Applicability of the Locus of Control of Behaviour scale for People with Dementia

Ingeborg Halse\textsuperscript{1,2,3}; Guro Hanevold Bjoerkløf\textsuperscript{1}; Knut Engedal\textsuperscript{1,2}; Anne Marie Mork Rokstad\textsuperscript{1,4}; Karin Persson\textsuperscript{1,2}; Rannveig Sakshaug Eldholm\textsuperscript{5,6}; Geir Selbæk\textsuperscript{1,2,3}; Maria Lage Barca\textsuperscript{1,2}

\textsuperscript{1} Norwegian National Advisory Unit on Ageing and Health, Vestfold Hospital Trust, Norway
\textsuperscript{2} Department of Geriatric Medicine, Oslo University Hospital-Ullevål, Oslo, Norway
\textsuperscript{3} Faculty of Medicine, University of Oslo, Oslo, Norway
\textsuperscript{4} Faculty of Health Sciences and Social Care, Molde University College, Molde, Norway
\textsuperscript{5} Department of Neuromedicine and Movement Science, Norwegian University of Science and Technology (NTNU), Trondheim, Norway.
\textsuperscript{6} Department of Geriatrics, St. Olavs Hospital, Trondheim, Norway.

**Corresponding author:** Ingeborg Halse, Norwegian National Advisory Unit on Ageing and Health, Postboks 2136, 3103 Tønsberg, Norway.

Telephone: (+47) 22117728 Fax number: (+47) 23016161

E-mail: ingeborg.halse@aldringoghelse.no

**Funding:** The project is funded by the Research Council of Norway (Grant numbers 222083/H10 and 2013058).

**Acknowledgements:** The authors would like to thank the many participating centers across Norway: 53 day-care centers, 19 in-home care units and 3 hospitals. We also thank those who assisted with data collection. And finally, we especially thank all the participants who volunteered their time to our study.
Disclosure statement: The authors report no conflict of interest.

Data availability: The data that support the findings in this manuscript are available from the corresponding author (IH), upon reasonable request.
Abstract

**Objective:** To investigate the applicability of the LoCB for people with dementia.

**Method:** A sample of 534 participants with dementia (78.4 mean age, 58% female) were included. Assessment included the LoCB, the Montgomery–Aasberg Depression Rating Scale (MADRS), the Mini-Mental Status Examination Norwegian revised (MMSE-NR) and the Instrumental Activities of Daily Living (I-ADL). Completion percentages and internal reliability of LoCB were examined for predefined MMSE-NR groups (0-4, 5-9, 10-14, 15-19, 20-24, 25-27, and 28-30). Factors associated with completion were analysed, and a Principal component analysis (PCA) of the LoCB was performed. Sum score and component subscale scores were compared to MADRS and MMSE-NR scores.

**Results:** In total, 234 participants completed the LoCB. Completion percentages ranged from 74% (MMSE-NR 28-30) to 0% (MMSE-NR 0-9). Internal reliability was between 0.80 and 0.72 in groups with MMSE-NR>9, except in MMSE-NR 20-24 (0.52). Age, MMSE-NR and education were associated with completion. The PCA yielded three components – powerful others, internal, and luck/fate – with explained variance of 41.3%. Participants with MADRS>7 scored higher on the LoCB sum score, powerful others and internal subscale scores. No difference was found regarding the luck/fate subscale score. MMSE-NR did not affect LoCB scores.

