**Life Engagement Test Psychometric Analysis**

The Life Engagement Test (LET) was designed to measure purpose in life (Scheier, et al, 2006). The authors of the LET defined purpose as the extent to which an individual partakes in activities and works towards goals that they find personally valuable. LET contains six items three positive (2,4,6) then three negative (1,3,5).

1.There is not enough purpose in my life.

2. To me, the things I do are all worthwhile.

3. Most of what I do seems trivial and unimportant to me.

4. I value my activities a lot.

5. I don’t care very much about the things I do.

6. I have lots of reasons for living.

Psychometric properties of the LET was conducted by the authors on samples of older adults such as community-dwelling men and women who participated in a study on infectious disease, female osteoarthritis patients and their spouses as well as a group of women transitioning through the menopause. No study has been conducted to test the validity of the survey instrument on youth.

In their studies the authors conducted exploratory factor analyses across the different samples and found that a one-factor solution accounted for between 43% and 62% of the variance among the items. They also found high factor loadings, between 57 and .86 and averaging .71, for all six items across all their samples. Although they conducted a test retest model, administered the LET twice, approximately 4 months apart, their sample size was relatively small with N = 178 in one group, N = 62 in the second, N = 55 in the third and N = 61 in the fourth.

In my analysis we have a sample of N=957 youth and I was unable to find support for a one factor model in an exploratory factor analysis. Parallel analysis suggested that there was two factors. Whilst the authors retained factors with eigenvalues >1 using Kaiser’s criterion, (Kaiser, 1960), In my Principle Component Analysis (PCA) I found two eigenvalues >.7 (the first was 2 and the second was 0.82) which based on Jolliffe’s criterion (Jolliffe, 1986) which recommends retaining factors above .70 would suggest two factors. In addition a scree plot supported the contention that there were two factors. Furthermore, the first factor only explained 0.42 percent of the variance whilst the second explained and additional 0.28 percent of the variance among the items. This further indicated that a two factor solution would be an optimal fit to the data.

Nonetheless, given the authors contention of their being one factor and finding only one component with an eigenvalue >1 in my EFA I tried to fit a one factor solution to the data. The results can be seen in table 1. Items 2 and 4 did not load on one factor at all and item six loaded poorly on the factor. I therefore tried a two factor solution and whilst the items loaded better and seemed to divide along the negatively and positively worded items, item 6 was cross loading on both factors (see table 1). The fit was also extremely poor and did not support a one factor solution at all (see table 2). I therefore tried to fit a two factor solution which seemed to be a good fit for the data. Most of the items loaded well on each factor except for item 6 (I have lots of reasons for living) which was cross loading. A Target Rotation yielded virtually identical results for this model. I therefore tried a model that removed item 6, whilst that yielded a somewhat better fit (see table 2) item 4 no longer loaded as well on the second factor and the correlation between the factor went down and item 2 was loading on the second factor at 1. In addition, the Chi Squared was not significant and the CFI and TLI were both 1 and the RMSEA was 0.01. A Target Rotation produced virtually identical results. All this indicated a potential over fitting of the data. I also noted that a one factor model without item 6 yielded results almost identical to a one factor model that included item 6. In addition, on the two factor model, correlations between the factors were low .14 for the model with item 6 and .07 for the model without item 6.

Based on this analysis I rejected the authors suggestion that LET represented one factor in favor of the evidence that that suggested there were two factors and that whilst item 6 was somewhat problematic removing it in the EFA yielded little benefit in terms of fit and factor structure. The two factors that emerged from the EFE were clearly based on positively and negatively worded items and the question therefore was whether this was just a method effect which if accounted for would still yield a one factor solution for the data.

Table 1. Factor Loadings for Exploratory Factor Analysis of LET

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | One Factor EFA | Two Factors EFA | | Two Factor EFA No Item 6 | |
| Variable | **Factor 1** | **Factor 1** | **Factor 2** | **Factor 1** | **Factor 2** |
| LET 1 | **0.66** | **0.63** | 0.15 | **0.64** | 0.15 |
| LET 2 | 0.12 | -0.03 | **0.74** | 0 | **1** |
| LET 3 | **0.85** | **0.87** | -0.04 | **0.87** | -0.02 |
| LET 4 | 0.08 | -0.07 | **0.74** | -0.01 | **0.54** |
| LET 5 | **0.77** | **0.79** | -0.06 | **0.78** | -0.06 |
| LET 6 | **0.42** | **0.33** | **0.50** |  |  |
| SS loadings | 1.96 | 1.9 | 1.4 | 1.77 | 1.32 |
|  | Correlations | 1 | 0.14 | 1 | 0.07 |
|  |  | 0.14 | 1 | 0.07 | 1 |

Table 2. Fit Measures for Exploratory Factor Analysis of LET

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Models | Chisq | DF | P-Value | CFI | TLI | RMSEA | lower | upper | SRMR |
| One Factor Model | 595.42 | 9 | 0 | 0.66 | 0.43 | 0.26 | 0.24 | 0.28 | 0.19 |
| Two Factor Model | 15.66 | 4 | 0 | 0.99 | 0.97 | 0.06 | 0.03 | 0.09 | 0.02 |
| Two Factor w/o 6 | 1.15 | 1 | 0.28 | 1 | 1 | 0.01 |  | 0.09 | 0.01 |

**Confirmatory Factor Analysis**

Given the evidence of the authors of the LET test that there was ponly one factor and my results from the EFA I was left wondering whether the two factors were a simple method effect of the negatively and positively worded items. In order to try and answer this I used Marsh et al’s (2009) methodology of dealing with negative and positive items and ev;luated a multiple model approach in the CFA.

