 0.408 0.683

AU2 -0.046 0.027 -1.663 0.096

AU3 0.017 0.030 0.568 0.570

AU5 0.082 0.030 2.779 0.005

EM1 -0.034 0.037 -0.910 0.363

EM2 -0.034 0.033 -1.011 0.312

EM4 0.036 0.036 0.998 0.318

EM5 -0.044 0.035 -1.249 0.212

HG1 0.012 0.028 0.409 0.683

HG3 0.055 0.028 1.952 0.051

HG5 0.023 0.030 0.779 0.436

CO2 -0.037 0.032 -1.145 0.252

CO5 -0.208 0.035 -5.989 0.000

CO6 -0.134 0.041 -3.295 0.001

CO9 0.008 0.031 0.251 0.802

CO10 -0.041 0.035 -1.190 0.234

CO11 0.022 0.038 0.581 0.561

ES2 0.062 0.034 1.814 0.070

ES4 0.065 0.036 1.805 0.071

ES7 0.092 0.032 2.881 0.004

EN2 0.139 0.053 2.637 0.008

EN3 0.291 0.032 9.108 0.000

EN7 0.183 0.034 5.450 0.000

OP BY

OP2 0.766 0.030 25.334 0.000

OP3 0.661 0.028 23.418 0.000

OP5 0.598 0.030 19.969 0.000

PE2 0.108 0.025 4.351 0.000

PE3 0.150 0.024 6.153 0.000

PE7 0.183 0.023 7.913 0.000

PR2 -0.019 0.027 -0.702 0.483

PR6 -0.037 0.029 -1.266 0.205

PR7 0.028 0.029 0.957 0.339

PR8 -0.004 0.031 -0.116 0.907

RE3 0.045 0.024 1.850 0.064

RE5 0.030 0.024 1.239 0.215

RE6 -0.085 0.026 -3.244 0.001

SE1 -0.034 0.027 -1.277 0.202

SE2 -0.099 0.029 -3.421 0.001

SE3 -0.116 0.028 -4.187 0.000

VI1 0.073 0.019 3.748 0.000

VI4 0.009 0.019 0.461 0.644

VI7 0.021 0.023 0.925 0.355

AC1 -0.047 0.030 -1.541 0.123

AC4 0.076 0.029 2.597 0.009

AC7 0.077 0.029 2.618 0.009

AC9 0.042 0.028 1.504 0.133

AU2 0.067 0.025 2.716 0.007

AU3 -0.059 0.025 -2.371 0.018

AU5 -0.025 0.027 -0.930 0.353

EM1 -0.021 0.034 -0.608 0.543

EM2 0.040 0.030 1.322 0.186

EM4 -0.035 0.033 -1.056 0.291

EM5 0.009 0.031 0.301 0.763

HG1 0.021 0.025 0.840 0.401

HG3 -0.003 0.025 -0.119 0.905

HG5 -0.030 0.026 -1.143 0.253

CO2 0.061 0.028 2.148 0.032

CO5 0.130 0.037 3.526 0.000

CO6 0.233 0.029 7.912 0.000

CO9 -0.029 0.027 -1.065 0.287

CO10 0.027 0.028 0.936 0.349

CO11 0.001 0.034 0.022 0.983

ES2 0.039 0.029 1.362 0.173

ES4 -0.078 0.030 -2.589 0.010

ES7 -0.119 0.026 -4.539 0.000

EN2 -0.127 0.042 -3.033 0.002

EN3 -0.153 0.026 -5.871 0.000

EN7 0.011 0.030 0.355 0.723

ME1 0.081 0.028 2.910 0.004

ME5 0.282 0.026 10.722 0.000

ME9 0.215 0.029 7.365 0.000

PE BY

PE2 0.656 0.030 21.695 0.000

PE3 0.668 0.030 22.603 0.000

PE7 0.720 0.028 26.020 0.000

PR2 0.015 0.027 0.550 0.582

PR6 0.078 0.028 2.752 0.006

PR7 -0.080 0.029 -2.734 0.006

PR8 0.013 0.030 0.419 0.675

RE3 0.052 0.024 2.159 0.031

RE5 0.033 0.024 1.398 0.162

RE6 -0.025 0.025 -1.008 0.314

SE1 0.098 0.029 3.428 0.001

SE2 0.186 0.030 6.144 0.000

SE3 0.070 0.029 2.391 0.017

VI1 0.031 0.019 1.601 0.109

VI4 -0.024 0.018 -1.342 0.180

VI7 0.000 0.022 0.015 0.988

AC1 -0.051 0.029 -1.750 0.080

AC4 -0.095 0.030 -3.204 0.001

AC7 -0.021 0.029 -0.728 0.467

AC9 0.067 0.028 2.447 0.014

AU2 0.016 0.025 0.635 0.526

AU3 0.004 0.024 0.174 0.862

AU5 0.012 0.027 0.446 0.655

EM1 0.040 0.033 1.183 0.237

EM2 -0.002 0.030 -0.070 0.944

EM4 -0.042 0.032 -1.308 0.191

EM5 -0.044 0.030 -1.458 0.145

HG1 -0.007 0.025 -0.258 0.796

HG3 -0.009 0.025 -0.346 0.730

HG5 0.035 0.026 1.337 0.181

CO2 -0.119 0.028 -4.313 0.000

CO5 -0.110 0.034 -3.259 0.001

CO6 -0.086 0.029 -2.954 0.003

CO9 0.029 0.027 1.061 0.289

CO10 -0.018 0.028 -0.651 0.515

CO11 0.034 0.031 1.079 0.281

ES2 -0.004 0.030 -0.125 0.900

ES4 0.037 0.032 1.176 0.240

ES7 0.167 0.029 5.697 0.000

EN2 0.224 0.030 7.400 0.000

EN3 0.055 0.027 2.020 0.043

EN7 0.196 0.028 6.955 0.000

ME1 0.026 0.026 0.975 0.330

ME5 -0.184 0.024 -7.823 0.000

ME9 -0.118 0.026 -4.615 0.000

OP2 0.161 0.026 6.287 0.000

OP3 0.050 0.023 2.155 0.031

OP5 0.239 0.024 10.003 0.000

PR BY

PR2 0.807 0.030 26.907 0.000

PR6 0.755 0.031 24.222 0.000

PR7 0.783 0.033 24.056 0.000

PR8 0.791 0.032 24.402 0.000

RE3 -0.022 0.021 -1.084 0.278

RE5 0.029 0.020 1.449 0.147

RE6 0.031 0.018 1.702 0.089

SE1 0.036 0.024 1.479 0.139

SE2 0.027 0.027 1.027 0.304

SE3 -0.013 0.024 -0.522 0.602

VI1 0.033 0.016 2.041 0.041

VI4 0.004 0.015 0.294 0.769

VI7 -0.014 0.020 -0.695 0.487

AC1 0.006 0.025 0.242 0.808

AC4 -0.011 0.024 -0.475 0.635