**Conclusion:** Older age, less education, and more cognitive impairment decreased the likelihood of completion. However, psychometric test results indicate that those who completed the LoCB understood the questions, even with severe cognitive impairment. We conclude, therefore, that the LoCB is applicable for investigating control orientation among people with dementia.
Keywords

Dementia, Depression, Locus of Control, Psychotherapeutic interventions
**Main text**

**Introduction**

Until a cure is discovered for dementia, helping people cope with their disease should be a major focus. One of the most common comorbid disorders to dementia is depression, with prevalence rates reported between 20% and 45% (Barca, Selbæk, Engedal, & Laks, 2009; Enache, Winblad, & Aarsland, 2011; Kitching, 2015). Locus of control (LoC), defined as the extent to which one expects events to be a consequence of one’s own behaviour as opposed to being controlled by outside forces (Rotter, 1966), has repeatedly been associated with depression (Benassi, Sweeney, Dufour, & Fowles, 1988; Bjørkløf, Engedal, Selbæk, Kouwenhoven, & Helvik, 2013). Furthermore, recent research has shown that an external LoC is also significantly related to depression among older persons (Bjørkløf et al., 2015). However, little research has been done on LoC orientation among people with dementia (Bjørkløf et al., 2013), and it is important not to take for granted that we know how psychological constructs underlying depression should be understood in this population.

If a biopsychosocial understanding of depression is assumed (Fiske, Wetherell, & Gatz, 2009), psychotherapeutic interventions can help those affected by dementia and depression, and we can reduce the need for psychotropic medication in this vulnerable patient group. Until now, psychotherapeutic interventions have been unusual, but this appears to be changing (Areán et al., 2010; Kiosses et al., 2015; Kurz et al., 2012). A systematic review and meta-analysis of psychological treatments for depression and anxiety for people with dementia indicate that cognitive behavioural therapy, interpersonal therapy, counselling and multimodal interventions are all effective treatments (Orgeta, Qazi, Spector, & Orrell, 2015). Investigations into which psychological constructs play a part in the development,
maintenance, and recovery from depression among people with dementia is, therefore, an
important supplement to this developing field and should guide therapeutic interventions.

In the present study, we investigated the applicability of the Norwegian version of the *Locus
of Control of Behaviour* scale (LoCB) (Craig, Franklin, & Andrews, 1984) for people with
dementia. This was done by examining how many participants with different degrees of
cognitive deficit completed the full scale, the internal reliability of the responses, and what
factors appeared to explain the likelihood of completion. Furthermore, we examined the
component structure of the LoCB, and whether LoCB scores differed according to the degree
of depression symptomatology and the degree of cognitive impairment.

**Method**

**Participants**

Participant data came from two projects: 273 from the follow-up part of the project
“Prognosis of Alzheimer’s Disease and Resource Use” (PADR), which included patients
referred to two memory clinics and one geriatric outpatient unit in Norway (Barca et al.,
2017), and 261 from “Effects and Costs of a Day Care Centre Program Designed for People
with Dementia” (ECOD), a study carried out in primary healthcare (Rokstad et al., 2014).
Details regarding inclusion and exclusion criteria can be found in the previously published
papers (Barca et al., 2017; Rokstad et al., 2014). In both projects, all measures were
interviewer administered, and the dementia diagnosis was independently confirmed by two
experienced physicians after a comprehensive clinical assessment. The vast majority, 81.1%,
were diagnosed with Alzheimer’s dementia (AD), and 8.1% with vascular dementia (VaD).
The remaining 1.9% had combined AD/VaD, Lewy body dementia, Parkinson’s disease with
dementia, frontal lobe dementia or another dementia. Of a total of 534 participants, 234 had complete data on the LoCB (77.3 mean age, 53.4% female) and 300 had between one and 17 missing-item responses on the LoCB (79.3 mean age, 62% female).

**Ethical consideration**

The project has been accepted by the Regional Committee in Ethics in Medical Research in South-East Norway; REK South-East case numbers 2013/1020 and 2011/531.

**Patient consent**

After written and oral information about the project, the participants were asked to give written informed consent. Only participants with the capacity to give consent were included.

