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# Convergent Validity and Test–Retest Reliability of the Authentic Happiness Inventory in Working Adults

Janine Shepherd · Melody Oliver · Grant Schofield

**Abstract** This study aimed to test the convergent validity and test–retest reliability of a measure of happiness questionnaire; the authentic happiness inventory questionnaire (AHI), with a convenience sample of working adults (n = 30). Participants completed the AHI on two consecutive days. On the second day, participants also completed the Satisfaction with Life Scale (SWLS) and the positive and negative affect scale (PANAS). Internal consistency was determined using Cronbach alpha coefficients, test–retest reliability using a one-way intraclass correlation coefficient (ICC) model, and convergent validity using Pearson product-moment correlations. A further sample of working adults (n = 192) was included to conduct an exploratory factor analysis using principal component analysis (total n = 222). High internal consistency and overall test–retest reliability for the AHI was found (Cronbach alpha = .92 and ICC = .92, $p < .001$). There was a strong positive correlation between AHI and SWLS (r = .76, $p < .005$) and AHI and PANAS positive (r = .82, $p < .005$). There was a medium negative correlation between AHI and PANAS (r = .48, $p < .005$). Principal components analysis revealed the presence of five components with eigenvalues exceeding one, with one factor explaining 36.1 % of the variance. Findings confirmed the convergent validity and test retest reliability of the Authentic Happiness Inventory in working adults.

**Keywords** Measure · Happy · Positive psychology · Questionnaire

## 1 Introduction

Increasing focus within psychology and health research is being placed on "positive psychology", a new area of psychology that is interested in positive emotions and the effect of positive emotions on mental wellbeing (Seligman et al. 2005). Positive

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psychology has grown from the recognition of an imbalance in psychology where most research has focused on mental illness rather than mental wellness. This is reflected in health research with World Health Organisation's global definition of health being "a state of complete positive physical, mental and social well-being and not merely the absence of disease or infirmity" (World Health Organization 1946, p. 1).

Numerous tools have been developed to assess differing concepts of positive psychological concepts, for example, gratitude, optimism, work-life satisfaction, and happiness. Happiness in particular has been seen as an extremely subjective concept and thus the accurate quantification of this construct has been limited. Veenhoven and Ehrhard (1995) defined happiness or life satisfaction as "the degree to which one judges the quality of one's life favourably" (p. 34). Happiness is often seen as one of the most important goals in life and the last few decades have seen an explosion of research on happiness or the more broadly defined subjective well-being. Numerous theories have attempted to identify the causes of happiness from economic factors, activity levels, life events, and demographic factors to dispositional factors (Diener 1984; Eysenck 1990; Myers 1992; Veenhoven 1994).

Differing measures of happiness have been developed, including the Fordyce Emotions Questionnaire, the Subjective Happiness Scale (SHS), and the authentic happiness inventory questionnaire (AHI). The Fordyce Emotions Questionnaire is a brief measure of current happiness (Fordyce 1988). It is used to understand baseline mood levels but the general nature of the measure can be a potential limitation. The questionnaire asks, in general how happy or unhappy do you usually feel, from $0 =$ extremely unhappy to $10 =$ extremely and then asks to quantify that into percentage of time feeling happy, unhappy and neutral. It has been demonstrated to have good reliability in many studies. For example test re-test reliability has been found to be as high as .98 over a 2 days period and .81 over a 1 month interval (Fordyce 1988). Convergent validity has also been established with strong positive correlations between the Fordyce Emotions Questionnaire and many other measures of happiness and well-being (Fordyce 1988).

The SHS assesses respondents subjective sense of global happiness by averaging four items; two in general I consider myself $1 =$ not very happy to $7 =$ a very happy person; and two compared to most of my peers I consider myself $1 =$ less happy to $7 =$ more happy (Lyubomirsky and Lepper 1999). This scale is widely used in research and shows good psychometric properties (Schwartz et al. 2002; Tkach and Lyubomirsky 2006). This measure has been shown to have a test re-test reliability of .72 over 1 month interval and an internal consistency of .86 (Lyubomirsky and Lepper 1999).

The Steen Happiness Index (SHI) was developed to capture upward changes in happiness (Seligman et al. 2005) and was designed to be an opposite to the Beck Depression Inventory (BDI; Beck et al. 1961) in that it is meant to be sensitive to changes in levels of happiness. More specifically the SHI evaluates changes in happiness based positive emotions, engagement and meaning in life. The original SHI consisted of 20 items with five statements from which respondents must choose one to describe themselves in the present. The SHI has been changed from 20 items to 24 items and has been renamed the AHI. Data on validity and reliability of the AHI is under development with web based research from University of Pennsylvania and therefore unavailable at the time of writing.

