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Psychometric properties of the Chinese version of the Motivation to Change Lifestyle and Health Behaviors for Dementia Risk Reduction scale (MCLHB-DRR) in Chinese community-dwelling older adults

Abstract

Objectives

To assess the psychometric properties of Chinese version of Motivation to Change Lifestyle and Health Behaviors for Dementia Risk Reduction (MCLHB-DRR) scale in Chinese community-dwelling older adults.

Methods

A convenience sample of 150 Chinese adults aged ≥ 50 was recruited from local community facilities. Reliability of MCLHB-DRR was evaluated using internal consistency and test-retest reliability over two weeks. Content validity and construct validity were assessed. Translation process followed Brislin's translation model.

Results

After excluding two items with poor loadings, the confirmatory factor analysis revealed a good model fit ($\chi^2/df=2.14$; CFI=0.91; IFI=0.91; RMSEA=0.087). The scale exhibited good internal consistency (Cronbach's $\alpha = 0.865$), as well as acceptable test-retest reliability (ICC=0.730).

Conclusions

The Chinese MCLHB-DRR showed satisfactory psychometric properties, providing valuable insights for promoting dementia risk reduction in Chinese population, considering cultural nuances that shape motivations and knowledge of lifestyle changes.

Keywords: Dementia, Motivation, Lifestyle change, Health behaviors, Risk reduction, Validation study

Abbreviations: MCLHB-DRR, Motivation to Change Lifestyle and Health Behaviors for Dementia Risk Reduction scale

Introduction

Dementia poses a global health crisis, particularly in countries characterized by aging populations. Chinese population alone accounted for approximately 25% of worldwide dementia cases.¹ Such prevalence places an overwhelming burden affecting individuals, and families, and the broader socio-economic and healthcare system.² To mitigate such profound impacts, early prevention at the pre-dementia stage is crucial. While pharmacological treatments for dementia remain uncertain,³ non-pharmacological interventions, particularly lifestyle changes and physical activity, have emerged as key preventive measures.^{4, 5, 6} A key barrier to adopting such preventive behaviors is motivation, which refers to the individuals' willingness to acknowledge, recognize, and act upon the risks of developing dementia.⁷ However, research consistently highlights a lack of motivation among the Chinese population to initiate such behavioral modifications.^{8, 9, 10, 11} This poses a significant obstacle to reinforcing dementia prevention strategies in China.

Motivation to engage in lifestyle change is influenced by various factors, such as personal beliefs,¹² attitudes,¹³ availability of resources,¹⁴ and cultural factors.¹⁵ In the context of dementia prevention, knowledge of the disease itself can serve as a strong motivator. Being aware of the potential risks and consequences of developing dementia can significantly impact individuals' commitment and responsibility to take proactive steps for prevention.^{16,17} Supportive networks, access to resources, and belief in self-efficacy are also important to sustaining behavior changes.¹⁸ While growing research has linked behavioral changes to preventing chronic illnesses, less attention has been placed to dementia prevention. Exploring theoretical foundations that enhance motivation for behavioral changes can offer valuable insights in designing tailored interventions to promote dementia prevention.

Growing studies started to explore theoretical models to guide motivating population for engaging dementia prevention behaviors.^{19,20} The Health Belief Model is one such model that commonly used for explaining factors that motivate or deter individuals from engaging in behavioral changes.²¹ This model postulates that an individual's decision to initiate behavior change, such as adapting regular physical activity, depends on that individual's perceived susceptibility and severity of dementia, as well as the perceived benefits and losses for such behavior change.²² Additionally, internal or external cues to action, a desire to achieve health benefits, and confidence in one's ability to perform the desired behaviors (self-efficacy) are necessary. Studies have shown that an individual's perception of dementia risk-reduction behavior change is influenced more by their health beliefs/ attitudes than by scientific evidence.^{17,23} These health beliefs/ attitudes, such as the fear of developing dementia, the belief that risk of dementia can be reduced, regarding dementia as an important health issue, and personal experience with dementia patients, are the determinants of adopting or improving a healthy lifestyle. Conversely, viewing dementia as a normal and inevitable part of aging could negatively affect motivation to initiate preventive behaviors. Thus, the Health Belief Model offers a valuable lens through which to examine populations' beliefs and attitudes towards dementia prevention.²⁴

Nurses, as frontline healthcare professionals, are well-positioned to address motivational barriers to lifestyle changes for dementia prevention. Nurses have been recognized as key figures in motivating behavioral changes across a wide range of diseases and lifestyle factors, such as smoking cessation,²⁵ obesity,²⁶ risky sexual behaviors,²⁷ and cardiovascular diseases.²⁸ By leveraging their professional knowledge and patient-centered approach, nurses can empower individuals to overcome motivational hurdles and make lasting lifestyle change.^{29,30} The Motivation to Change Lifestyle and Health Behaviors for Dementia Risk

Reduction (MCLHB-DRR) scale, which was developed based on the Health Belief Model to measure how attitudes towards dementia risks affect motivation for lifestyle changes,³¹ can be valuable in guiding nurses to understand and tailor interventions to address motivational aspects of dementia prevention.

