

The Revised Life Orientation Test (LOT-R)

Age Cohorts	Younger, Mid-age, Older
Surveys	Survey 2 & 3
Derived Variables:	LOTR
Definition	LOT-R optimism score
Source Items (Index Numbers)	LOTR1 to LOTR6 (Younger & Mid-age: LOTR-007 to LOTR-012; Older: LOTR-001 to LOTR-006)
Statistical Form	Continuous variable
Index Number:	LOTR-013
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Background¹

People differ greatly in their approach to the world; some have a favourable outlook towards all aspects of their lives, while others do not. The extent to which people maintain an optimistic outlook to life has been found to impact physical and mental health.

Scheier and Carver¹ argued that optimism was a stable personality characteristic, and that an individual's level of optimism will influence his or her attitudes and behaviour, and therefore have consequences for both physical and emotional health. It is hypothesised that an optimistic person will adopt attitudes and behaviours associated with good health even in objectively difficult circumstances.

Some researchers have argued that optimism and pessimism are opposite ends of a continuum, while others have argued that they are related but distinct constructs.

The Revised Life Orientation Test (LOT-R)

Scheier and Carver¹ developed the Life Orientation Test (LOT) comprising four positive items, four negative items and four filler items. The LOT is still used extensively in research.

The LOT was re-evaluated because the authors were concerned with the conceptual properties of the scale. The positive items 'I'm a believer in the idea that "every cloud has a silver lining"' and 'I always look on the bright side of things' included in the LOT did not explicitly refer to the expectation of positive outcomes and were excluded from the Revised Life Orientation Test (LOT-R).² The authors wanted to have equal numbers of positive and negative items in the LOT-R. Thus, the new positive item 'Overall, I expect more good things to happen to me than bad' was added. It was believed that this item explicitly referred to the expectation of positive outcomes. The negative item 'Things never work out the way I want them to' was excluded from the LOT-R. Thus the LOT-R comprised 3 positive, 3 negative and 4 filler items. It is common for researchers not to include the 4 filler items from their questionnaire when using the LOT-R.

Source items

The ALSWH surveys used only the six 'active' LOT-R items. The 4 filler items were not included in the survey questionnaire to conserve space and because their inclusion was not deemed to be important. These items were first included in the full versions of the second survey of the Younger and Older cohorts and the third survey of the Mid-age cohort. Items and scoring are shown below.

LOTR1	a	In uncertain times, I usually expect the best ^a
LOTR2	b	If something can go wrong for me, it will ^b
LOTR3	c	I'm always optimistic about my future ^a
LOTR4	d	I hardly ever expect things to go my way ^b
LOTR5	e	I rarely count on good things happening to me ^b
LOTR6	f	Overall, I expect more good things to happen to me than bad ^a

^a Positive item

^b Negative item

Code	Positive Item Score	Negative Item Score	Response
1	0	4	Strongly disagree
2	1	3	Disagree
3	2	2	Neutral
4	3	1	Agree
5	4	0	Strongly agree

Scale Evaluation

Item Responses

The distributions of responses to the 6 items from the LOT-R are shown in Table 1. Responses were distributed across the entire scale, with a slight skewed left for positive items and slight skew right for negative items.

Mean scores were similar for the 3 age cohorts (Younger: 2.3 to 2.8; Mid-age and Older: 2.4 to 2.9). The percentage of missing item response was low for the Younger and Mid-age cohorts (1% or less and 2.1% or less respectively) but higher among the Older cohort (3.0 to 7.6%).

Table 1 Distribution (%) and mean (SD) of responses and percent missing for 6 LOT-R items