Ensuring the tools used to measure happiness are valid and reliable is vital and assessing overall happiness may be particularly important in health related research, to identify relationships between happiness and health. The AHI offers a tool to measure current state happiness while the other two measures described above are global or general trait measures of happiness. The AHI, if proven valid and reliable, may be a useful measure of happiness when looking at interventions to increase happiness. This study aims to test the

convergent validity and test–retest reliability of the AHI, with a convenience sample of working adults and to explore the AHI with factor analysis to ascertain if there was reason to exclude any of the 24 questions.

## 2 Methods

### 2.1 Study Population and Procedures

#### 2.1.1 Test–Retest Reliability and Convergent Validity

A convenience sample of adults (n = 30) was recruited from Auckland University of Technology (AUT) staff during working hours via the AUT staff electronic notice board. A sample of 30 adults ensured that appropriate test–retest and convergent validity confidence limits could be generated by fulfilling the minimal acceptable criteria of intraclass correlation coefficient (ICC) values above .7 (Baumgartner and Chung 2001). To be eligible, participants were required to be employees of AUT (either part time or full time) and aged 20 years or older. On day 1 of data collection, participants were asked to complete a brief demographic survey (gender, age, ethnicity, occupation and qualification level) and then to complete the AHI. On the following day (day 2), the participants were asked to complete the AHI, and then to complete two other questionnaires; the Satisfaction with Life Scale (SWLS) and the positive and negative affect scale (PANAS). Order of completion of the SWLS and PANAS after completing the AHI was randomly assigned to mitigate any potential bias from respondent fatigue (Choi and Pak 2005). Data were collected in December 2010.

#### 2.1.2 Exploratory Factor Analysis

Data for the exploratory factor analysis were drawn from the AUT University sample (n = 30 as above) plus a separate sample of adults (n = 200) participating in the "Brief Interventions" project (total n = 230). Brief Interventions is an Auckland-based workplace intervention promoting and supporting healthy lifestyles. The data presented here are from the baseline assessment of this intervention study. All employees of the worksite who were aged 20 years or over were invited to participate. A team of health professionals and researchers visited the workplace and each participant underwent a cardiovascular disease risk assessment and completed three questionnaires: the AHI, a physical activity and nutrition patterns questionnaire, and a demographic survey. Data were collected in July 2010.

Informed consent was gained from all participants and ethical approval was granted by the host institution ethics committee.

### 2.2 Measures

The AHI is a measure of current overall happiness that was developed to measure upward changes in happiness levels and reflects three kinds of happy lives; the pleasant life, the engaged life, and the meaningful life. The inventory comprises 24 questions to which there is a group of five statements as possible answers ranging from a negative to an extreme positive. No items are reverse scored. Participants are asked to tick the one statement in each group which best describes the way they have been feeling in the past week, including the day of completing the questionnaire (e.g.; 1 = my life does not have any purpose or

meaning, 5 = I have a very clear idea about the purpose or meaning of my life; 1 = I am pessimistic about the future, 5 = I feel extraordinarily optimistic about the future). Scores from the 24 items are summed and averaged to provide an overall happiness score. Pilot work with over two hundred adult participants has shown evidence for convergent validity for the AHI in comparison with other measures of happiness using Pearson's correlation; (r = .79 with the General Happiness Scale, r = .74 with the Fordyce Happiness Scale; Seligman et al. 2005). To date, no further evidence for the reliability or validity of the AHI has been reported.

The SWLS and PANAS were used as comparison measures for examining the convergent validity of the AHI. The SWLS is a 5-item scale of global life satisfaction (Diener et al. 1985). This scale measures the emotional components of positive affect and the absence of negative affect, plus one cognitive element; life satisfaction, which refers to the person's internal subjective assessment of their overall quality of life. Participants rate the degree to which they agree with each item (1 = strongly disagree; 7 = strongly agree). The SWLS has been shown to be a valid and reliable measure of life satisfaction and is widely used across a range of age groups and population types (Pavot et al. 1991). Evidence for the internal consistency of the SWLS has been provided (Cronbach's alpha coefficient = .85).