**Assessments**

The LoCB contains 17 questions with a six-point Likert-type scale ranging from zero to five for each question. The score on items 1, 5, 7, 8, 13, 15 and 16 are inverted, and the total sum score indicates the degree of externality. Scores vary from zero to 85, with higher scores indicating an external LoC orientation (Craig et al., 1984). The scale has been translated into Norwegian and back-translated (Nordtug, Krokstad, & Holen, 2011). The Norwegian version has been applied in several studies in Norway (Bjørkløf et al., 2015; Bruvik, Ulstein, Ranhoff, & Engedal, 2013; Dyb, Holen, Steinberg, Rodriguez, & Pynoos, 2003; Helvik et al., 2016).

The revised Norwegian version of the Mini-Mental Status Examination (MMSE-NR) was used to measure global cognitive function. The scale is a well-established screening tool for cognitive impairment, with 20 items measuring a wide range of cognitive functions. Scores vary from zero to 30, with higher scores indicating better cognitive function (Strobel & Engedal, 2008).
The Montgomery–Åsberg Depression Rating scale (MADRS) was used to measure depressive symptoms. The scale measures symptoms present during the past week and consists of ten items. Sum scores vary from zero to 60, with higher scores indicating more severe symptomatology (Montgomery & Asberg, 1979). The Norwegian version of the MADRS has been validated for use among people with dementia, and the best cut-off indicating depression was found at >7 (Knapskog, Barca, & Engedal, 2011), in contrast to a cut-off of 14 among old people without dementia (Engedal et al., 2012).

The Instrumental Activities of Daily Living (I-ADL) was used to measure the ability to perform the activities of daily life. The I-ADL has eight items with a possible sum score between eight and 31. A higher score indicates poorer independent functioning (Lawton & Brody, 1969).

**Statistical analysis**

The data were analysed using the Statistical Package for the Social Sciences (SPSS), version 21.0. Comparisons between groups with complete and incomplete LoCBs were made using the independent sample t-test and the Mann–Whitney U test/Kruskal–Wallis test for normally distributed and skewed continuous data, respectively. Age and LoCB sum scores were found to be normally distributed by examining the histogram, Q-Q, and box-plot of each variable. A chi-square test was used for categorical data. A p-value of <0.05 was used as the significance level throughout.

First, applicability of the LoCB for people with dementia was evaluated by examining the proportion of complete responses within the following seven MMSE-NR groups: 0-4, 5-9, 10-
The internal reliability of the LoCB in the seven groups was then examined using Cronbach’s α. Second, after dividing participants into “completers” versus “non-completers”, both unadjusted and adjusted logistic regression models were set up to examine factors associated with completion of the LoCB. Variables with p<0.2 in the unadjusted analysis were included in the adjusted analysis.

Third, a principal component analysis (PCA) on complete data sets was performed. Results from the Kaiser-Meyer-Olkin measure of sampling adequacy, Bartlett’s test of sphericity, and the sample sizes indicated the group was large enough and appropriate for a PCA. The procedure was as follows: first, an unforced PCA using varimax rotation was performed, followed by gradually enforcing fewer components until reaching only one. Loadings greater than or equal to 0.4 were judged to be significant. The process was repeated using oblimin rotation. The number of components best fitting the data was determined by evaluating the criterion of eigenvalues ≥1, examining the scree plot and performing a Monte Carlo PCA for parallel analysis. Finally, LoCB sum scores and the sum scores of the LoCB subscales (as found through the PCA component analysis) were examined in relation to depressive symptomatology and the degree of cognitive impairment.

Results

Participants’ demographic and clinical characteristics

The characteristics of participants with complete and incomplete responses on the LoCB are presented in Table 1. Those in the group with complete responses were younger, had a higher level of education, had a better cognitive function, and a better function in the activities of daily living compared to the non-completers. No significant differences were found between the groups regarding gender, marital status or level of depressive symptomatology.
Completion percentages

As seen in Table 2, the completion percentage decreased with decreasing cognitive function, from 74% (MMSE-NR 28-30) to 0% (MMSE-NR 0-9). Cronbach’s α in the different MMSE-NR groups ranged from 0.80 to 0.52.