		Percent					Mean (SD)	Percent missing
		Strongly disagree ^e	Disagree ^e	Neutral	Agree	Strongly agree		
Thinking about your current approach to life, please indicate how much you think each statement describes you.								
Younger Cohort (n = 9 600)								
Positive items								
a	In uncertain times, I usually expect the best	2.8	17.6	37.2	35.8	6.7	2.3 (0.9)	0.8
c	I'm always optimistic about my future	1.0	12.2	26.7	48.5	11.6	2.6 (0.9)	0.9
f	Overall, I expect more good things to happen to me than bad	1.5	8.0	20.8	51.0	18.7	2.8 (0.9)	0.7
Negative items^a								
b	If something can go wrong for me, it will	9.2	37.6	28.4	21.2	3.6	2.3 (1.0)	0.7
d	I hardly ever expect things to go my way	11.8	44.8	25.8	15.7	1.9	2.5 (1.0)	0.9
e	I rarely count on good things happening to me	14.2	41.8	23.9	17.6	2.6	2.5 (1.0)	1.0
Mid-age Cohort (n = 11 196)								
Positive items								
a	In uncertain times, I usually expect the best	1.5	15.8	30.5	45.6	6.6	2.4 (0.9)	2.1
c	I'm always optimistic about my future	1.0	9.2	22.3	57.0	10.5	2.7 (0.8)	1.8
f	Overall, I expect more good things to happen to me than bad	0.9	5.2	14.1	62.9	16.9	2.9 (0.8)	1.2
<i>Continued next page</i>								
Negative items^a								
b	If something can go wrong for me, it will	11.4	49.2	20.9	16.6	1.9	2.5 (1.0)	1.8
d	I hardly ever expect things to go my way	11.0	53.0	21.4	13.3	1.3	2.6 (0.9)	1.6

Thinking about your current approach to life, please indicate how much you think each statement describes you.

	Percent					Mean (SD)	Percent missing
	Strongly disagree ^e	Disagree ^e	Neutral	Agree	Strongly agree		
e I rarely count on good things happening to me	13.1	50.3	19.4	15.6	1.7	2.6 (1.0)	1.6
Older Cohort(n = 9 501)							
Positive items							
a In uncertain times, I usually expect the best	2.4	12.4	29.2	49.4	6.6	2.5 (0.9)	7.6
c I'm always optimistic about my future	1.1	6.4	21.4	59.8	11.2	2.7 (0.8)	5.9
f Overall, I expect more good things to happen to me than bad	1.2	3.2	14.2	66.8	14.6	2.9 (0.7)	3.0
Negative items^a							
b If something can go wrong for me, it will	13.6	43.8	24.1	16.5	2.1	2.5 (1.0)	7.4
d I hardly ever expect things to go my way	14.3	45.8	25.0	13.2	1.8	2.6 (0.9)	7.3
e I rarely count on good things happening to me	13.5	39.5	27.0	17.7	2.3	2.4 (1.0)	6.5

^a mean and SD for reverse scored negative items

Internal reliability

Cronbach's alphas for the 6 items exceeded the criteria from the ALSWH procedure for all 3 age cohorts (Younger: 0.84; Mid-age: 0.84 Older 0.74) (Table 2).

Internal reliability did not increase when individual items were deleted from the factor, except there was a very slight increase in Cronbach's alpha when removing item a in the Younger cohort. Item-to-total correlations were moderate, exceeding 0.5, for all items in the Mid-age cohort and all but item a in the Younger cohort. Item-to-total correlations for the Older cohort were low to moderate (0.4 to 0.6).

Table 2 Correlation with item-total and Cronbach's alpha for standardised variables with deletion of individual items

	Deleted item						
	None	a	b	c	d	e	f
Cronbach's Alpha							
Younger ^a	0.84	0.85	0.80	0.82	0.78	0.79	0.80
Mid-age ^a	0.84	0.84	0.82	0.83	0.80	0.81	0.82
Older ^a	0.74	0.74	0.70	0.71	0.66	0.68	0.72
Correlation with total							
Younger		0.42	0.64	0.54	0.73	0.70	0.64
Mid-age		0.51	0.64	0.58	0.72	0.68	0.62
Older		0.35	0.48	0.44	0.61	0.56	0.43

^a Younger Cohort: n=9 368; Mid-age Cohort: n=10 751; Older Cohort: n=8 357

Factor Analysis

Factor analysis using principal components estimation was performed on responses from women completing all 6 items. Inter-item correlations are shown in Table 3.

Results of factor analyses were similar for the Younger and Mid-age cohorts; only 1 factor had an eigenvalue greater than one and that factor explained approximately 56% of the variance (Table 4). The parallel analysis and MAP tests also suggested 1 factor.

For the Older cohort, both the observed and simulated eigenvalues suggested two factors; these factors explained approximately 44% and 20% of the variance respectively (Table 4). However, the MAP test suggested 1 factor and only one item loading from the second factor exceeded 0.5. Thus, it was decided that a one-factor solution was also appropriate for the Older cohort.