AC7 0.021 0.027 0.788 0.431

AC9 0.023 0.025 0.893 0.372

AU2 0.020 0.022 0.919 0.358

AU3 0.018 0.019 0.913 0.361

AU5 -0.031 0.025 -1.258 0.208

EM1 0.046 0.032 1.427 0.154

EM2 -0.054 0.028 -1.934 0.053

EM4 -0.022 0.030 -0.719 0.472

EM5 -0.003 0.027 -0.095 0.924

HG1 0.041 0.023 1.804 0.071

HG3 0.008 0.021 0.376 0.707

HG5 -0.013 0.024 -0.552 0.581

CO2 0.102 0.026 3.878 0.000

CO5 0.026 0.024 1.084 0.278

CO6 0.003 0.023 0.119 0.905

CO9 0.046 0.026 1.788 0.074

CO10 -0.005 0.022 -0.206 0.837

CO11 -0.035 0.020 -1.788 0.074

ES2 -0.058 0.023 -2.538 0.011

ES4 0.002 0.025 0.075 0.940

ES7 0.051 0.023 2.271 0.023

EN2 0.012 0.022 0.558 0.577

EN3 0.031 0.022 1.398 0.162

EN7 0.044 0.025 1.719 0.086

ME1 0.055 0.022 2.484 0.013

ME5 0.049 0.022 2.210 0.027

ME9 0.028 0.022 1.288 0.198

OP2 0.037 0.018 2.035 0.042

OP3 0.096 0.020 4.887 0.000

OP5 -0.057 0.021 -2.780 0.005

PE2 0.017 0.021 0.799 0.424

PE3 0.032 0.020 1.620 0.105

PE7 0.071 0.019 3.777 0.000

RE BY

RE3 0.732 0.025 28.990 0.000

RE5 0.744 0.024 30.729 0.000

RE6 0.848 0.024 34.870 0.000

SE1 0.030 0.021 1.403 0.161

SE2 0.072 0.024 2.963 0.003

SE3 0.049 0.024 2.032 0.042

VI1 -0.001 0.015 -0.082 0.935

VI4 0.019 0.014 1.394 0.163

VI7 0.024 0.018 1.308 0.191

AC1 -0.010 0.024 -0.415 0.678

AC4 -0.049 0.023 -2.152 0.031

AC7 0.224 0.025 9.139 0.000

AC9 -0.080 0.023 -3.473 0.001

AU2 0.003 0.020 0.125 0.901

AU3 0.029 0.017 1.701 0.089

AU5 -0.003 0.022 -0.118 0.906

EM1 0.009 0.029 0.320 0.749

EM2 -0.028 0.025 -1.140 0.254

EM4 -0.003 0.027 -0.116 0.907

EM5 -0.009 0.024 -0.365 0.715

HG1 0.029 0.021 1.391 0.164

HG3 -0.026 0.019 -1.376 0.169

HG5 0.009 0.022 0.408 0.683

CO2 0.002 0.024 0.075 0.941

CO5 0.072 0.025 2.829 0.005

CO6 0.061 0.026 2.314 0.021

CO9 -0.060 0.023 -2.612 0.009

CO10 -0.019 0.020 -0.969 0.332

CO11 0.063 0.018 3.513 0.000

ES2 0.099 0.023 4.330 0.000

ES4 -0.062 0.024 -2.534 0.011

ES7 -0.029 0.022 -1.351 0.177

EN2 -0.002 0.026 -0.073 0.942

EN3 0.005 0.022 0.224 0.823

EN7 0.062 0.024 2.544 0.011

ME1 0.014 0.021 0.638 0.524

ME5 0.036 0.021 1.728 0.084

ME9 0.036 0.022 1.630 0.103

OP2 0.003 0.020 0.132 0.895

OP3 0.028 0.018 1.539 0.124

OP5 0.028 0.021 1.343 0.179

PE2 0.050 0.020 2.475 0.013

PE3 0.024 0.020 1.203 0.229

PE7 0.036 0.017 2.059 0.039

PR2 -0.036 0.023 -1.570 0.116

PR6 0.039 0.023 1.700 0.089

PR7 -0.030 0.025 -1.207 0.228

PR8 0.026 0.025 1.042 0.297

SE BY

SE1 0.581 0.040 14.488 0.000

SE2 0.580 0.045 12.910 0.000

SE3 0.596 0.043 13.803 0.000

VI1 0.002 0.022 0.114 0.909

VI4 0.037 0.021 1.741 0.082

VI7 0.054 0.025 2.127 0.033

AC1 0.075 0.036 2.084 0.037

AC4 -0.010 0.038 -0.273 0.785

AC7 -0.063 0.032 -1.994 0.046

AC9 0.287 0.030 9.477 0.000

AU2 -0.126 0.027 -4.668 0.000

AU3 0.020 0.027 0.741 0.459

AU5 0.042 0.031 1.373 0.170

EM1 0.057 0.037 1.555 0.120

EM2 0.061 0.033 1.876 0.061

EM4 0.010 0.036 0.273 0.785

EM5 -0.051 0.035 -1.469 0.142

HG1 -0.035 0.028 -1.256 0.209

HG3 0.010 0.027 0.353 0.724

HG5 -0.017 0.030 -0.558 0.577

CO2 0.117 0.033 3.538 0.000

CO5 0.185 0.039 4.755 0.000

CO6 0.183 0.036 5.042 0.000

CO9 0.118 0.030 3.957 0.000

CO10 0.014 0.033 0.409 0.682

CO11 -0.085 0.036 -2.368 0.018

ES2 -0.153 0.031 -4.957 0.000

ES4 -0.047 0.036 -1.334 0.182

ES7 0.023 0.031 0.759 0.448

EN2 -0.174 0.042 -4.109 0.000

EN3 -0.093 0.032 -2.892 0.004

EN7 -0.012 0.034 -0.353 0.724

ME1 0.238 0.027 8.830 0.000

ME5 0.111 0.029 3.831 0.000

ME9 0.184 0.030 6.100 0.000

OP2 -0.110 0.027 -4.028 0.000

OP3 -0.060 0.025 -2.412 0.016

OP5 -0.063 0.027 -2.332 0.020

PE2 0.096 0.029 3.369 0.001

PE3 0.145 0.027 5.441 0.000

PE7 0.110 0.026 4.285 0.000

PR2 0.109 0.031 3.462 0.001

PR6 0.040 0.034 1.194 0.232

PR7 -0.040 0.032 -1.242 0.214

PR8 -0.157 0.033 -4.780 0.000

RE3 0.117 0.027 4.359 0.000

RE5 -0.096 0.025 -3.819 0.000

RE6 0.084 0.030 2.807 0.005

VI BY

VI1 0.819 0.019 43.519 0.000

VI4 0.909 0.018 49.242 0.000

VI7 0.665 0.019 34.776 0.000

AC1 -0.024 0.019 -1.230 0.219

