Cross-cultural validation of the Motivation to Change Lifestyle and Health Behaviours for Dementia Risk Reduction scale in the Dutch general population

Tessa Joxhorst
Universitair Medisch Centrum Groningen

Joyce Vrijsen (j.vrijsen@umcg.nl)
Universitair Medisch Centrum Groningen https://orcid.org/0000-0003-1506-2266

Jacobien Niebuur
Universitair Medisch Centrum Groningen

Nynke Smidt
Universitair Medisch Centrum Groningen

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Abstract

BACKGROUND: This study aims to translate and validate the Motivation to Change Lifestyle and Health Behaviours for Dementia Risk Reduction (MCLHB-DRR) scale in the Dutch general population.

METHODS: A random sample of Dutch residents aged between 30 and 80 years old were invited to complete an online questionnaire including the translated MCLHB-DRR scale. Exploratory and confirmatory factor analyses (EFA and CFA) were conducted to assess construct validity. Cronbach's alpha was calculated to assess internal consistency.

RESULTS: 618 participants completed the questionnaire. EFA and Cronbach's alpha showed that four items were candidate for deletion. CFA confirmed that deleting these items led to an excellent fit (RMSEA = 0.043, CFI = 0.960, TLI = 0.951, χ^2/df = 2.130). Cronbach's alpha ranged from 0.69 to 0.93, indicating good internal consistency.

CONCLUSION: The Dutch MCLHB-DRR scale demonstrated to have good validity to assess the health beliefs and attitudes towards dementia risk reduction.

Background

Dementia is a major public health concern for society. The prevalence of dementia increases rapidly, from 47 million cases worldwide in 2015 to an estimated 131 million cases in 2050 (1). The increasing number of dementia patients carries a high socioeconomic burden for society because of the associated rising health care costs and the burdensome effects of the disease on patients, their families and caregivers (2). The World Health Organization highlights dementia as a public health priority and advocates for action to decrease its social and economic burden (3).

The increase in the number of dementia patients is mainly attributable to population ageing, since age is the most important risk factor for dementia (1,4). In addition to non-modifiable risk factors for dementia like age and genetics, several studies suggested potential modifiable risk factors that are associated with dementia and in particular AD and vascular dementia (5–8). Recently, the evidence for these potential modifiable risk factors for dementia was summarized by Livingston et al. (2017) (8). They found that 35% of all dementia cases worldwide are attributable to nine modifiable risk factors and recommended to start interventions including more childhood education, promotion of exercise, reduction of smoking, maintaining social engagement and management of hypertension, diabetes, obesity, depression and hearing loss. It is estimated that these interventions might delay or prevent a third of all dementia cases (8).

Currently, there is no cure for dementia, so prevention of dementia is the key in fighting this disease. A diversity of multi-domain lifestyle interventions is conducted in elderly and people at risk for dementia in order to decrease the risk of developing dementia, including the FINGER study, MAPT study, preDIVA study and HATICE trial (9–12). The aforementioned studies showed some evidence for effectiveness of a

multi-domain approach to prevent elderly from cognitive decline, but further research is needed (13–15). Although behavioural change is crucial for dementia risk reduction, changing behaviour is complex and many factors are related to the chances for successfully altering behaviour according to different social cognitive theories and models (16–20). Measuring beliefs and attitudes towards lifestyle adaptations for dementia risk reduction may help to predict a person's willingness to change lifestyle and behaviour aiming to reduce one's risk of developing dementia.

The Motivation to Change Lifestyle and Health Behaviours for Dementia Risk Reduction (MCLHB-DRR) scale is developed in Australia and measures the beliefs and attitudes towards dementia and dementia risk reduction (21). The MCLHB-DRR scale was based on the Health Belief Model (HBM), since the HBM turned out to be the best-suited social cognitive model for dementia risk reduction (21). The HBM suggests that engagement in health-promoting behaviour is defined by a person's subjective risk assessment of getting a condition and how serious this condition and its consequences are, the perceived benefits and barriers of performing this behaviour, a stimulus to trigger this behaviour, the desire to achieve an outcome, and the confidence in one's ability to take action (22). The MCLHB-DRR scale consists of 27 items and includes all seven subscales of the HBM: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, general health motivation and self-efficacy. The MCLHB-DRR scale is considered to be valid and reliable in Australians aged 50 years and older (21). To our knowledge, the MCLHB-DRR scale has not yet been cross-culturally validated in any other language since its development in Australia.