Table 3 Pearson Correlations for 6 LOT-R items

LOT-R Item	b	c	d	e	f
Younger cohort (n = 9 338)					
a	0.26	0.41	0.32	0.30	0.35
b		0.39	0.65	0.59	0.50
c			0.42	0.41	0.46
d				0.72	0.54
e					0.54
Mid-age cohort (n = 10 751)					
a	0.345	0.52	0.38	0.35	0.43
b		0.37	0.64	0.59	0.45
c			0.43	0.42	0.51
d				0.71	0.49
e					0.48
Older cohort (n = 8 357)					
a	0.14	0.38	0.227	0.20	0.34
b		0.21	0.534	0.45	0.22
c			0.277	0.25	0.42
d				0.62	0.27
e					0.261

Furthermore, for the Older cohort the correlation between the sum of the negative items and the sum of the positive items was 0.34 suggesting they are not totally distinct constructs. For the Older cohort the correlation between mental health (and social support) and optimism, and mental health (and social support) and pessimism were of approximately the same magnitude but opposite directions. This further suggests that optimism and pessimism are polar opposites, not different constructs.

Loadings (un-rotated) on the first factor from the principal components solution for the Younger and Mid-age cohorts were moderate for all items (Younger:>0.5; Mid-age:>0.6; Table 4). For the Older cohort loadings on the first factor were moderate for all items (>0.5) and were greater than the loadings on the second factor (except for item a which had a slightly higher loading on second factor) (Table 5).

Table 4 Results of factor analysis of 6 LOT-R items

Factor	Eigenvalue	Difference	Proportion	Simulated Eigenvalue ^a		Average ^b
				Mean	95 th Percentile	Squared Correlation
Younger cohort (n = 9 368)						
1	3.33	2.42	0.56	1.04	1.05	0.06
2	0.91	0.33	0.15	1.02	1.03	0.12
3	0.58	0.09	0.10	1.01	1.01	0.24
4	0.49	0.08	0.08	0.99	1.00	0.55
5	0.42	0.15	0.07	0.98	0.99	1.00
6	0.27		0.05	0.97	0.98	
Mid-age Cohort (n = 10 751)						
1	3.38	2.47	0.56	1.03	1.04	0.07
2	0.91	0.37	0.15	1.02	1.02	0.11
3	0.54	0.08	0.09	1.00	1.01	0.25
4	0.46	0.05	0.08	1.00	1.00	0.56
5	0.41	0.13	0.07	0.98	0.99	1.00
6	0.29		0.05	0.97	0.98	
Older Cohort (n = 8 357)						
1	2.63	1.42	0.44	1.04	1.05	0.08
2	1.21	0.55	0.20	1.02	1.03	0.10
3	0.66	0.09	0.11	1.01	1.02	0.24
4	0.58	0.02	0.10	0.99	1.00	0.56
5	0.55	0.19	0.09	0.98	0.99	1.00
6	0.37		0.06	0.96	0.97	

^aParallel Analysis

^bVelicer's MAP test

Communalities for the one factor solution were adequate (greater than 0.5) except for items a (0.3) and c (0.45) in the Younger cohort and item a (0.4) in the Mid-age cohort. Only two of the six items (d and e) were adequate for the Older cohort.

Most of the ALSWH procedure's criteria were met for the 6 items to be regarded as one factor in the Younger and Older cohort data from Survey 2, and Mid-age cohort data from Survey 3.

Table 5 Factor loadings and commuality estimates from un-rotated factor analyses of 6 LOT-R items.

Item	Younger (n = 9 368)	Mid-age (n = 10 751)	Older (n = 8 357)	
	Factor 1	Factor 1	Factor 1	Factor 2
Factor loadings				
a	0.54	0.65	0.53	0.54
b	0.78	0.77	0.67	-0.43
c	0.67	0.71	0.61	0.49
d	0.84	0.83	0.78	-0.38
e	0.82	0.80	0.74	-0.38
f	0.77	0.74	0.61	0.45
Commuality Estimates				
a	0.30	0.42	0.28	
b	0.61	0.59	0.45	
c	0.45	0.50	0.38	
d	0.71	0.68	0.61	
e	0.68	0.64	0.55	
f	0.59	0.55	0.37	

Derived Variable

Scores and missing values

Summed scores were calculated as the sum of unweighted item scores for all 6 items ("LOT-R score"). Mean substitution for up to two missing values was allowed. The distribution of number of LOT-R items missing are shown in Table 6. Allowing mean-substitution for up to 2 missing items decreases the percentage of women missing a sum score by 2% for the Younger cohort, 2.5% for the Mid-age cohort and 5% for the Older cohort.