AC4 -0.024 0.019 -1.285 0.199

AC7 0.020 0.021 0.963 0.336

AC9 0.044 0.020 2.209 0.027

AU2 0.021 0.017 1.238 0.216

AU3 -0.004 0.015 -0.254 0.799

AU5 -0.010 0.019 -0.519 0.604

EM1 -0.068 0.025 -2.761 0.006

EM2 -0.041 0.021 -1.949 0.051

EM4 0.037 0.023 1.605 0.109

EM5 0.019 0.021 0.909 0.364

HG1 0.025 0.017 1.455 0.146

HG3 0.027 0.016 1.654 0.098

HG5 -0.003 0.018 -0.165 0.869

CO2 0.023 0.021 1.138 0.255

CO5 -0.008 0.020 -0.384 0.701

CO6 0.013 0.020 0.641 0.521

CO9 0.043 0.020 2.167 0.030

CO10 -0.002 0.017 -0.141 0.888

CO11 -0.004 0.016 -0.267 0.790

ES2 0.017 0.018 0.929 0.353

ES4 -0.025 0.020 -1.268 0.205

ES7 0.034 0.018 1.956 0.050

EN2 -0.013 0.021 -0.627 0.531

EN3 0.104 0.022 4.703 0.000

EN7 0.092 0.022 4.134 0.000

ME1 0.006 0.017 0.337 0.736

ME5 0.030 0.017 1.722 0.085

ME9 -0.022 0.017 -1.311 0.190

OP2 0.029 0.016 1.745 0.081

OP3 0.088 0.016 5.568 0.000

OP5 0.038 0.017 2.231 0.026

PE2 0.043 0.016 2.607 0.009

PE3 0.022 0.016 1.397 0.163

PE7 -0.021 0.014 -1.489 0.136

PR2 -0.058 0.019 -2.999 0.003

PR6 0.041 0.020 2.120 0.034

PR7 -0.024 0.021 -1.147 0.252

PR8 0.016 0.021 0.744 0.457

RE3 -0.032 0.016 -2.017 0.044

RE5 0.028 0.016 1.794 0.073

RE6 0.029 0.014 1.999 0.046

SE1 0.069 0.018 3.837 0.000

SE2 0.038 0.020 1.920 0.055

SE3 0.011 0.019 0.554 0.579

AC BY

AC1 0.855 0.042 20.476 0.000

AC4 0.923 0.038 24.292 0.000

AC7 0.546 0.036 15.363 0.000

AC9 0.544 0.034 16.053 0.000

AU2 0.055 0.026 2.092 0.036

AU3 -0.031 0.023 -1.378 0.168

AU5 0.067 0.029 2.289 0.022

EM1 -0.063 0.036 -1.764 0.078

EM2 0.026 0.031 0.849 0.396

EM4 -0.084 0.034 -2.488 0.013

EM5 0.008 0.031 0.255 0.798

HG1 -0.005 0.026 -0.179 0.858

HG3 0.021 0.025 0.835 0.403

HG5 0.001 0.027 0.051 0.960

CO2 0.022 0.030 0.720 0.472

CO5 -0.017 0.032 -0.539 0.590

CO6 -0.096 0.030 -3.218 0.001

CO9 0.039 0.029 1.350 0.177

CO10 0.037 0.026 1.440 0.150

CO11 -0.013 0.025 -0.535 0.592

ES2 0.064 0.028 2.299 0.022

ES4 0.022 0.031 0.702 0.482

ES7 0.045 0.028 1.588 0.112

EN2 0.096 0.030 3.252 0.001

EN3 0.052 0.026 1.998 0.046

EN7 0.027 0.029 0.906 0.365

ME1 -0.014 0.026 -0.527 0.598

ME5 0.000 0.026 -0.007 0.994

ME9 -0.006 0.027 -0.211 0.833

OP2 0.097 0.023 4.179 0.000

OP3 0.004 0.023 0.179 0.858

OP5 0.114 0.025 4.615 0.000

PE2 0.021 0.025 0.839 0.401

PE3 -0.028 0.024 -1.192 0.233

PE7 -0.002 0.022 -0.091 0.928

PR2 -0.004 0.029 -0.139 0.889

PR6 -0.062 0.029 -2.117 0.034

PR7 0.070 0.031 2.265 0.024

PR8 0.021 0.031 0.689 0.491

RE3 0.081 0.024 3.304 0.001

RE5 0.086 0.024 3.589 0.000

RE6 -0.048 0.023 -2.120 0.034

SE1 0.144 0.029 4.967 0.000

SE2 0.078 0.034 2.278 0.023

SE3 0.136 0.033 4.180 0.000

VI1 0.001 0.019 0.039 0.969

VI4 0.022 0.018 1.243 0.214

VI7 0.034 0.023 1.491 0.136

AU BY

AU2 0.755 0.028 27.423 0.000

AU3 0.909 0.026 34.449 0.000

AU5 0.681 0.028 24.398 0.000

EM1 0.005 0.027 0.192 0.847

EM2 0.025 0.023 1.075 0.282

EM4 -0.055 0.025 -2.186 0.029

EM5 -0.010 0.022 -0.432 0.666

HG1 -0.009 0.019 -0.464 0.643

HG3 -0.018 0.018 -0.979 0.327

HG5 0.045 0.020 2.224 0.026

CO2 0.048 0.023 2.069 0.039

CO5 -0.004 0.023 -0.195 0.845

CO6 0.059 0.024 2.429 0.015

CO9 0.048 0.021 2.263 0.024

CO10 -0.002 0.019 -0.100 0.920

CO11 -0.022 0.017 -1.285 0.199

ES2 -0.026 0.019 -1.347 0.178

ES4 0.077 0.022 3.510 0.000

ES7 -0.035 0.019 -1.819 0.069

EN2 0.057 0.024 2.337 0.019

EN3 0.019 0.020 0.935 0.350

EN7 0.047 0.023 2.060 0.039

ME1 0.029 0.019 1.492 0.136

ME5 0.047 0.019 2.432 0.015

ME9 0.061 0.019 3.177 0.001

OP2 0.006 0.018 0.315 0.753

OP3 0.022 0.017 1.284 0.199

OP5 0.035 0.019 1.891 0.059

PE2 0.044 0.018 2.420 0.016

PE3 0.054 0.018 3.040 0.002

PE7 -0.005 0.016 -0.315 0.753

PR2 0.013 0.021 0.603 0.546

PR6 -0.024 0.021 -1.129 0.259

PR7 0.030 0.023 1.301 0.193

PR8 -0.040 0.023 -1.736 0.083

RE3 0.030 0.017 1.723 0.085

RE5 -0.023 0.017 -1.345 0.179

RE6 0.038 0.016 2.415 0.016

SE1 0.018 0.020 0.908 0.364

SE2 0.001 0.022 0.059 0.953

SE3 -0.014 0.021 -0.661 0.508

VI1 0.037 0.014 2.729 0.006