There is currently no instrument available to measure attitudes and beliefs towards lifestyle and health behavioural changes for dementia risk reduction in the Netherlands. The MCLHB-DRR scale could be used to measure the attitudes and beliefs towards lifestyle adaptations for dementia risk reduction in the Dutch population. This induces the opportunity to use this scale in developing tailored interventions or education programs focused on lifestyle adjustments for dementia risk reduction. Therefore, the aim of the current study is to translate and validate the MCLHB-DRR scale in the Dutch general population aged between 30 and 80 years old.

Methods

Study design and participants

MCLHB-DRR data were collected among a random sample of residents of the municipality of Groningen aged between 30 and 80 years old. From the 101,518 residents of the municipality of Groningen, 4,500 residents stratified for age (30–39, 40–49, 50–59, 60–69 and 70–80 years old) and gender (male, female) were randomly selected by a staff member of the municipality of Groningen. This staff member was not involved in the data collection nor data analyses of this study. The selected 4,500 residents were invited by mail to participate in an online survey about 'Lifestyle and dementia'. The translated MCLHB-DRR scale was the last part of this survey. The survey was built in Survey Monkey (SurveyMonkey Inc., San Mateo, California, VS, www.surveymonkey.com). In order to increase the response rate, participants

were able to win a voucher of 20 Euros. Furthermore, participants were offered to receive the survey results on population level if they would finish the complete survey.

A pilot study was conducted to test the final version of the online survey ‘Lifestyle and dementia’. A total of 25 people aged 30 to 80 years who were living outside the municipality of Groningen participated in the pilot study. They were recruited within the network of the research team members. Results of the pilot study did not lead to any changes in the final Dutch version of the MCLHB-DRR scale.

Questionnaire

The MCLHB-DRR scale is a self-reported questionnaire aiming to measure the attitudes and beliefs towards dementia and dementia risk reduction (21). The MCLHB-DRR scale consists of 27 items covering seven subscales: perceived susceptibility (4 items), perceived severity (5 items), perceived benefits (4 items), perceived barriers (4 items), cues to action (4 items), general health motivation (4 items) and self-efficacy (2 items). Items are answered on a 5 point Likert-scale, ranging from ‘strongly disagree’ (score = 1) to ‘strongly agree’ (score = 5) (21).

Scale translation

For the translation of the MCLHB-DRR scale, we used the method of Beaton et al. (2000) (23). Briefly, the MCLHB-DRR scale was translated into Dutch by three native Dutch translators, independently. Two of these translators were familiar with the concepts being examined in the questionnaire (the so-called informed translators). The third translator was not familiar with the content or concepts of the questionnaire (uninformed translator). All items, instructions and the response options of the questionnaire were translated.

Subsequently, the three translated versions were synthesized to one Dutch version by the informed translators. The discrepancies between the three translated versions were discussed between the informed translators, taking the original questionnaire into account.

Secondly, the synthesized Dutch version of the questionnaire was translated back into English by two independent native English speakers (uninformed translators). Both translators were not involved in the translation of the questionnaire from English to Dutch and were blinded to the original version of the questionnaire.

Afterwards all versions of the questionnaire, including the original version, the three translated versions, the synthesized Dutch version, the two back translations and all written reports about the decisions being made during the translation process were discussed by the informed translators. Special attention was paid to achieve semantic, idiomatic, experiential and conceptual equivalence between the source and target version of the questionnaire. After a comprehensive review of all versions of the questionnaire, consensus about the pre-final version of the questionnaire was reached.

Finally, the two back translations were combined in the best possible way and this version was send to the developers of the original scale (21) to check whether the meaning of the translated items was equivalent to the meaning of the original items. Their feedback was discussed, resulting in a small change in the translation of item 20 and item 25. Afterwards, the Dutch final version of the MCLHB-DRR scale was established.