The mean-substitution for up to 2 missing items was probably not necessary for the Younger and Mid-age cohorts since the percentage missing one or more items was very low. However, for the Older cohort it was necessary to minimise missing scores and thus mean-substitution for up to 2 missing items was done for consistency.

A factor score was calculated as the total of the 6 item scores, weighted by the standardised scoring coefficients from the factor analysis for women with complete data for all 6 items (Table 7). Distributional properties of the sum and factor scores are shown in Table 8. All scores were approximately normally distributed.

Since the correlation between summed score and factor score was very high (0.99 all age-cohorts; Younger: n=9 368; Mid-age: n=10 751; Older: n=8 357) the summed score is recommended as a measure of optimism.

Table 6 Number and percent of LOT-R items missing

Number of items missing	Younger		Mid-age		Older	
	Number	Percent	Number	Percent	Number	Percent
0	9 368	97.6	10 751	96.0	8 357	88.0
1	164	1.7	248	2.2	406	4.3
2	17	0.2	37	0.3	111	1.2
3	5	0.1	19	0.2	89	0.9
4	2	0.0	12	0.1	128	1.4
5	8	0.1	40	0.4	286	3.0
6	36	0.4	89	0.8	124	1.3

Table 7 Standardised Scoring Coefficients from the 1-Factor Solution

LOT-R Item	Younger cohort	Mid-age cohort	Older cohort
a	0.163	0.191	0.201
b	0.234	0.226	0.255
c	0.202	0.209	0.233
d	0.253	0.244	0.297
e	0.247	0.237	0.281
f	0.230	0.219	0.231

Table 8 Younger cohort: Distributional properties of sum and factor scores for LOT-R

Score	Mean	(SD)	Median	Skewness	Range
Younger cohort					
Sum score	14.84	(4.22)	15	-0.35	0 - 24
Factor score	3.30	(0.95)	3.39	-0.36	0 - 5.32
Mid-age cohort					
Sum score	15.64	(3.96)	16	-0.45	0 - 24
Factor score	3.47	(0.88)	3.47	-0.45	0 - 5.31
Older cohort					
Sum score	15.61	(3.52)	16.61	-0.17	0 - 24
Factor score	3.91	(0.90)	3.91	-0.14	0 - 5.99

Recommendation for usage

The 6-item sum is referred to as the LOT-R score. Higher scores indicate a more optimistic outlook. The approximate normality of the LOT-R score suggests statistical use as a continuous variable is appropriate.

The SAS code deriving the LOT-R summed score is:

```
*****  
Create Optimism score (Based on revised life orientation test or LOT-R)  
6 questions, parts b, d and e are reversed.  
Must have at least 4 responses for score to be calculated  
  
/*mid-age cohort*/  
/*array items {6} m3q84a m3q84b m3q84c m3q84d m3q84e m3q84f;*/  
/*older cohort*/  
/*array items {6} o2q39a o2q39b o2q39c o2q39d o2q39e o2q39f;*/  
*****/;  
/*Young cohort*/  
array items {6} y2q69a y2q69b y2q69c y2q69d y2q69e y2q69f;  
array lotritem {6} lotr1 lotr2 lotr3 lotr4 lotr5 lotr6 ;  
/*rename and recode */  
do i = 1 to 6 ;  
lotritem{i} = items{i}-1 ;  
end ;  
/*reverse code negative items */  
lotr2n = 4-lotr2 ;  
lotr4n = 4-lotr4 ;  
lotr5n = 4-lotr5 ;  
sumlotr = sum(lotr1, lotr2n, lotr3, lotr4n, lotr5n, lotr6) ;  
meanlotr = mean(lotr1, lotr2n, lotr3, lotr4n, lotr5n, lotr6);  
misslotr = nmiss(lotr1, lotr2n, lotr3, lotr4n, lotr5n, lotr6) ;  
/* create sum score */  
if y2survey =1 and misslotr in (0,1,2) then  
lotr = sumlotr + (misslotr * meanlotr) ;  
else lotr = . ;
```

References

1. Scheier M, Carver C. Optimism, coping and health: assessment and implications of generalized outcome expectancies. *Health Psychology* 1985;4:219-247
2. Scheier M, Carver C, Bridges M. Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the life orientation test. *Journal of Personality and Social Psychology* 1994;67:1063-1078