VI4 0.029 0.013 2.305 0.021

VI7 -0.031 0.017 -1.833 0.067

AC1 -0.061 0.022 -2.843 0.004

AC4 0.005 0.022 0.237 0.813

AC7 0.034 0.023 1.492 0.136

AC9 0.096 0.022 4.470 0.000

EM BY

EM1 0.564 0.031 17.912 0.000

EM2 0.788 0.030 26.511 0.000

EM4 0.780 0.032 24.459 0.000

EM5 0.872 0.029 30.574 0.000

HG1 0.028 0.022 1.305 0.192

HG3 0.007 0.021 0.341 0.733

HG5 0.095 0.023 4.223 0.000

CO2 0.005 0.023 0.223 0.824

CO5 0.003 0.022 0.114 0.909

CO6 0.000 0.022 -0.017 0.987

CO9 0.025 0.022 1.148 0.251

CO10 0.017 0.019 0.877 0.380

CO11 0.005 0.018 0.287 0.774

ES2 0.010 0.020 0.479 0.632

ES4 0.024 0.023 1.027 0.304

ES7 0.041 0.020 2.046 0.041

EN2 0.036 0.022 1.642 0.101

EN3 -0.043 0.021 -2.085 0.037

EN7 0.058 0.023 2.519 0.012

ME1 -0.015 0.019 -0.784 0.433

ME5 0.024 0.019 1.258 0.209

ME9 0.014 0.020 0.723 0.470

OP2 0.026 0.017 1.549 0.121

OP3 0.014 0.017 0.815 0.415

OP5 0.013 0.018 0.704 0.482

PE2 0.030 0.018 1.618 0.106

PE3 0.001 0.018 0.074 0.941

PE7 0.002 0.016 0.098 0.922

PR2 -0.053 0.022 -2.439 0.015

PR6 -0.045 0.022 -2.049 0.040

PR7 0.069 0.024 2.896 0.004

PR8 0.042 0.024 1.762 0.078

RE3 0.016 0.018 0.880 0.379

RE5 -0.016 0.018 -0.880 0.379

RE6 0.011 0.016 0.703 0.482

SE1 0.020 0.021 0.960 0.337

SE2 0.075 0.023 3.333 0.001

SE3 0.050 0.022 2.299 0.022

VI1 -0.006 0.014 -0.449 0.654

VI4 0.005 0.013 0.349 0.727

VI7 0.002 0.018 0.094 0.925

AC1 -0.003 0.022 -0.138 0.890

AC4 -0.010 0.021 -0.492 0.623

AC7 -0.015 0.023 -0.659 0.510

AC9 -0.034 0.022 -1.539 0.124

AU2 0.017 0.019 0.866 0.387

AU3 -0.008 0.017 -0.480 0.631

AU5 0.007 0.021 0.330 0.742

HG BY

HG1 0.775 0.024 31.798 0.000

HG3 0.821 0.024 33.760 0.000

HG5 0.733 0.025 29.305 0.000

CO2 0.010 0.022 0.456 0.648

CO5 0.033 0.022 1.447 0.148

CO6 0.045 0.023 1.954 0.051

CO9 -0.091 0.021 -4.449 0.000

CO10 0.002 0.018 0.109 0.913

CO11 0.060 0.017 3.531 0.000

ES2 0.005 0.019 0.237 0.812

ES4 0.077 0.022 3.525 0.000

ES7 -0.055 0.019 -2.901 0.004

EN2 -0.004 0.023 -0.171 0.864

EN3 0.005 0.019 0.253 0.800

EN7 0.041 0.022 1.906 0.057

ME1 0.082 0.019 4.253 0.000

ME5 0.010 0.019 0.503 0.615

ME9 0.043 0.020 2.137 0.033

OP2 -0.002 0.018 -0.124 0.901

OP3 -0.003 0.016 -0.209 0.834

OP5 0.039 0.018 2.142 0.032

PE2 0.027 0.018 1.513 0.130

PE3 0.008 0.017 0.490 0.624

PE7 0.015 0.016 0.956 0.339

PR2 0.045 0.021 2.190 0.029

PR6 0.072 0.021 3.456 0.001

PR7 -0.059 0.022 -2.612 0.009

PR8 -0.050 0.022 -2.239 0.025

RE3 0.029 0.017 1.662 0.097

RE5 0.001 0.017 0.079 0.937

RE6 -0.013 0.015 -0.870 0.384

SE1 -0.028 0.020 -1.446 0.148

SE2 -0.001 0.022 -0.039 0.969

SE3 0.034 0.022 1.588 0.112

VI1 0.024 0.013 1.795 0.073

VI4 0.034 0.013 2.708 0.007

VI7 0.004 0.017 0.264 0.792

AC1 0.020 0.021 0.949 0.342

AC4 0.073 0.021 3.516 0.000

AC7 -0.038 0.022 -1.744 0.081

AC9 -0.053 0.021 -2.573 0.010

AU2 -0.040 0.018 -2.143 0.032

AU3 0.024 0.016 1.488 0.137

AU5 0.029 0.020 1.431 0.152

EM1 0.174 0.028 6.237 0.000

EM2 0.002 0.025 0.063 0.950

EM4 -0.060 0.026 -2.278 0.023

EM5 -0.084 0.024 -3.566 0.000

COX WITH

CO 0.536 0.083 6.459 0.000

ES WITH

CO 0.259 0.062 4.187 0.000

COX 0.685 0.037 18.285 0.000

EN WITH

CO -0.075 0.058 -1.298 0.194

COX 0.518 0.083 6.239 0.000

ES 0.627 0.046 13.579 0.000

ME WITH

CO 0.724 0.015 48.289 0.000

COX 0.448 0.054 8.362 0.000

ES 0.284 0.069 4.121 0.000

EN -0.013 0.090 -0.145 0.885

OP WITH

CO -0.032 0.061 -0.519 0.604

COX 0.441 0.050 8.877 0.000

ES 0.612 0.035 17.304 0.000

EN 0.799 0.014 58.889 0.000

ME 0.137 0.077 1.788 0.074

PE WITH

CO 0.689 0.020 35.007 0.000

COX 0.533 0.051 10.443 0.000

ES 0.446 0.071 6.269 0.000

EN 0.114 0.070 1.623 0.105

ME 0.815 0.017 48.065 0.000

OP 0.244 0.066 3.689 0.000

PR WITH

CO 0.436 0.043 10.129 0.000

COX 0.677 0.014 48.956 0.000

ES 0.601 0.023 26.565 0.000

EN 0.514 0.050 10.355 0.000

ME 0.523 0.048 10.871 0.000

OP 0.555 0.035 15.947 0.000

PE 0.600 0.040 15.037 0.000

RE WITH

CO 0.372 0.062 5.967 0.000

COX 0.638 0.016 40.692 0.000