The PANAS is used to measure state affect and was developed by Watson and Clark (1988). Positive affect is conceptualised in terms of enthusiasm, alertness and positive engagement. The PANAS contains ten positive and ten negative words such as "interested", "excited", and "distressed" or "scared". Participants are asked to indicate to what extent they feel this way right now for a series of affect descriptors like angry (1 = very slightly or not at all, 5 = extremely). The PANAS is widely used in psychological research and extensive evidence exists for its validity and reliability (Crawford and Henry 2004; McDowell 2006; Watson et al. 1988).

In addition to the above questionnaires, participants completed a demographic survey to identify gender, age, ethnicity, occupation, and qualification level. Statistics New Zealand statistical standards for occupation and education level and qualifications were used to classify these factors (Statistics New Zealand 2006).

## 2.3 Statistical Analyses

The internal consistency of items within each measure (AHI, SWLS, and PANAS) was assessed using Cronbach alpha coefficients.

### 2.3.1 Test–Retest Reliability

Assuming random variance between AHI scores for day 1 and day 2, test–retest reliability was determined using a one-way ICC model. The ICC value cut-off ranges used for the current study were .0–.20 (weak agreement), .21–.4 (poor agreement), .41–.6 (moderate agreement), .61–.8 (substantial agreement), and .81–1.0 (almost perfect agreement). Overall an ICC above .7 was considered an acceptable measure of test–retest reliability (Baumgartner and Chung 2001).

### 2.3.2 Convergent Validity

Pearson product-moment correlations were used to examine convergent validity for the AHI (day 2), SWSL, PANAS positive, and PANAS negative scales in the sub sample of

adults (n = 30). Preliminary analyses were performed to ensure no violation of the assumption of normality. The following criteria were used to classify magnitude of correlations: small, r = .1–.29; medium, r = .3–.49; large, r = .5–1.0 (Cohen 1960).

### 2.3.3 Exploratory Factor Analysis

The underlying structure of the AHI was explored using exploratory factor analysis after first confirming the data were suitable for this process by examining sample size and the strength of the relationship among the items. A sample of at least 150 is recommended for exploratory factor analyses to determine if a data set is suitable for factor analysis (Tabachnick and Fidell 2007). Principal component analysis (PCA) was used to extract the factors. Inspection of the screeplot was used to guide identification of factors for retention.

All data analyses were conducted with SPSS 17.0 software and confidence intervals were set at 95 %.

## 3 Results

All AUT University staff (n = 30) completed the AHI in full. Eight (4 %) participants were removed from the Brief Interventions sample due to non-completion of the AHI (n = 7), and missing values in their completed AHI (n = 1). The final sample for analyses (n = 222; 30 from the AUT sample, 192 from the Brief Interventions study sample) was 39.2 % male, predominantly full-time working adults, with a mean age of 40.2 years. Full participant characteristics are shown in Table 1.

### 3.1 Internal Consistency

The Cronbach alpha coefficient for the AHI in the total sample (n = 222) was .92, indicating adequate internal consistency (the recommended minimum value for internal consistency is .7; Nunnally 1978). For the SWSL the Cronbach alpha coefficient was .85, and

**Table 1** Demographic profile of study participants

| Characteristic | n or mean | (%) or (SD) |
|---|---|---|
| Sex | | |
| Male | 87 | (39.2) |
| Female | 135 | (60.8) |
| Age, mean (SD) | 40.2 | 10.3 |
| Ethnicity | | |
| NZ/European | 76 | (34.2) |
| Māori | 23 | (10.4) |
| Pacific island | 67 | (30.2) |
| Asian | 45 | (20.3) |
| Other | 11 | (5.0) |
| Work status | | |
| Full time | 218 | (98.2) |
| Part time | 4 | (1.8) |

n sample size; SD Standard deviation

for the PANAS the Cronbach alpha coefficient for positive affect was .92 and .89 for negative affect.

## 3.2 Test–Retest Reliability

Table 2 presents the results of the test–retest analyses for the AHI in the sub-sample (n = 30). For individual items, ICC values ranged from .05 to .92, with 15 of the 24 items showing ICC values of .7 or greater ($p < .001$). For the overall AHI sum, the test–retest reliability was ICC = .92, $p < .001$.

## 3.3 Convergent Validity

Large correlations between the AHI and the SWLS and PANAS indicated that high levels of happiness were positively associated with both high levels of life satisfaction and positive affect while levels of happiness were moderately negatively associated with levels of negative affect as expected (Table 3).