Model 1 was a one factor model. Model 2 was a two factor model where the two factors were correlated with each other. Model 3 was a two factor approach but dropped item 6. Model 4 was a second order model with one global factor and a positive and negative latent factor. Model 5 was a bi-factor model where positive and negative latent factors were set as uncorrelated with each other or with the main factor. Model 6 is similar to model 3 but only identified the negative items as latent factor uncorrelated with the main factor. Model 7 was also a bi-factor similar to model 3 but only identified the positive items as latent factor uncorrelated with the main factor. As Marsh et al. point out these models will allow us to asses whether there is a method effect associated with the negatively and positively worded items going on.

Model 1 Model 2



 Model 3 Model 4

Model 5 Model 6



Model 7



**Results**

In this section I examine the seven models. Model 1 which tested the one factor approach did not load well and was a poor fit for the data and the loading were also problematic as can be seen in tables 2 and 3. Based on the EFA on previous research on method effects the one factor approach was clearly the worst fitting model (CFI = .66, TLI = .42, RMSEA = .24-.25).

The two factor model (Model 2) was substantially better than Model 1, loadings were decent to excellent (see table 3). The fit, however, was poor with a (CFI = .89, TLI = 80, RMSEA = .13 - .17) indicating that a two factor model was a poor fit for the data. Correlations between the factors was .18.

Model 3 was two factor model without item 6. When running that model some estimated variances were negative and the observed variable error term matrix was not positive definite which resulted in item 2 loading on the positive factor at 1.17—the was clearly an over fitted model as was seen in the EFA. I therefore ran the model setting item 2 to be <=1. This resulted in results identical to those found in the EFA. The negative items remaining unchanged from Model 2. However, item 2 now loaded on the positive factor at 1 and item 5 at .54. The fit improved dramatically a (CFI = .97, TLI = 93, RMSEA = .07 - .12). The correlation between the factors without item 6 was now at .07 indicating that without item 6 there is even less in common between these positive and negative factors.

Overall, dropping item 6 was problematic on a number of levels. First, it caused problems with the model to the degree that it over fitted initially. Second, it left us with a two item factor positive factor, not ideal at the best of times. Furthermore the difference in the loadings of the two items on the positive factor made for a less convincing coherent factor. Third, doing this did not leave us with excellent fit measures. Thus, I concluded that we would gain little from dropping item 6 in the rest of the models.

Model 4 suggested that there might be a higher order global LET purpose factor that incorporated the positive and negative purpose items that might be a better fit for the data. I therefore set the positive and negative items to their own individual latent factors and set both of them to a LET Global factor. Loading on the individual factors were good to excellent. However, the positive factor only loaded marginally well onto the LET Global factor (.32) and the negative factor loaded acceptably well on the LET Global (.54) but not extremely well (see table 3). Despite this, the fit measures indicated that a second order model a still poor fit to the data a (CFI = .89, TLI = 73, RMSEA = .14 - .18) and was in fact a slightly worse fit than Model 2 which accounted for the items as tow independent factors (see table 4).

Model 5 was a bi-factor model which accounted for a global factor and two independent uncorrelated positive and negative factors that could explain some of the method effects. The results, however, did not indicate that this was a good fit for the data. Items 2 and 4 did not load on the Global LET factor with a loading >.3, the rest of the items, however, were loading well on their respective positive and negative factors. There was a significant improvement in the fit over Models 1, 2 and 4 (CFI = .97, TLI = 87, RMSEA = .9 - .15).

Model 6 was a bi-factor that only took into account the negative items as a separate uncorrelated latent factor. The results, also did not indicate that this model was a good fit for the data. Like Model 5 items 2 and 4 did not load on the Global LET factor with a loading >.3, yet the items were all loading well on the negative factor, this model represented a worse fit than Models 2, 4 and 5 although was better than Models 1 and 2 (CFI = .91, TLI = 79, RMSEA = .13 - .18).

The final Model was number 7 which took into account the positive items as a separate uncorrelated latent factor. Like Model 5 and 6 items 2 and 4 did not load on the Global LET factor with a loading >.3, yet the items were all loading well on the positive factor, this model represented a the best fit of all (CFI = .97, TLI = 93, RMSEA = .06 - .11). Thus this model represented a good fit for the data. This can be interpreted to mean that there is a methods effect represented by the positively worded questions in the LET test. The limitation to this interpretation, however, is that at least tow of those positively worded items were not loading onto the Global LET factor again indicating that they are separate factors.