The MCLHB-DRR scale was a 27-item self-report instrument, has been validated in its original English version, as well as in translated Turkish, Dutch, and Israeli versions. Kim and her colleagues³¹ validated the original English version in Australia, and the findings supported its good internal consistency ($\alpha = 0.61 - 0.86$), test-retest reliability ($r = 0.55-0.78$), and good fit structure. Similarly, Zehirlioglu³² validated the Turkish version and supported its good internal consistency ($\alpha = 0.81$) and test-retest reliability. Joxhorst³³ validated the Dutch version and supported a seven-factor structure with 23 items. Shevdko³⁴ validated the Hebrew version in Israel and supported a good model fit for its seven-factor structure with 23 items. While the scale has demonstrated applicability across various cultural contexts, its utility within the Chinese population remains unexplored. To align with its aging care needs,³⁵ frontline healthcare professionals, especially nurses, need updated tools to assess people's motivation to engage in dementia prevention. Accordingly, this study aims to translate the MCLHB-DRR into Chinese and evaluate its psychometric properties in Chinese population.

Materials and methods

Design and participants

This is a descriptive and cross-sectional study that recruited a convenience sample of 150 Chinese adults aged 50 years or above, who were fluent in speaking and reading Chinese, and provided their consent to participate. Recruitment was conducted from October 2022 to

February 2023 at three community facilities in Hong Kong that offer services and activities for older adults. The age criterion was set based on the research suggesting that cognitive decline typically initiates around the age of 50.³⁶ Individuals were excluded from the study if they self-reported a dementia diagnosis, had sensory impairments affecting vision or hearing, or declined to give consent.

Sample size calculation

The sample size for this study was determined based on established guidelines for factor analysis. Following the recommendation of Muthen,³⁷ a subject-to-item ratio of 5:1 is advised for conducting confirmatory factor analysis, such that a minimum of 135 participants is required for the 27-item MCLHB-DRR. To assess test-retest reliability, a subsample of 32 participants was required based on the recommendation of Hopkins.³⁸ Taken together, a sample size of 150 participants is deemed adequate to conduct psychometric testing in this study.

Study procedures

Ethical approval for this study (reference no. HSEARS20220711002; approved date: August 18th, 2022) was obtained from the Human Subjects Ethics Sub-committee (HSESC) (or its delegate) of the Hong Kong Polytechnic University before the study began. The study was conducted in two phases: (1) translation of the original English version of the MCLHB-DRR into Chinese, and (2) testing the validity and reliability of the MCLHB-DRR. All procedures followed the guidelines outlined in the Declaration of Helsinki.

Translation of the MCLDR-HBB

The researchers obtained permission from the original author, Dr. Sarang Kim, to use the MCLHB-DRR instrument. The translation of the MCLHB-DRR into Chinese followed a modified version of Brislin's translation model, which involved several steps to ensure semantic, idiomatic, and conceptual equivalence. Firstly, two bilingual nursing researchers proficient in English and Chinese conducted a forward translation of the original English version. Next, the two initial translations were compared, and any discrepancies were discussed and modified until a consensus was reached. Secondly, two other bilingual translators, who were blinded to the original English version and not involved in the previous stage, conducted a backward translation of the Chinese version into English. Finally, a meeting was held within the research team to evaluate the semantic, idiomatic, and conceptual equivalence of the back-translated MCLHB-DRR. The original author reviewed the back-translated version, and any inconsistencies were discussed and resolved until a consensus was achieved. Supplementary material 1 shows the Chinese translated version of the MCLHB-DRR.

Data collection

Various strategies were employed to enhance participant recruitment, including word of mouth and promotion during health education talks in the local community facilities. Eligible individuals expressing interest were referred to the research team for scheduling of initial in-person interviews. During these interviews, study researchers provided the participants with a detailed explanation of the study, including its purpose, procedures, time commitment, voluntary nature, potential risks/benefits, and contact information. Written informed consent was obtained prior to administering the questionnaires, including the Chinese version of MCLHB-DRR and a socio-demographic sheet. Data were collected through in-person or telephone interviews by trained research personnel. To assess the test-retest reliability of the

MCLHB-DRR, an invitation for a second interview was extended to all participants until the minimum sample size of 32 was achieved. All collected data were anonymous, confidential, and used solely for research purposes. Data were securely stored in password-protected electronic folders.