**Table 2** Test-retest reliability of the AHI in a sample of adults

| Item | n | ICC | 95 % CI | F |
|---|---|---|---|---|
| Item 1 | 30 | .58* | (.27–.78) | 3.79 |
| Item 2 | 30 | .55* | (.25–.76) | 3.46 |
| Item 3 | 30 | .66* | (.40–.82) | 4.90 |
| Item 4 | 30 | .05 | (−.92 to .39) | 1.09 |
| Item 5 | 30 | .26 | (−.11 to .56) | 1.67 |
| Item 6 | 30 | .72* | (.50–.89) | 6.23 |
| Item 7 | 30 | .59* | (.29–.78) | 3.82 |
| Item 8 | 30 | .88* | (.77–.94) | 15.92 |
| Item 9 | 30 | .73* | (.50–.86) | 6.34 |
| Item 10 | 30 | .75* | (.54–.87) | 7.07 |
| Item 11 | 30 | .58* | (.29–.78) | 3.77 |
| Item 12 | 30 | .89* | (.77–.94) | 16.38 |
| Item 13 | 30 | .77* | (.58–.89) | 7.80 |
| Item 14 | 30 | .87* | (.75–.94) | 14.67 |
| Item 15 | 30 | .92* | (.84–.96) | 24.00 |
| Item 16 | 30 | .89* | (.78–.95) | 16.78 |
| Item 17 | 30 | .81* | (.64–.90) | 9.48 |
| Item 18 | 30 | .79* | (.60–.89) | 8.31 |
| Item 19 | 30 | .54* | (.23–.75) | 3.33 |
| Item 20 | 30 | .71* | (.48–.85) | 6.00 |
| Item 21 | 30 | .92* | (.83–.96) | 22.75 |
| Item 22 | 30 | .55* | (.24–.76) | 3.44 |
| Item 23 | 30 | .77* | (.56–.88) | 7.50 |
| Item 24 | 30 | .80* | (.63–.90) | 9.21 |
| Item sum total | 30 | .92* | (.83–.96) | 23.05 |

*n* sample size; *ICC* intraclass correlation coefficient; *CI* confidence intervals; *F* variance ratio

\* $p < 0.001$

**Table 3** Correlation coefficients for associations between the AHI and (a) the SWLS, and (b) the PANAS

| Scale | Correlation coefficient |
| --- | --- |
| Satisfaction With Life Scale | .76* |
| PANAS—Positive score | .82* |
| PANAS—Negative score | −.48* |

* $p < 0.005$
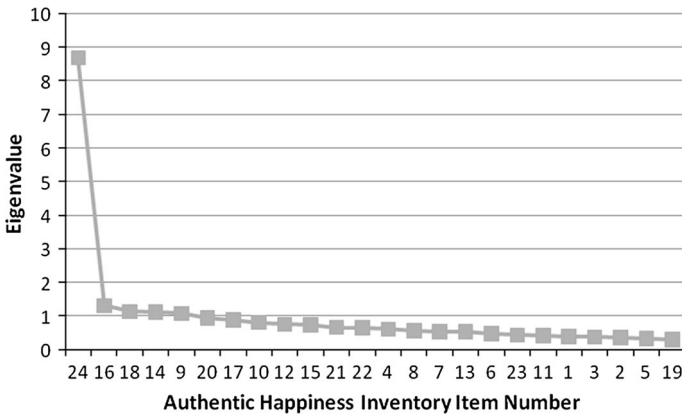


**Fig. 1** Screeplot of eigenvalues and AHI item numbers

3.4 Exploratory Factor Analysis (EFA)

An exploratory factor analysis was conducted to understand if the 24 questions in the AHI adequately captured the construct being measured (happiness) and to ascertain if there was reason to exclude certain items. The total sample of adults (n = 222) was used for EFA. The Kaiser–Meyer–Olkin value, which is a test of sampling adequacy, was .94, exceeding the recommended value of .6 (Kaiser 1970; Tabachnick and Fidell 2007) and Bartlett's test of Sphericity reached statistical significance ($p = .05$), therefore factor analysis was appropriate. PCA showed the presence of five components with eigenvalues exceeding one, with one factor explaining 36.1 % of the variance. Inspection of the screeplot (Fig. 1) supported a one-factor solution. The one factor solution was Question 24 which was the general or global happiness item, with respondents asked to choose the most appropriate statement from the following five options: (a) my life is a bad one, (b) my life is an OK one, (c) my life is a good one, (d) my life is a very good one, or (e) my life is a wonderful one.