ES 0.751 0.023 32.149 0.000

EN 0.515 0.059 8.729 0.000

ME 0.441 0.045 9.898 0.000

OP 0.545 0.039 13.934 0.000

PE 0.555 0.044 12.612 0.000

PR 0.584 0.016 36.446 0.000

SE WITH

CO 0.086 0.099 0.865 0.387

COX 0.547 0.064 8.479 0.000

ES 0.619 0.038 16.179 0.000

EN 0.760 0.018 41.497 0.000

ME 0.011 0.058 0.188 0.851

OP 0.707 0.014 50.997 0.000

PE 0.169 0.084 2.011 0.044

PR 0.584 0.053 10.968 0.000

RE 0.444 0.040 11.009 0.000

VI WITH

CO 0.365 0.048 7.533 0.000

COX 0.558 0.017 33.695 0.000

ES 0.579 0.023 24.828 0.000

EN 0.505 0.063 7.991 0.000

ME 0.494 0.040 12.476 0.000

OP 0.529 0.042 12.690 0.000

PE 0.583 0.037 15.908 0.000

PR 0.518 0.017 30.841 0.000

RE 0.644 0.014 45.853 0.000

SE 0.318 0.033 9.739 0.000

AC WITH

CO 0.632 0.043 14.701 0.000

COX 0.722 0.020 35.363 0.000

ES 0.669 0.048 13.970 0.000

EN 0.383 0.061 6.241 0.000

ME 0.611 0.045 13.507 0.000

OP 0.381 0.045 8.554 0.000

PE 0.659 0.028 23.651 0.000

PR 0.690 0.018 38.005 0.000

RE 0.685 0.024 28.863 0.000

SE 0.460 0.082 5.598 0.000

VI 0.559 0.020 28.306 0.000

AU WITH

CO 0.487 0.059 8.221 0.000

COX 0.695 0.014 50.301 0.000

ES 0.607 0.023 26.130 0.000

EN 0.528 0.064 8.274 0.000

ME 0.464 0.042 11.025 0.000

OP 0.522 0.042 12.556 0.000

PE 0.529 0.041 13.020 0.000

PR 0.696 0.013 54.504 0.000

RE 0.598 0.016 37.364 0.000

SE 0.540 0.039 13.855 0.000

VI 0.522 0.017 31.089 0.000

AC 0.713 0.022 32.973 0.000

EM WITH

CO 0.345 0.042 8.162 0.000

COX 0.381 0.021 17.751 0.000

ES 0.349 0.035 9.936 0.000

EN 0.279 0.056 5.032 0.000

ME 0.323 0.033 9.649 0.000

OP 0.217 0.038 5.717 0.000

PE 0.339 0.032 10.703 0.000

PR 0.542 0.019 28.283 0.000

RE 0.289 0.023 12.739 0.000

SE 0.268 0.044 6.029 0.000

VI 0.301 0.021 14.109 0.000

AC 0.490 0.019 25.914 0.000

AU 0.405 0.021 19.129 0.000

HG WITH

CO 0.324 0.045 7.119 0.000

COX 0.470 0.019 24.406 0.000

ES 0.415 0.022 19.208 0.000

EN 0.378 0.042 8.984 0.000

ME 0.263 0.037 7.099 0.000

OP 0.318 0.031 10.177 0.000

PE 0.295 0.032 9.205 0.000

PR 0.535 0.017 30.799 0.000

RE 0.389 0.020 19.884 0.000

SE 0.402 0.034 11.731 0.000

VI 0.313 0.020 15.318 0.000

AC 0.508 0.023 22.454 0.000

AU 0.431 0.019 22.846 0.000

EM 0.731 0.017 42.445 0.000

Intercepts

CO2 0.000 0.020 -0.004 0.997

CO5 0.000 0.020 0.007 0.994

CO6 0.000 0.020 -0.005 0.996

CO9 0.000 0.020 0.011 0.992

CO10 0.000 0.020 0.012 0.990

CO11 0.000 0.020 -0.004 0.997

ES2 0.000 0.020 -0.003 0.997

ES4 0.000 0.020 -0.004 0.997

ES7 0.000 0.020 -0.004 0.997

EN2 0.000 0.020 0.009 0.993

EN3 0.000 0.020 0.009 0.993

EN7 0.000 0.020 0.009 0.993

ME1 0.000 0.020 0.006 0.995

ME5 0.000 0.020 0.010 0.992

ME9 0.000 0.020 -0.005 0.996

OP2 0.000 0.020 0.012 0.991

OP3 0.000 0.020 -0.005 0.996

OP5 0.000 0.020 -0.005 0.996

PE2 0.000 0.020 -0.005 0.996

PE3 0.000 0.020 0.003 0.998

PE7 0.000 0.020 -0.005 0.996

PR2 0.000 0.020 0.005 0.996

PR6 0.000 0.020 -0.005 0.996

PR7 0.000 0.020 0.006 0.995

PR8 0.000 0.020 0.007 0.994

RE3 0.000 0.020 -0.004 0.997

RE5 0.000 0.020 -0.004 0.997

RE6 0.000 0.020 -0.004 0.997

SE1 0.000 0.020 -0.005 0.996

SE2 0.000 0.020 0.006 0.995

SE3 0.000 0.020 0.007 0.994

VI1 0.000 0.020 -0.004 0.997

VI4 0.000 0.020 -0.004 0.997

VI7 0.000 0.020 -0.004 0.997

AC1 0.000 0.020 -0.004 0.996

AC4 0.000 0.020 -0.004 0.996

AC7 0.000 0.020 -0.004 0.997

AC9 0.000 0.020 -0.005 0.996

AU2 0.000 0.020 0.006 0.995

AU3 0.000 0.020 -0.005 0.996

AU5 0.000 0.020 -0.004 0.996

EM1 0.000 0.020 0.008 0.993

EM2 0.000 0.020 -0.004 0.997

EM4 0.000 0.020 -0.003 0.997

EM5 0.000 0.020 0.009 0.992

HG1 0.000 0.020 -0.005 0.996

HG3 0.000 0.020 -0.005 0.996

HG5 0.000 0.020 0.008 0.993

Variances

CO 1.000 0.000 999.000 999.000

COX 1.000 0.000 999.000 999.000

ES 1.000 0.000 999.000 999.000

EN 1.000 0.000 999.000 999.000

ME 1.000 0.000 999.000 999.000

OP 1.000 0.000 999.000 999.000

PE 1.000 0.000 999.000 999.000

PR 1.000 0.000 999.000 999.000

RE 1.000 0.000 999.000 999.000

SE 1.000 0.000 999.000 999.000

VI 1.000 0.000 999.000 999.000