Statistical analysis

First, study population characteristics and characteristics of the MCLHB-DRR scale were calculated using descriptive statistics. Second, exploratory factor analysis (EFA) was performed. Maximum Likelihood estimation or Principal Axis Factoring was used depending on whether the data was roughly normally distributed or non-normally distributed, respectively. Oblique rotation was used as rotation method (delta (0)), which is taking into account correlations among factors. If the correlations between all factors were below 0.32, we changed to Varimax rotation (24). Items that did not have a correlation of 0.20 or higher with any of the other items were deleted immediately. Items with a high correlation (> 0.70) with any of the other items, were considered carefully. Items with a factor loading below 0.30 on any of the factors were deleted immediately. Deletion of an item was considered if the item did not load sufficiently on one of the factors (< 0.50) or if an item had a cross-loading greater than 0.30 (25).

Internal consistency of the subscales was evaluated by item-total correlations and Cronbach's alpha. Deletion of an item was considered when the item-total correlation of an item was below 0.30 (25). Cronbach's alpha values of 0.70 or higher were considered acceptable (26).

In addition, confirmatory factor analysis (CFA) was conducted. The following fit indices and their required levels were used to verify construct validity of the MCLHB-DRR scale: Root Mean Squared Error of Approximation (RMSEA) < 0.08 (moderate) and < 0.05 (excellent), Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) > 0.90 (moderate) and > 0.95 (excellent) and $\chi^2/df < 3.0$ (27,28).

EFA was performed using IBM SPSS Statistics software version 23 (SPSS Inc., Chicago, IL, USA). CFA was analysed using Stata version 13 (StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP.). Participants who did not complete the whole MCLHB-DRR scale were excluded from data analysis.

Ethics

The Medical Ethics Review Board of the UMCG concluded that this study was not subject to the Medical Research Involving Human Subjects Act. Respondents participated in this study voluntary. They could withdraw at any time without any consequence or penalty. Data were collected and analysed anonymously. All participants provided informed consent.

Results

Participant recruitment

From the 4,500 selected potential participants, 621 participants completed the survey. The data of the ‘cues to action’ subscale of three participants were missing. These participants were excluded, leaving a total of 618 participants for data analysis.

Characteristics of the study population

The characteristics of the study population (n = 618) are presented in Table 1. The mean age of the participants was 57.3 ± 13.5 years and more than half of the participants were female (54%) and were married or had a registered partnership (54%). Most participants completed tertiary education (59%), followed by upper secondary education (24%), lower secondary education (14%) and elementary education (2%). About 58% of the participants were currently working. The percentages of participants knowing a relative with dementia or a non-relative with dementia were 45% and 21%, respectively.

Analysis of the psychometric characteristics of the MCLHB-DRR scale

Scale descriptives

The average MCLHB-DRR total scale score was 75.1 ± 11.1 (SD), ranging from 30 to 115. The total scale score was approximately normally distributed, although the scores were moderately leptokurtic (skewness = -0.394, kurtosis = 0.994). The mean subscale scores were 10.1 ± 2.7 (range = 4 to 18) for perceived susceptibility, 13.9 ± 3.7 (range = 5 to 25) for perceived severity, 12.6 ± 2.9 (range = 4 to 20) for perceived benefits, 8.0 ± 2.5 (range = 4 to 15) for perceived barriers, 10.2 ± 3.1 (range = 4 to 19) for cues to action, 14.5 ± 2.3 (range = 4 to 20) for general health motivation and 5.8 ± 1.7 (range = 2 to 10) for self-efficacy. All subscale scores were approximately normally distributed. Item response scores of the MCLHB-DRR scale ranged from 1.9 ± 0.8 (item 15) to 4.1 ± 0.7 (item 24).