**4 Discussion**

This study aimed to assess the utility, reliability, and validity of the AHI for use with working adults. We utilized exploratory factor analysis to ascertain if there was reason to exclude any of the 24 items. Our analyses showed that one factor explained 36.1 % of the

variance in the data set. This factor had an eigenvalue of 8.7, which far exceeded values found for the other items. This question was conceptualized as relating to general happiness and life satisfaction. Our findings indicate that this item might be reliably used as a single item scale; however, further work is required to confirm this assertion. In particular, investigating the convergent validity, discriminant validity, and test–retest reliability for the single item factor in a larger studies across a range of population groups would be worthwhile. Previous research on single item scales of happiness validates the concept that these measures are as valid and reliable as many multiple item scales (Brebner et al. 1995; Cammock et al. 1994; Diener et al. 1992; Furnham and Cheng 1997). Furthermore Burisch (1997) maintained that short scales were as valid as long scales and lengthening a scale beyond some point could actually weaken its validity. In terms of research application the single item is more economical for large-scale population surveys and for research projects in which participant time is limited. If researchers are interested in only an overall happiness or life satisfaction score there is little benefit in asking multiple questions when a single question can give reliable and valid data (Cummins 1995).

Results from the test–retest and convergent validity analyses showed initial support of the AHI as a valid and reliable tool. The test–retest of the AHI sum total showed an ICC value of .92, which is well above the recommended cut off value for acceptability of .7. Although there are no published data available on the between day reliability of the AHI, this result compares favourably to similar examinations with comparable measures. For example, the SHS has been reported to have a test–retest reliability of .90 over 7 days (Lyubomirsky and Lepper 1999); the Brief Life Satisfaction Scale reliability of .91 (Funk et al. 2006); the SWLS ranged from .5 to .8 for test–retest periods ranging from 2 days to 3 months (Pavot and Diener 2009; Pavot et al. 1991) and the PANAS reliability ranged from .4 to .7 from 2 days to 4 months (Watson et al. 1988). Acknowledging the temporality of happiness (Gable and Haidt 2005), we chose a relatively short timeframe between the first and second AHI assessments (i.e., 1 day). This approach was taken in the interest of capturing possible variability in AHI reliability, rather than variability in happiness as a function of time. Had we stipulated a longer time frame between testing occasions, it is possible that the test–retest reliability of the AHI would have been reduced. Nine out of the 24 individual questions failed to reach an acceptable ICC value of .7 or above. Further research on these individual questions is needed to examine the reasons for this; however as the overall sum ICC value was acceptable, the use of the AHI sum appropriate test–retest reliability can be assumed for this sample.

Convergent validity showed a strong positive correlation between the AHI and both the SWLS ($r = .76$) and the PANAS positive ($r = .82$) and a medium negative correlation between the AHI and the PANAS negative ($r = -.48$). Pilot data from the University of Pennsylvania support these results with the General Happiness Questionnaire ($r = .79$) and the Fordyce's Happiness Scale ($r = .74$; Seligman et al. 2005). In this study the SWLS showed a strong positive correlation with the PANAS positive of .62 which is consistent with previous studies ranges of .4–.62 and a medium negative correlation with the PANAS negative of $-.46$ with previous studies ranges of .26–.48 (Lucas et al. 1996).

Once the AHI pilot studies currently underway (Seligman et al. 2005) have been completed it will be of value to compare the results with the results of this study. Although these pilot studies involve internet users it has been found that survey data collected via the internet is no more or less biased than data collected via traditional methods (Gosling et al. 2004). The sample used in this study was small and consisted of university staff members which could be considered to lack variability, as such further testing with larger numbers and different populations is recommended.

Overall, the results of this study show that when using the AHI for the intention it was developed it is appropriate to use in its entirety and can be considered to have acceptable test–retest reliability and convergent validity when used with working adults. Evidence is also provided for the possible use of one item as a single measure. Further research is needed to examine the accuracy and reliability of using this single item as a standalone measure, and in conjunction with other questionnaires.

## 5 Conclusion

Findings confirmed the convergent validity and test retest reliability of the AHIin working adults. Future research using larger sample sizes and samples of other populations can add to the validity and reliability of this tool, as can research examining its internal reliability, and content, discriminant, and construct validity.

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