AC 1.000 0.000 999.000 999.000

AU 1.000 0.000 999.000 999.000

EM 1.000 0.000 999.000 999.000

HG 1.000 0.000 999.000 999.000

Residual Variances

CO2 0.372 0.012 30.442 0.000

CO5 0.321 0.021 15.662 0.000

CO6 0.252 0.019 13.258 0.000

CO9 0.316 0.011 29.088 0.000

CO10 0.286 0.015 18.649 0.000

CO11 0.269 0.019 14.406 0.000

ES2 0.352 0.016 22.082 0.000

ES4 0.359 0.014 25.451 0.000

ES7 0.266 0.013 20.730 0.000

EN2 0.254 0.025 10.200 0.000

EN3 0.255 0.013 19.590 0.000

EN7 0.292 0.011 27.342 0.000

ME1 0.209 0.008 25.264 0.000

ME5 0.223 0.008 26.234 0.000

ME9 0.184 0.010 19.267 0.000

OP2 0.136 0.010 13.713 0.000

OP3 0.194 0.008 25.401 0.000

OP5 0.210 0.008 26.341 0.000

PE2 0.194 0.008 25.114 0.000

PE3 0.160 0.007 22.106 0.000

PE7 0.160 0.007 22.047 0.000

PR2 0.353 0.015 23.304 0.000

PR6 0.313 0.013 24.219 0.000

PR7 0.430 0.016 26.740 0.000

PR8 0.411 0.016 25.630 0.000

RE3 0.233 0.010 23.963 0.000

RE5 0.240 0.010 23.288 0.000

RE6 0.190 0.011 16.908 0.000

SE1 0.270 0.011 25.678 0.000

SE2 0.312 0.012 25.506 0.000

SE3 0.254 0.012 21.298 0.000

VI1 0.143 0.007 19.197 0.000

VI4 0.129 0.008 15.246 0.000

VI7 0.226 0.008 29.581 0.000

AC1 0.355 0.017 20.987 0.000

AC4 0.392 0.020 19.935 0.000

AC7 0.354 0.012 29.708 0.000

AC9 0.302 0.011 28.422 0.000

AU2 0.314 0.014 22.980 0.000

AU3 0.194 0.016 12.140 0.000

AU5 0.351 0.013 27.067 0.000

EM1 0.500 0.016 30.331 0.000

EM2 0.388 0.016 23.740 0.000

EM4 0.526 0.020 26.419 0.000

EM5 0.425 0.020 21.543 0.000

HG1 0.302 0.013 23.517 0.000

HG3 0.255 0.013 19.443 0.000

HG5 0.328 0.013 24.856 0.000

R-SQUARE

Observed Two-Tailed

Variable Estimate S.E. Est./S.E. P-Value

CO2 0.628 0.013 47.136 0.000

CO5 0.679 0.021 32.022 0.000

CO6 0.748 0.020 38.113 0.000

CO9 0.684 0.012 56.450 0.000

CO10 0.714 0.016 44.110 0.000

CO11 0.731 0.019 37.690 0.000

ES2 0.648 0.017 38.612 0.000

ES4 0.641 0.015 42.455 0.000

ES7 0.734 0.014 53.116 0.000

EN2 0.746 0.025 29.440 0.000

EN3 0.745 0.014 53.326 0.000

EN7 0.708 0.012 59.383 0.000

ME1 0.791 0.009 84.168 0.000

ME5 0.777 0.010 80.425 0.000

ME9 0.816 0.010 78.642 0.000

OP2 0.864 0.010 82.821 0.000

OP3 0.806 0.009 92.078 0.000

OP5 0.790 0.009 86.490 0.000

PE2 0.806 0.009 91.317 0.000

PE3 0.840 0.008 103.607 0.000

PE7 0.840 0.008 103.152 0.000

PR2 0.647 0.016 40.219 0.000

PR6 0.687 0.014 49.180 0.000

PR7 0.570 0.017 34.081 0.000

PR8 0.589 0.017 35.211 0.000

RE3 0.767 0.011 71.033 0.000

RE5 0.760 0.011 66.736 0.000

RE6 0.810 0.012 67.560 0.000

SE1 0.730 0.012 62.392 0.000

SE2 0.688 0.013 51.535 0.000

SE3 0.746 0.013 57.715 0.000

VI1 0.857 0.008 104.888 0.000

VI4 0.871 0.009 96.613 0.000

VI7 0.774 0.009 86.401 0.000

AC1 0.645 0.018 36.293 0.000

AC4 0.608 0.020 29.946 0.000

AC7 0.646 0.013 49.403 0.000

AC9 0.698 0.012 58.719 0.000

AU2 0.686 0.015 46.698 0.000

AU3 0.806 0.017 48.639 0.000

AU5 0.649 0.014 46.238 0.000

EM1 0.500 0.016 30.356 0.000

EM2 0.612 0.017 35.750 0.000

EM4 0.474 0.020 24.179 0.000

EM5 0.575 0.020 28.438 0.000

HG1 0.698 0.014 50.271 0.000

HG3 0.745 0.014 53.024 0.000

HG5 0.672 0.014 47.140 0.000

**Section 12: Mplus Syntax Used for Analyses Presented in the Main Manuscript (Relations between Individual items from the WEMWBS and The Flourishing, and the 15 WB-Pro Factors: The Multidimensionality of Unidimensional Scales)**

USEVARIABLES ARE

t2CO2 t2CO5 t2CO6

t2CO9 t2CO10 t2CO11

t2ES2 t2ES4 t2ES7

t2EN2 t2EN3 t2EN7

t2ME1 t2ME5 t2ME9

t2OP2 t2OP3 t2OP5

t2PE2 t2PE3 t2PE7

t2PR2 t2PR6 t2PR7 t2PR8

t2RE3 t2RE5 t2RE6

t2SE1 t2SE2 t2SE3

t2VI1 t2VI4 t2VI7

t2AC1 t2AC4 t2AC7 t2AC9

t2AU2 t2AU3 t2AU5

t2EM1 t2EM2 t2EM4 t2EM5

t2HG1 t2HG3 t2HG5

t2WMWB1 t2WMWB2 t2WMWB3 t2WMWB4 t2WMWB5 t2WMWB6

t2WMWB7 t2WMWB8 t2WMWB9 t2WMWB10 t2WMWB11 t2WMWB12

t2WMWB13 t2WMWB14

;

define: standardize all;

t2DIEN1 = -t2DIEN1 ;

t2DIEN2 = -t2DIEN2 ;

t2DIEN3 = -t2DIEN3 ;

t2DIEN4 = -t2DIEN4 ;

t2DIEN6 = -t2DIEN6 ;

t2DIEN7 = -t2DIEN7 ;

t2DIEN8 = -t2DIEN8 ;

t2DIEN9 = -t2DIEN9 ;