**Discussion**

Whilst it is plausible to argue that a one factor solution fits the data when a positively worded method effect is taken into consideration, thus supporting the authors contention of the LET being a scale the represents on factor of purpose, a more plausible interpretation is that there are two separate factors here that in the end do not work well and therefore result in a poor fit for the data. This interpretation is supported by the fact that two of the positively worded items (2 and 4) do not load on the Global LET factor at all (.07 and .03 respectively) when the positive method effect is taken into consideration. This seems to show that these items are loading entirely on the positive latent factor and not on the Global LET factor at all, clear proof of a two factor model. Despite this, as was demonstrated above, a two factor model ends up having good loadings but poor fit indices.

**Conclusion**

Thus, I have concluded that the two factors present in the LET test are not a result of a method effect but a result of poorly worded items that do not properly tap the construct of purpose as understood by youth.

Table 3. Factor Loadings for CFA of LET

|  |  |  |  |
| --- | --- | --- | --- |
| Model | Items | Factor Names | Loadings |
| Model 1 | LET 1 | LET | 0.66 |
|  | LET 2 | LET | 0.12 |
|  | LET 3 | LET | 0.85 |
|  | LET 4 | LET | 0.08 |
|  | LET 5 | LET | 0.77 |
|  | LET 6 | LET | 0.42 |
| Model 2 | LET 1 | Negative | 0.65 |
|  | LET 3 | Negative | 0.87 |
|  | LET 5 | Negative | 0.77 |
|  | LET 2 | Positive | 0.72 |
|  | LET 4 | Positive | 0.73 |
|  | LET 6 | Positive | 0.56 |
| Model 3 | LET 1 | Negative | 0.64 |
|  | LET 3 | Negative | 0.87 |
|  | LET 5 | Negative | 0.77 |
|  | LET 2 | Positive | 1 |
|  | LET 4 | Positive | 0.54 |
| Model 4 | LET 1 | Negative | 0.64 |
|  | LET 3 | Negative | 0.87 |
|  | LET 5 | Negative | 0.77 |
|  | LET 2 | Positive | 0.72 |
|  | LET 4 | Positive | 0.73 |
|  | LET 6 | Positive | 0.56 |
|  | Positive | LET Global | 0.32 |
|  | Negative | LET Global | 0.55 |
| Model 5 | LET 1 | Negative | 0.43 |
|  | LET 3 | Negative | 0.7 |
|  | LET 5 | Negative | 0.58 |
|  | LET 2 | Positive | 0.66 |
|  | LET 4 | Positive | 0.8 |
|  | LET 6 | Positive | 0.43 |
|  | LET 1 | LET Global | 0.48 |
|  | LET 2 | LET Global | 0.16 |
|  | LET 3 | LET Global | 0.54 |
|  | LET 4 | LET Global | 0.08 |
|  | LET 5 | LET Global | 0.5 |
|  | LET 6 | LET Global | 0.63 |
| Model 6 | LET 1 | Negative | 0.61 |
|  | LET 3 | Negative | 0.86 |
|  | LET 5 | Negative | 0.77 |
|  | LET 1 | LET Global | 0.28 |
|  | LET 2 | LET Global | 0.74 |
|  | LET 3 | LET Global | 0.13 |
|  | LET 4 | LET Global | 0.71 |
|  | LET 5 | LET Global | 0.09 |
|  | LET 6 | LET Global | 0.55 |
| Model 7 | LET 2 | Positive | 0.71 |
|  | LET 4 | Positive | 0.76 |
|  | LET 6 | Positive | 0.5 |
|  | LET 1 | LET Global | 0.65 |
|  | LET 2 | LET Global | 0.07 |
|  | LET 3 | LET Global | 0.86 |
|  | LET 4 | LET Global | 0.03 |
|  | LET 5 | LET Global | 0.78 |
|  | LET 6 | LET Global | 0.4 |

Table 4. Fit Measures for CFA of LET

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Models | Chisq | DF | P-Value | CFI | TLI | RMSEA | lower | upper | SRMR |
| Model 1 | 598.24 | 9 | 0 | 0.66 | 0.43 | 0.26 | 0.24 | 0.28 | 0.14 |
| Model 2 | 188.42 | 8 | 0 | 0.89 | 0.80 | 0.15 | 0.13 | 0.17 | 0.09 |
| Model 3 | 50.117 | 5 | 0 | 0.97 | 0.93 | 0.10 | 0.07 | 0.12 | 0.04 |
| Model 4 | 188.42 | 7 | 0 | 0.89 | 0.77 | 0.16 | 0.14 | 0.19 | 0.09 |
| Model 5 | 47.67 | 3 | 0 | 0.97 | 0.87 | 0.12 | 0.1 | 0.16 | 0.03 |
| Model 6 | 151.02 | 6 | 0 | 0.92 | 0.79 | 0.16 | 0.14 | 0.18 | 0.08 |
| Model 7 | 51.43 | 6 | 0 | 0.97 | 0.93 | 0.09 | 0.07 | 0.11 | 0.04 |