Measure

The 27-item Chinese version of MCLHB-DRR consists of seven subscales, including 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). Participants rated each item on a 5-point Likert scale, ranging from 'strongly disagree' (score = 1) to 'strongly agree' (score = 5). In the original English version, acceptable test-retest reliability was demonstrated ($\alpha = 0.776$), and the seven-factor structure received support based on acceptable fit indices (CFI = 0.668, GFI = 0.713).³¹

Socio-demographic characteristics, such as age, educational level, marital status, monthly household income, employment status, and personal experience with individuals with dementia, were collected from participants.

Statistical analyses

All statistical analyses were analyzed by the SPSS 27.0 and Amos 23.0. The significance level was set at $p < .05$. Descriptive statistics, including frequencies, percentages, means, standard deviation [SD]) was adopted to summarize the characteristics of the participants. Normality of

data was assessed based on kurtosis (within the range of +2 to -2) and skewness (within the range of +7 to -7) to ensure acceptable normal distribution.³⁹

Internal consistency of the MCLDR-HBB was assessed using Cronbach's alpha coefficient for overall measures and average inter-item correlation. A Cronbach's alpha > 0.70 and an inter-item correlation ranging from 0.15 to 0.50 were deemed acceptable.⁴⁰ Item correlation was evaluated through the corrected item-to-total correlation and Cronbach's alpha upon item deletion. Items with a correlation between 0.30 and 0.80 were considered satisfactory, while those falling outside this range were considered for deletion.⁴⁰ Any deleted items that increased Cronbach's α by more than 0.10 were considered redundant. Stability of the MCLHB-DRR and its subscales was evaluated by two-week test-retest reliability by computing the intraclass correlation coefficient (ICC), with an acceptable ICC value of ≥ 0.70 .⁴¹

Construct validity was evaluated confirmatory factor analysis (CFA) for this theory-based instrument.⁴² CFA with maximum likelihood method was conducted to confirm the model fit. The model was considered as a good fit based on the following criteria: root mean square error of approximation (RMSEA < 0.09), Chi-squared/ degree of freedom ($\chi^2/df < 3$), comparative fit index (CFI ≥ 0.90), and incremental fit index (IFI ≥ 0.90). Factor loadings were examined, and each item was considered satisfactory if its loading was greater than 0.60.⁴³ A second CFA was conducted by excluding the items with poor loading. Internal consistency was examined in case for the modified version of MCLHB-DRR.

Given that our study involved participants across a broad age spectrum, further analysis was conducted after stratifying participants into three age group: those aged ≤ 65 years, 65 to 75

years, and ≥ 75 years. One-way ANOVA was used to assess the potential significant difference in subscale mean score, and Tukey's HSD test was conducted for any significant difference. Internal consistency was conducted for the modified version based on age groups to provide insight into its applicability across varying age range. Test-retest reliability and CFA was not tested due to the limited sample size available in this study.

Results

Table 1 presents the characteristics of the study population. A total of 150 community-dwelling older adults were recruited in this study. The mean age of the participants was 69.94 (SD = 7.28; range 53 to 88) years. More than half of the participants were female (58.7%). The majority of the participants were married (65.3%) and living with family (75.3%) and have completed at least primary education (46.0%). Approximately 12.7% of participants reported having relatives diagnosed with dementia, while 8.6% reported having friends diagnosed with dementia. Moreover, 8.5% of participants mentioned being caregivers for their relatives or friends with dementia. The data exhibited a normal distribution, as evidenced by the acceptable skewness value of -0.063 and kurtosis value of 1.381.

Table 1. Characteristics of study participants ($n = 150$).

Characteristics	N (%)
Age, years (mean \pm SD [range])	69.94 \pm 7.28 [range 53 – 88]
Gender (female %)	88 (58.7)
Marital status	
Married	98 (65.3)

Single	7 (4.7)
Divorced	2 (1.3)
Widow/widower	43 (28.7)
Living status	
Living with family/ partners/ friends	113 (75.3)
Living alone	18 (12.0)
Education	
Elementary	29 (19.3)
Primary	69 (46.0)
Secondary	43 (28.6)
Tertiary or above	9 (6.0)
Monthly household income (HKD)	
1000 - 5000	106 (71.1)
5000 – 10000	19 (12.7)
10000 – 30000	15 (10.0)
> 30000	8 (5.4)
Working status (currently working)	11 (7.3)
Relative with dementia	19 (12.7)
Non-relative with dementia	13 (8.6)

Cared for relative/friends with dementia	12 (8.0)
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Internal consistency

Table 2 shows the results of item analysis. The corrected item-to-total correlations ranged from 0.261 to 0.594; all items had a value above 0.30, except for item 27 with a correlation of 0.261, which was considered as non-homogenous with other items in the scale and could be deleted. Statistics after excluding each item on the scale did not indicate an increase in Cronbach's alpha by 0.10. After deleting the item 27, the Cronbach's alpha was 0.873 for overall scale, 0.944 for perceived susceptibility, 0.881 for the perceived severity, 0.875 for the perceived benefit, 0.875 for perceived barriers, 0.874 for cue to actions, 0.890 for general health motivation, and 0.900 for self-efficacy. Such results supported the good internal consistency of the Chinese version of MCLHB-DRR.