Logistic regression analysis

The unadjusted logistic regression analyses indicated there was no association between completion probability and severity of the depressive symptomatology (score on MADRS) (p=0.44) or marital status (p=0.51). In the adjusted analysis, age, education, and cognitive function (MMSE-NR) were significantly associated with LoCB completion. No interaction effect was found between MMSE-NR and age or between MMSE-NR and education.

Principal Component Analysis

The PCA with three components enforced, using both the varimax and oblimin rotation methods, reached the best results. The component correlation matrix from the oblimin PCA revealed low correlations between the variables, indicating that the components were not related and thus showing that the varimax rotation procedure best fit the data, as shown in Table 4. The three components were labelled ‘powerful others’, ‘luck/fate’, and ‘internal’, and explained 41.3% of the variance. The Cronbach’s α of the full scale was 0.69. The powerful others, internal, and luck/fate subscale scores had a Cronbach’s α of 0.47, 0.67, and 0.65, respectively (Table 4).

LoCB scores in relation to level of depressive symptomatology and to level of cognitive impairment
Table 5 shows that participants with MADRS >7 had higher scores on the total LoCB sum and on the internal and powerful others subscales compared to those with MADRS \( \leq 7 \), but no difference on the luck/fate subscale. No significant differences were found on the LoCB sum or subscales when comparing participants with different MMSE-NR scores (data not shown).

Discussion

The aim of the present study was to examine the applicability of the LoCB for people with dementia. Among participants with an MMSE-NR sum score \( \geq 20 \), more than half completed the LoCB, but no participants with MMSE-NR \( \leq 9 \) managed to complete the scale. Better cognitive functioning, younger age and a higher level of education increased the likelihood of completion. The internal consistency was good, with a high Cronbach’s \( \alpha \) even among those with severe cognitive deficits, and the PCA revealed component structures similar to populations without cognitive deficits.

Ideally, however, we would have wanted an even higher completion rate to ascertain the applicability of the scale for this population. To explore potential reasons for completion of the LoCB, we performed a logistic regression analysis. Lower age, better cognitive functioning and higher education increased the likelihood of completion. Being younger may also mean having more stamina, and less cognitive deficit increases the ability to think in abstract ways. However, MMSE-NR only gives an indication of cognitive deficits regarding the items in that specific test and does not give a complete picture of what the individual person with dementia might struggle with. Higher education is known to postpone cognitive deficits, for example, due to an increased cognitive reserve (Stern, 2012). Highly educated
people may also be more accustomed to the type of setting that the interview was performed in, which can resemble an exam or a cognitively demanding meeting.

Although cognitive functioning, age, and education were indicative of higher completion probability, other non-measurable factors may have been influential as well. For instance, in both the ECOD and PADR studies, the LoCB was only one scale among a large test battery that the participants performed. Therefore, low completion rates could also be due to fatigue. Additionally, the uncommon and complicated wording may have been detrimental to comprehension. In general, people with cognitive deficits benefit from concise wording, whereas the items in the LoCB are phrased in a general and sometimes abstract way. Indeed, other studies have reported eliminating items from the scale, in order to increase comprehension and internal reliability (Bright, Kane, Marsh, & Bishop, 2013; Nordtug et al., 2011). Both studies, one with the English version and one with the Norwegian, included cognitively healthy participants, indicating that understanding the meaning of the LoCB items could be problematic in general. Adding a cognitive disability, therefore, seems likely to reduce the comprehension and thereby potentially the completion probability as well.