ANALYSIS: ESTIMATOR = MLR;

ROTATION = TARGET;

PROCESSORS =4;

MODEL:

CO by t2CO2-t2CO6~.80 t2CO9-t2hg5~0 t2WMWB1-t2DIEN9~0

T2WMWB2~.8 T2WMWB6~.8 T2WMWB10~.8 T2DIEN6~.8 (\*t1);

CT by t2CO9-t2CO11~.80 t2es2-t2hg5~0 t2CO2-t2CO6~0 t2WMWB1-t2DIEN9~0

T2WMWB7~.8 T2WMWB11~.8 T2DIEN6~.8 (\*t1);

ES by t2ES2-t2ES7~.80 t2EN2-t2hg5~0 t2CO2-t2CO11~0 t2WMWB1-t2DIEN9~0

T2WMWB3~.8 (\*t1);

EN by t2EN2-t2EN7~.80 t2ME1-t2hg5~0 t2CO2-t2ES7~0 t2WMWB1-t2DIEN9~0

T2WMWB3-T2WMWB5~.8 T2WMWB13~.8 T2DIEN3~.8 (\*t1);

ME by t2ME1-t2ME9~.80 t2OP2-t2hg5~0 t2CO2-t2EN7~0 t2WMWB1-t2DIEN9~0

T2WMWB2~.8 T2DIEN1~.8 T2DIEN7~.8 T2DIEN8~.8 (\*t1);

OP by t2OP2-t2OP5~.80 t2PE2-t2hg5~0 t2CO2-t2ME9~0 t2WMWB1-t2DIEN9~0

T2WMWB1~.8 T2WMWB13~.8 T2DIEN8~.8 (\*t1);

PE by t2PE2-t2PE7~.80 t2PR2-t2hg5~0 t2CO2-t2OP5~0 t2WMWB1-t2DIEN9~0

T2WMWB3~.8 T2WMWB8~.8 T2WMWB12~.8 T2WMWB14~.3 T2DIEN1~.8 (\*t1);

PR by t2PR2-t2PR8~.80 t2RE3-t2hg5~0 t2CO2-t2PE7~0 t2WMWB1-t2DIEN9~0

T2WMWB4~.8 T2WMWB9~.8 T2WMWB12~.8 T2DIEN2~.8 T2DIEN4~.8 T2DIEN9~.8 (\*t1);

RE by t2RE3-t2RE6~.80 t2SE1-t2hg5~0 t2CO2-t2PR8~0 t2WMWB1-t2DIEN9~0

T2WMWB6~.8 (\*t1);

SE by t2SE1-t2SE3~.80 t2VI1-t2hg5~0 t2CO2-t2RE6~0 t2WMWB1-t2DIEN9~0

T2WMWB8~.8 T2WMWB10~.8 T2DIEN6~.8 T2DIEN7~.8 T2DIEN9~.8 (\*t1);

VI by t2VI1-t2VI7~.80 t2AC1-t2hg5~0 t2CO2-t2SE3~0 t2WMWB1-t2DIEN9~0

T2WMWB5~.8 (\*t1);

AC by t2AC1-t2AC9~.80 t2AU2-t2hg5~0 t2CO2-t2VI7~0 t2WMWB1-t2DIEN9~0

(\*t1);

AU by t2AU2-t2AU5~.80 t2EM1-t2hg5~0 t2CO2-t2AC9~0 t2WMWB1-t2DIEN9~0

T2WMWB11~.8 (\*t1);

EM by t2EM1-t2EM5~.80 t2HG1-t2hg5~0 t2CO2-t2AU5~0 t2WMWB1-t2DIEN9~0

T2WMWB5~.8 T2WMWB9~.8 (\*t1);

HG by t2HG1-t2HG5~.80 t2CO2-t2EM5~0 t2WMWB1-t2DIEN9~0

T2WMWB4~.8 T2WMWB9~.8 T2DIEN4~.8 (\*t1);

OUTPUT: sampstat stdyx mod TECH1 tech4 sval;! MODINDICES (ALL);

**Supplemental References**

Asparouhov, T., & Muthén, B. (2009). Exploratory structural equation modeling. *Structural Equation Modeling: A Multidisciplinary Journal, 16,* 397-438.

Baron-Cohen, S. (2011). *Zero degrees of empathy: A new theory of human cruelty.* London: Allen Lane.

Baskarod, G., Sahdra, B. K., Ciarrochi, J. (2018). Body image-acceptance and action questionnaire-5: An abbreviation using genetic algorithms. *Behavior Therapy, 49*, 388-402.

Batson, C. D. (1991). *The altruism question: Toward a social-psychological answer*. Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc.

Bollen, K. A., & Lennox, R. (1991). Conventional wisdom on measurement: A structural equation perspective. Psychological Bulletin, 100, 305-314.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin, 56*(2), 81-105. doi:10.1037/h0046016

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling*, 14(3), 464–504. <http://dx.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.

Davis, M. H. (1994). *Empathy: a social psychological approach.* Madison Wisconsin: Brown & Benchmark.

Davis, M. H., & Oathout, H. A. (1987). Maintenance of satisfaction in romantic relationships: Empathy and relational competence. Journal of Personality and Social Psychology, 53(2), 397-410. <http://dx.doi.org/10.1037/0022-3514.53.2.397>

Edwards, J. R., & Bagozzi, R. P. (2000). On the nature and direction of relationships between constructs and measures. *Psychological Methods, 5*, 155-174.

Eisenbarth, H., Lilienfeld, S. O., & Yarkoni, T. (2015). Using a genetic algorithm to abbreviate the Psychopathic Personality Inventory–Revised (PPI-R). *Psychological Assessment, 27*(1), 194-202.

Henry, C. S., Sager, D. W., & Plunkett, Scott W. (1996). Adolescent's perceptions of family system characteristics, parent-adolescent dyadic behaviors, adolescent qualities, and adolescent empathy. *Family Relations,45*(3), 283.

Holland, J. (1975). *Adaption in Natural and Artificial Systems*. Ann Arbor, MI: The University of Michigan Press.