Exploratory factor analysis

EFA analysis with extraction method Maximum Likelihood and Oblimin rotation was used to assess the number of factors, because the data were roughly normally distributed. First, a seven factor solution was evaluated as the original MCLHB-DRR scale consists of seven subscales. All items had an inter-item correlation greater than 0.20 with at least one of the other items. The correlation between item 1 and item 2 was 0.86 ($p < 0.001$), the correlation between item 1 and item 3 was 0.77 ($p < 0.001$) and the correlation between item 2 and item 3 was 0.82 ($p < 0.001$). Although these items had high inter-item correlations, they still measured something else ($r < 0.90$) and loaded on their intended factors. Therefore, none of these items was deleted. All other inter-item correlations did not exceed 0.70. The Bartlett’s test of sphericity was significant, indicating that the data was adequate for factor analysis ($p < 0.001$). The first seven factors had eigenvalues greater than 1.00. The eigenvalues and the cumulative percentages of explained variance of the first seven factors in brackets were 5.86 (21.7%), 2.94 (32.6%), 2.52 (41.9%), 2.10 (49.7%), 1.56 (55.5%), 1.23 (60.0%) and 1.03 (63.9%), respectively. The scree plot also suggested a seven factor model.

Almost all items loaded on their intended subscales and did not have any significant cross-loadings. However, item 10 did not have a factor loading greater than 0.30 on any of the factors. Therefore, item 10 was deleted. Item 26 had a significant cross-loading (cross-loading = 0.37) on the perceived benefits subscale. Furthermore, items 4, 5, 7, 9, 13, 25 and 26 had factor loadings between 0.30 and 0.50 on their intended factors (Table 2). Inclusion of these items was assessed in the next step by evaluating the internal consistency of their subscale. The inter-scale correlations between the subscale factors ranged from -0.13 to 0.51.

Internal consistency

Item-total correlation analysis showed that all items were positively correlated with the total MCLHB-DRR scale score. Item-total correlations ranged from 0.15 to 0.67. The item-total correlations of item 14 ($r = 0.28$), item 22 ($r = 0.15$), item 23 ($r = 0.26$) and item 24 ($r_s = 0.19$) were lower than 0.30. All other items had an item-total correlation above 0.30. Cronbach's alpha values were $\alpha = 0.86$ for perceived susceptibility, $\alpha = 0.76$ for perceived severity, $\alpha = 0.76$ for perceived benefits, $\alpha = 0.77$ for perceived barriers, $\alpha = 0.84$ for cues to action, $\alpha = 0.64$ for general health motivation and $\alpha = 0.81$ for self-efficacy, all indicating good internal consistency. Cronbach's alpha of the perceived susceptibility, perceived benefits and general health motivation subscales could be elevated by deleting an item. Items 4, 13 and 25 already had low factor loadings (factor loadings < 0.50) and were therefore eliminated. After deletion of these items, Cronbach's alpha values were $\alpha = 0.93$ for perceived susceptibility, $\alpha = 0.80$ for perceived benefits and $\alpha = 0.69$ for general health motivation. Cronbach's alpha of all subscales could not be raised any further after deleting these items (Table 3).

Confirmatory factor analysis

CFA with Maximum Likelihood method was conducted to explore the model fit of the MCLHB-DRR scale. A seven factor model with 23 items (excluding items 4, 10, 13 and 25) was evaluated with CFA (model 1). All fit indices were indicating an excellent fit (RMSEA = 0.043, CFI = 0.960, TLI = 0.951, $\chi^2/df = 2.130$) (Table 4). The factor loadings ranged from 0.395 to 0.978 and were all statistically significant (Table 5). A seven factor model including all 27 items (model 2) showed a moderate fit (RMSEA = 0.053, CFI = 0.920, TLI = 0.907, $\chi^2/df = 2.743$), indicating model 1 had a better fit to the data than model 2.

Discussion

We demonstrated that the Dutch version of the MCLHB-DRR scale consisting of 23 items is a valid instrument to measure the beliefs and attitudes towards lifestyle and health behavioural changes for dementia risk reduction in people aged between 30 and 80 years old. EFA showed that nearly all items loaded on their intended factors without cross-loadings. Cronbach's alpha varied from 0.69 to 0.93, indicating good internal consistency. CFA confirmed that a seven factor model including 23 items (without items 4, 10, 13 and 25) had an excellent fit to the data (RMSEA = 0.043, CFI = 0.960, TLI = 0.951, $\chi^2/df = 2.130$).