However, those who did complete the full scale gave valid answers despite sometimes difficult wording. The internal reliability analysis of the whole scale showed a Cronbach’s α of 0.69. This relatively high internal reliability result remained even among those with MMSE-NR scores below 20. In the group with MMSE-NR 10-14 – although applying to only three participants – the Cronbach’s α was 0.80. These findings alone should guide researchers and practitioners to remember that a dementia diagnosis is not equal to reduced ability to comprehend complex questions and state valid opinions, as also argued by Wogn-Henriksen (2012). In her qualitative study on how the person with dementia experience the disease,
Wogn-Henriksen (2012) found they showed considerable insight and ability to understand and communicate their experiences. It is thus valuable to try to elicit more knowledge on coping mechanisms in this population, using for example the LoCB. Interestingly, in the group with MMSE-NR 25-27, the Cronbach’s α was 0.52, but statistical analysis did not reveal reasons for this discrepancy.

In addition to examining indicators for completion and completion rates, a PCA was undertaken to compare the LoCB component structure in a population with dementia with populations without cognitive deficits. The LoCB was found to be multidimensional, with an internal, powerful others, and luck/fate control orientation. Although this is in contrast to findings by its developers (Craig et al., 1984), the defragmentation of the external LoCB is consistent with both empirical and theoretical findings argued by others (Bright et al., 2013; Furnham & Steele, 1993; Johansson et al., 2001; Levenson, 1973; Wallston, Wallston, & DeVellis, 1978). Distinguishing between an external LoC based on powerful others versus luck/fate is valuable, since believing the world to be unordered may lead to chaotic or passive behaviour, whilst those believing in powerful others may still manage to effectively produce wanted outcomes. The distinction is both meaningful and important when trying to understand how people act.

Finally, we examined if LoCB scores were associated with depressive symptoms or the degree of cognitive impairment. No differences were found regarding the latter, indicating that the degree of impairment does not alter one’s LoC orientation. More depressive symptoms, however, were associated with a higher LoCB sum score, and internal and powerful others subscale scores. This resonates with prior research on depressed older people in Norway, where depression was associated with a higher LoCB sum score (Bjørkløf et al.,
This finding further strengthens the notion that the participants in our study who completed the LoCB understood its complex questions, thereby strengthening the applicability of the LoCB for people with dementia.

The present study has some limitations. The data came from two projects, posing the potential risk of different data collection methods and contextual conditions. The Norwegian version of the LoCB has not been validated, and we therefore only have a small number of comparable results making interpretations difficult. On the other hand, the study is strengthened by the inclusion of participants with dementia from a variety of healthcare services, such as specialist and primary healthcare institutions, minimizing the risk of subgroup effects. The dementia diagnosis was made by experienced physicians, and well-established and validated scales have been used for evaluating cognition and depression. Finally, a major strength regarding the LoCB analyses is the sole use of data sets with complete responses. All 17 items of the original scale were analysed, and no missing items were imputed.

Conclusion

Persons with dementia who completed the LoCB scale gave valid answers, and the LoCB sum scores increased with depressive symptoms, as previously shown in populations without dementia. Though older age, more severe cognitive impairment, and a lower level of education increase the risk of non-completion, we argue that the scale is applicable for use among people with dementia and has the potential to help us better understand control orientation in this population. This is valuable information for effectively preventing and treating depression among people with dementia.
References


related quality of life in older adults with and without depression? *Archives of Gerontology and Geriatrics*, 64, 130-137. doi:10.1016/j.archger.2016.01.014