Hu, L., Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis:

Conventional criteria versus new alternatives. *Structural Equation Modeling 6*, 1–55

<https://doi.org/10.1080>

Huppert, F. A., & So, T. T. C. (2013). Flourishing Across Europe: Application of a New Conceptual Framework for Defining Well-Being. *Social Indicators Research, 110*(3), 837–861. http://doi.org/10.1007/s11205-011-9966-7

James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). *An introduction to statistical learning.* New York, NY: Springer.

Marsh, H. W. (1988). Multitrait multimethod analysis. In J P. Keeves (Ed.), *Educational research methodology, measurement and evaluation: An international handbook* (pp. 570-580). Oxford: Pergamon Press.

Marsh, H. W. (1993). Multitrait-multimethod analyses: Inferring each trait-method combination with multiple indicators. *Applied Measurement in Education, 6*(1), 49-81. doi:10.1207/s15324818ame0601\_4

Marsh, H. W., Balla, J, & McDonald, R. P. (1988). Goodness of fit in confirmatory factor analysis: The effect of sample size. *Psychological Bulletin, 103*, 391-410.

Marsh, H. W., Ellis, L. A., Parada, R. H., Richards, G., & Heubeck, B. G. (2005). A short version of the Self Description Questionnaire II: operationalizing criteria for short-form evaluation with new applications of confirmatory factor analyses. *Psychological Assessment*, *17*(1), 81-102.

Marsh, H. W., Guo, J., Dicke, T., Parker, P. D., Craven, R. G. (in press). Confirmatory factor analysis (CFA), exploratory structural equation modeling (ESEM) & Set-ESEM: Optimal balance between goodness of fit and parsimony. *Multivariate Behavioral Research*

Marsh, H. W., Hau, K.T., & Grayson, D. (2005). Goodness of Fit Evaluation in Structural Equation Modeling. In A. Maydeu-Olivares & J. McArdle (Eds.), *Contemporary Psychometrics*. A Festschrift for Roderick P. McDonald (pp. 275-340). Mahwah NJ: Erlbaum.

Marsh, H.W., Hau, K.T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis testing approaches to setting cutoff values for fit indexes and dangers in overgeneralising Hu & Bentler’s (1999) findings. *Structural Equation Modelling, 11,* 320-341. http://dx.doi.org/10.1207/s15328007sem1103\_2

Marsh, H. W., Martin, A. J., & Jackson, S. (2010). Introducing a short version of The Physical Self Description Questionnaire: new strategies, short-form evaluative criteria, and applications of factor analyses. *Journal of Sport and Exercise Psychology*, *32*(4), 438-482.

Marsh, H. W., Muthén, B., Asparouhov, T., Lüdtke, O., Robitzsch, A., Morin, A. J., & Trautwein, U. (2009). Exploratory structural equation modeling, integrating CFA and EFA: Application to students' evaluations of university teaching. *Structural equation modeling: A multidisciplinary journal*, *16*(3), 439-476.

Marsh, H. W., & Grayson, D. (1995). Latent-variable models of multitrait-multimethod data. In R. H. Hoyle (Ed.), *Structural equation modeling: Issues and applications* (pp. 177-198). Thousand Oaks: Sage.

Marsh, H. W., & Hocevar, D. (1988). A new, more powerful approach to multitrait-multimethod analyses: Application of second-order confirmatory factor analysis. *Journal of Applied Psychology*, *73*(1), 107.

Marsh, H. W., Lüdtke, O., Nagengast, B., Morin, A. J., & Von Davier, M. (2013). Why item parcels are (almost) never appropriate: Two wrongs do not make a right—Camouflaging misspecification with item parcels in CFA models. *Psychological Methods*, *18*(3), 257. doi:10.1037/a0032773

Marsh, H. W., Morin, A. J., Parker, P. D., & Kaur, G. (2014). Exploratory structural equation modeling: An integration of the best features of exploratory and confirmatory factor analysis. *Annual review of clinical psychology*, *10*, 85-110.

Meyer, B., Enström, M., Harstveit, M., Bowles, D., & Beevers, C. (2007). Happiness and despair on the catwalk: Need satisfaction, well-being, and personality adjustment among fashion models. *The Journal of Positive Psychology, 2*(1), 2-17.

Morin, A. J, Marsh, H. W & Nagengast, B. (2013). Exploratory structural equation modeling. In G. R. Hancock, R. O. Mueller (Ed.), *Structural equation modeling: A second course* 395-436. United States of America: Information Age Publishing Inc.

R Core Team (2018). A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from http://www.R-project.org/

Sahdra, B. K., Ciarrochi, J., Parker, P., & Scrucca, L. (2016). Using genetic algorithms in a large nationally representative American sample to abbreviate the Multidimensional Experiential Avoidance Questionnaire. *Frontiers in Psychology, 7,* 189.

Sass, D. A., & Schmitt, T. A. (2010). A comparative investigation of rotation criteria within exploratory factor analysis. *Multivariate Behavioral Research, 45*, 1-33.

Schroeders, U., Wilhelm, O., & Olaru, G. (2016). The influence of item sampling on sex differences in knowledge tests. *Intelligence, 58*, 22-32.

Scrucca, L., and Sahdra, B. (2015). *GAabbreviate: Abbreviating Questionnaires (or Other Measures) using Genetic Algorithms (Version 1.0): R package*. Retrieved from <http://CRAN.Rproject.org/package=GAabbreviate>

Stewart-Brown, S., Tennant, A., Tennant, R., Platt, Stephen., Parkinson, J. & Weich, S. (2009). Internal construct validity of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS): a Rasch analysis using data from the Scottish Health Education Population Survey. *Health and Quality of Life Outcomes, 7,*15. doi:10.1186/1477-7525-7-15.

Thøgersen-Ntoumani, C., & Ntoumanis, N. (2007). A Self-determination Theory Approach to the Study of Body Image Concerns, Self-presentation and Self-perceptions in a Sample of Aerobic Instructors. *Journal of Health Psychology, 12*(2), 301-315.

Wei, M., Shaffer, P., Young, S., Zakalik, R., & Hansen, Jo-Ida C. (2005). Adult Attachment, Shame, Depression, and Loneliness: The Mediation Role of Basic Psychological Needs Satisfaction. *Journal of Counseling Psychology,* *52*(4), 591-601.

Weinstein, N., & Ryan, R. M. (2010). When helping helps: Autonomous motivation for prosocial behavior and its influence on well-being for the helper and recipient. Journal of Personality and Social Psychology, 98(2), 222-244.

Yarkoni, T. (2010). The abbreviation of personality, or how to measure 200 personality scales with 200 items. *Journal of Research in Personality, 44*(2), 180-198.