Items 4, 10, 13 and 25 had low factor loadings and were therefore not included in the final Dutch version of the instrument. This could possibly be explained by differences in knowledge of dementia and dementia prevention between residents of Australia and the Netherlands. Australia is leading in the field of dementia prevention with the world first publicly-funded dementia prevention program (29). This could lead to increased public awareness about dementia and the prevention of dementia in Australia. In general, the Australian population scored higher on all subscales of the MCLHB-DRR scale. Besides, differences in cultural beliefs about general health, health behaviours and the prestige of health professionals may play a role. Another possible explanation is the age difference between the Australian and Dutch study populations (21). The study population of the Australian study was 50 years and older whereas our population was between 30 and 80 years. People aged below 50 years might be less scared to develop dementia in the upcoming 10 years and might be less concerned about their health in comparison to people aged 50 years and over. However, our sensitivity analysis in which we only included people aged 50 years and over did not change our results in any way. Deficiencies in the translation process could be a third explanation. The translation of item 10 slightly changed, as the part of the sentence 'may give me something that I never thought of' is not included in the Dutch translation.

Strengths and limitations

To our knowledge, this was the first study that validated the MCLHB-DRR scale in the Dutch general population. A major strength of the current study was the random sample, as the information letter was send to randomly selected residents of the municipality of Groningen. Another strength is the adequate sample size, consisting of a total number of 618 participants. Besides, we followed formal guidelines presented by Beaton et al. (2000) during the translation process (23).

This study also had certain limitations. The response rate of the current study was 14%, which is relatively low. However, we used several methods which have shown to increase the response rate to electronic surveys, such as a lottery to win a voucher, an offer to receive survey results on population level, a personalised invitation letter, an easily accessible link to the survey and a deadline to complete the survey (30,31). In our study, 59% of the participants completed tertiary education, which is higher than the percentage completing tertiary education in Dutch residents aged 45 years and over (26%) (32). Therefore, the sample is not fully representative for the Dutch general population.

Recommendations for future research

First, assessing reliability and responsiveness of the Dutch MCLHB-DRR scale would be a valuable addition for future research. Second, a part of the study population might not be familiar with the health behaviours that decrease the risk of developing dementia. Future research could consider informing participants about these health behaviours before filling in the MCLHB-DRR scale. Further research should also examine the association between the motivation to change lifestyle and health behaviours for dementia risk reduction and actually conducting this behaviour in daily life.

Implications

This scale can be useful in developing and evaluating interventions aimed at dementia risk reduction in various ways. Firstly, this instrument might help to predict people who will comply with an intervention program aimed at dementia prevention. Secondly, this instrument can be used in developing tailored interventions based on a person's motivations and beliefs. For example, if an individual scores low on the perceived benefits subscale, it would be convenient to educate this individual about how changing lifestyle and health behaviours could reduce its risk of dementia. Finally, assessing the beliefs towards lifestyle and health behavioural changes in the community population of the Netherlands may help to develop media campaigns or education programs focused on dementia prevention.

Conclusion

In summary, we have demonstrated that the translated and adapted Dutch version of the MCLHB-DRR scale consisting of 23 items is a valid instrument to assess beliefs and attitudes towards dementia and dementia risk reduction in the Dutch general population aged between 30 and 80 years old. The MCLHB-DRR scale can be used in the development and evaluation of lifestyle interventions and media campaigns aimed at dementia risk reduction.

Abbreviations

MCLHB-DRR
Motivation to Change Lifestyle and Health Behaviours for Dementia Risk Reduction
EFA
Exploratory factor analyses
CFA
Confirmatory factor analyses
RMSEA
Root Mean Squared Error of Approximation
CFI
Comparative Fit Index
TLI
Tucker-Lewis Index
AD
Alzheimer's disease
HBM
Health Belief Model
SD
Standard deviation

Declarations

Ethics approval

The Medical Ethics Review Board of the UMCG concluded that this study was not subject to the Medical Research Involving Human Subjects Act. Respondents participated in this study voluntary. They could withdraw at any time without any consequence or penalty. Data were collected and analysed anonymously.

Patient consent All participants provided informed consent.

Availability of data and materials The datasets analysed during the current study are available from the corresponding author on reasonable request.

Competing interests None declared

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Authors' contributions All authors contributed to the design of the study. All co-authors read and approved the final manuscript.

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Tables

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