universitet, Fakultet for samfunnsvitenskap og teknologiledelse, Psykologisk institutt, Trondheim.
Table 1. Demographic and clinical characteristics in groups with and without complete LoCBs.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>All (n=534)</th>
<th>Complete LoCB (n=234)</th>
<th>Incomplete LoCB (n=300)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (sd) (n=534)</td>
<td>78.43 (8.1)</td>
<td>77.3 (SD 8.2)</td>
<td>79.3 (7.8)</td>
<td>0.003¹</td>
</tr>
<tr>
<td>Female, n (%) (n=534)</td>
<td>311 (58.2)</td>
<td>125 (53.4)</td>
<td>186 (62.0)</td>
<td>0.057²</td>
</tr>
<tr>
<td>Education, &lt;10yrs, n (%) (n=524)</td>
<td>263 (50.2)</td>
<td>91 (39.7)</td>
<td>172 (58.3)</td>
<td>&lt;0.001²</td>
</tr>
<tr>
<td>Unmarried, n (%) (n=531)</td>
<td>242 (45.6)</td>
<td>102 (44.0)</td>
<td>140 (46.8)</td>
<td>0.570²</td>
</tr>
<tr>
<td>LoCB, mean (sd) (n=234)</td>
<td>N A</td>
<td>30.8 (10.5)</td>
<td>N A</td>
<td></td>
</tr>
<tr>
<td>MMSE-NR, mean (sd) (n=520)</td>
<td>19.8 (5.6)</td>
<td>22.2 (3.7)</td>
<td>17.9 (6.2)</td>
<td>&lt;0.001³</td>
</tr>
<tr>
<td>MADRS, mean (sd) (n=483)</td>
<td>4.6 (5.1)</td>
<td>4.8 (5.4)</td>
<td>4.5 (4.8)</td>
<td>0.672³</td>
</tr>
<tr>
<td>ADL, mean (sd) (n=417)</td>
<td>21.0 (6.5)</td>
<td>19.4 (6.2)</td>
<td>22.2 (6.4)</td>
<td>&lt;0.001³</td>
</tr>
</tbody>
</table>

¹ Independent sample t-test   ² Chi-square test for independence ³ Mann–Whitney test

(LoCB: Locus of Control of Behaviour scale; MADRS: Montgomery–Aasberg Depression Rating scale; MMSE-NR: Mini-Mental Status Examination-Norwegian Revised; I-ADL: Instrumental-Activities of Daily Living scale)
Table 2: Completion percentages and internal reliability of LoCB in relation to MMSE-NR score.

<table>
<thead>
<tr>
<th>MMSE-NR</th>
<th>Complete LoCB</th>
<th>Total</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>0</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>5-9</td>
<td>0</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>10-14</td>
<td>14% (3)</td>
<td>21</td>
<td>0.80</td>
</tr>
<tr>
<td>15-19</td>
<td>34% (63)</td>
<td>185</td>
<td>0.73</td>
</tr>
<tr>
<td>20-24</td>
<td>55% (101)</td>
<td>185</td>
<td>0.72</td>
</tr>
<tr>
<td>25-27</td>
<td>63% (50)</td>
<td>79</td>
<td>0.52</td>
</tr>
<tr>
<td>28-30</td>
<td>74% (17)</td>
<td>23</td>
<td>0.72</td>
</tr>
<tr>
<td>Total</td>
<td>234</td>
<td>534</td>
<td>0.69</td>
</tr>
</tbody>
</table>
Table 3: Logistic regression predicting likelihood of LoCB completion.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unadjusted</th>
<th>Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR 95% C.I.</td>
<td>P-value</td>
</tr>
<tr>
<td>Gender</td>
<td>1.42 1.00-2.01</td>
<td>0.046</td>
</tr>
<tr>
<td>Age</td>
<td>0.97 0.97-0.99</td>
<td>0.003</td>
</tr>
<tr>
<td>Education</td>
<td>2.12 1.49-3.01</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Married</td>
<td>1.12 0.80-1.58</td>
<td>0.512</td>
</tr>
<tr>
<td>MADRS</td>
<td>1.01 0.98-1.05</td>
<td>0.444</td>
</tr>
<tr>
<td>MMSE-NR</td>
<td>1.22 1.16-1.27</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>I-ADL</td>
<td>0.93 0.91-0.96</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

(LoCB: Locus of Control of Behaviour scale; MADRS: Montgomery–Aasberg Depression Rating scale; MMSE-NR: Mini-Mental Status Examination-Norwegian Revised; I-ADL: Instrumental-Activities of Daily Living scale)
**Table 4.** Principal component analysis of the LoCB.

<table>
<thead>
<tr>
<th>Component</th>
<th>Powerful others</th>
<th>Internal</th>
<th>Luck/Fate</th>
</tr>
</thead>
<tbody>
<tr>
<td>12: When I am under stress, the tightness in my muscles is due to things outside my control.</td>
<td>0.635</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15: I understand why my problem(s) varies so much from one occasion to the next.</td>
<td></td>
<td>-0.593</td>
<td></td>
</tr>
<tr>
<td>6: My problem(s) will dominate me all my life.</td>
<td></td>
<td>0.585</td>
<td></td>
</tr>
<tr>
<td>11: To continually manage my problems I need professional help.</td>
<td></td>
<td>0.517</td>
<td></td>
</tr>
<tr>
<td>14: It is impossible to control my irregular breathing when I am having difficulties.</td>
<td></td>
<td>0.506</td>
<td></td>
</tr>
<tr>
<td>10: People are victims of circumstances beyond their control.</td>
<td>0.505</td>
<td></td>
<td>0.428</td>
</tr>
<tr>
<td>4: I can control my problem(s) only if I have outside support.</td>
<td></td>
<td>0.413</td>
<td></td>
</tr>
<tr>
<td>13: I believe a person can really be the master of his fate.</td>
<td></td>
<td></td>
<td>0.742</td>
</tr>
<tr>
<td>8: Becoming a success is a matter of hard work, luck has little or nothing to do with it.</td>
<td></td>
<td></td>
<td>0.649</td>
</tr>
<tr>
<td>16: I am confident of being able to deal successfully with future problems.</td>
<td></td>
<td></td>
<td>0.593</td>
</tr>
<tr>
<td>5: When I make plans, I am almost certain that I can make them work.</td>
<td></td>
<td>0.575</td>
<td></td>
</tr>
<tr>
<td>7: My mistakes and problems are my responsibility to deal with.</td>
<td></td>
<td>0.517</td>
<td></td>
</tr>
<tr>
<td>1: I can anticipate difficulties and take action to avoid them.</td>
<td></td>
<td>0.439</td>
<td></td>
</tr>
<tr>
<td>3: Everyone knows that luck or chance determines one’s future.</td>
<td></td>
<td></td>
<td>0.817</td>
</tr>
<tr>
<td>17: In my case maintaining control over my problem(s) is due mostly to luck.</td>
<td></td>
<td></td>
<td>0.728</td>
</tr>
<tr>
<td>2: A great deal of what happens to me is probably just a matter of chance.</td>
<td></td>
<td></td>
<td>0.579</td>
</tr>
<tr>
<td>9: My life is controlled by outside actions and events.</td>
<td></td>
<td></td>
<td>0.528</td>
</tr>
</tbody>
</table>

Eigenvalue: 3.3 2.2 1.5
Explained variance: 19.3 13.0 9.0
Cronbach’s α: 0.47 0.67 0.65

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.\(^a\)

\(^a\) Rotation converged in 5 iterations.
Table 5: LoCB sum and subscale scores according to presence of depression.

<table>
<thead>
<tr>
<th>LoCB</th>
<th>Complete LoCB (n=234)</th>
<th>MADRS</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤7 Mean (SD)</td>
<td>&gt;7 Mean (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum&lt;sup&gt;1&lt;/sup&gt;</td>
<td>28.0</td>
<td>38.5</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Powerful others&lt;sup&gt;1&lt;/sup&gt;</td>
<td>12.0</td>
<td>18.0</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Internal&lt;sup&gt;1&lt;/sup&gt;</td>
<td>7.0</td>
<td>11.0</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Luck/Fate&lt;sup&gt;1&lt;/sup&gt;</td>
<td>8.0</td>
<td>9.0</td>
<td>0.138</td>
<td></td>
</tr>
</tbody>
</table>

<sup>1</sup> Mann–Whitney test

(LoCB: Locus of Control of Behaviour scale; MADRS: Montgomery–Aasberg Depression Rating scale)