Table 2. Results for reliability of the MCLHB-DRR ($n = 150$).

Item	Description	Corrected Item-total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's alpha
Perceived susceptibility (4 items; range: 4 – 20; mean = 8.34 ± 5.68)				0.944
Q1	My chances of developing dementia are great	0.448	0.869	
Q2	I feel that my chances of developing dementia in the future are high	0.487	0.868	

Q3	There is a strong possibility that I will develop dementia	0.503	0.867	
Q4	Within the next 10 years I will develop dementia	0.389	0.871	
Perceived severity (5 items; range: 5 – 2; mean = 12.01 ± 6.91)				0.881 ^a
Q5	The thought of dementia scares me	0.497	0.868	
Q6	When I think about dementia my heart beats faster	0.594	0.865	
Q7	My feelings about myself would change if I develop dementia	0.459	0.869	
Q8	When I think about dementia I feel nauseous	0.562	0.866	
Q9	It would be more serious for me to develop dementia than if I developed other diseases	0.557	0.866	
Perceived benefits (4 items; range = 4 – 20; mean = 16.7 ± 4.67)				0.875
Q10	Information and advice from experts may give me something that I never thought of, and may reduce my chance of developing dementia	0.379	0.871	

Q11	Changing my lifestyle and health habits can help me reduce my chance of developing dementia	0.425	0.870	
Q12	I have a lot to gain by changing my lifestyle and health behaviour	0.389	0.871	
Q13	Adapting to a healthier lifestyle and behaviour would prevent dementia for me	0.310	0.872	
Perceived barriers (4 items; range = 4 – 20; mean = 9.48 ± 5.96)				0.875
Q14	I am too busy to change my lifestyle and health habits	0.468	0.869	
Q15	My financial situation does not allow me to change my lifestyle and health behaviour	0.385	0.871	
Q16	Family responsibilities make it hard for me to change my lifestyle and behaviour	0.434	0.870	
Q17	Changing lifestyle and behaviour interferes with my schedule	0.416	0.870	
Cues to action (4 items; range = 4 – 20; mean = 16.02 ± 4.87)				0.874
Q18	Being forgetful makes me think I have to change my lifestyle and behaviour	0.393	0.871	

Q19	Having risk factor(s) for dementia makes me think I have to change my lifestyle and behaviour	0.434	0.869	
Q20	Learning more about dementia from the media makes me think I have to change my lifestyle and behaviour	0.304	0.872	
Q21	Knowing family member(s) with dementia makes me think I have to change my lifestyle and behaviour	0.339	0.872	
General health motivation (4 items; range = 4 – 20; mean = 18.77 ± 2.95)				0.890 ^b
Q22	Nothing is as important to me as good health	0.376	0.871	
Q23	I often think about my health	0.468	0.870	
Q24	I think I have to pay attention to my own health	0.497	0.870	
Q25	I am concerned about my health	0.463	0.870	
Self-efficacy (2 items; range = 2 – 10; mean = 8.91 ± 2.56)				0.900
Q26	I am certain that I can change my lifestyle and behaviour so I can reduce the risk of developing dementia	0.303	0.872	

Q27	I am able to make differences that will change the risk of developing dementia	0.261	0.873	
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a: Cronbach's alpha increased to 0.904 if item 5 and 7 were deleted.

b: Cronbach's alpha remained unchanged if item 27 was deleted.

Bold = correlation coefficient < 0.30.

Test-retest reliability

Test-retest reliability was tested among 32 participants. ICC was 0.730 for the overall scale, 0.808 for perceived susceptibility, 0.881 for perceived severity, 0.735 for perceived benefit, 0.763 for perceived barriers, 0.634 for cue to actions, 0.699 for general health motivation, and 0.818 for self-efficacy.

Confirmatory Factor Analysis

Fig. 1 shows the results of the CFA. The analysis of the original 27-item scale did not yield a good fit ($\chi^2/df = 2.24$, CFI = 0.89, IFI = 0.89, RMSEA = 0.090). The standardized coefficient of most items was deemed acceptable, ranging from 0.66 to 0.97, except for item 7 from perceived severity (0.46) and item 18 from cue to actions (0.57). All factor loading were statistically significant. To ensure a robust conclusion, a second CFA analysis was conducted for a modified 25-item version, excluding item 7 and item 18 (Fig. 2), which resulted in a better fit ($\chi^2/df = 2.14$; CFI = 0.91; IFI = 0.91; RMSEA = 0.087).

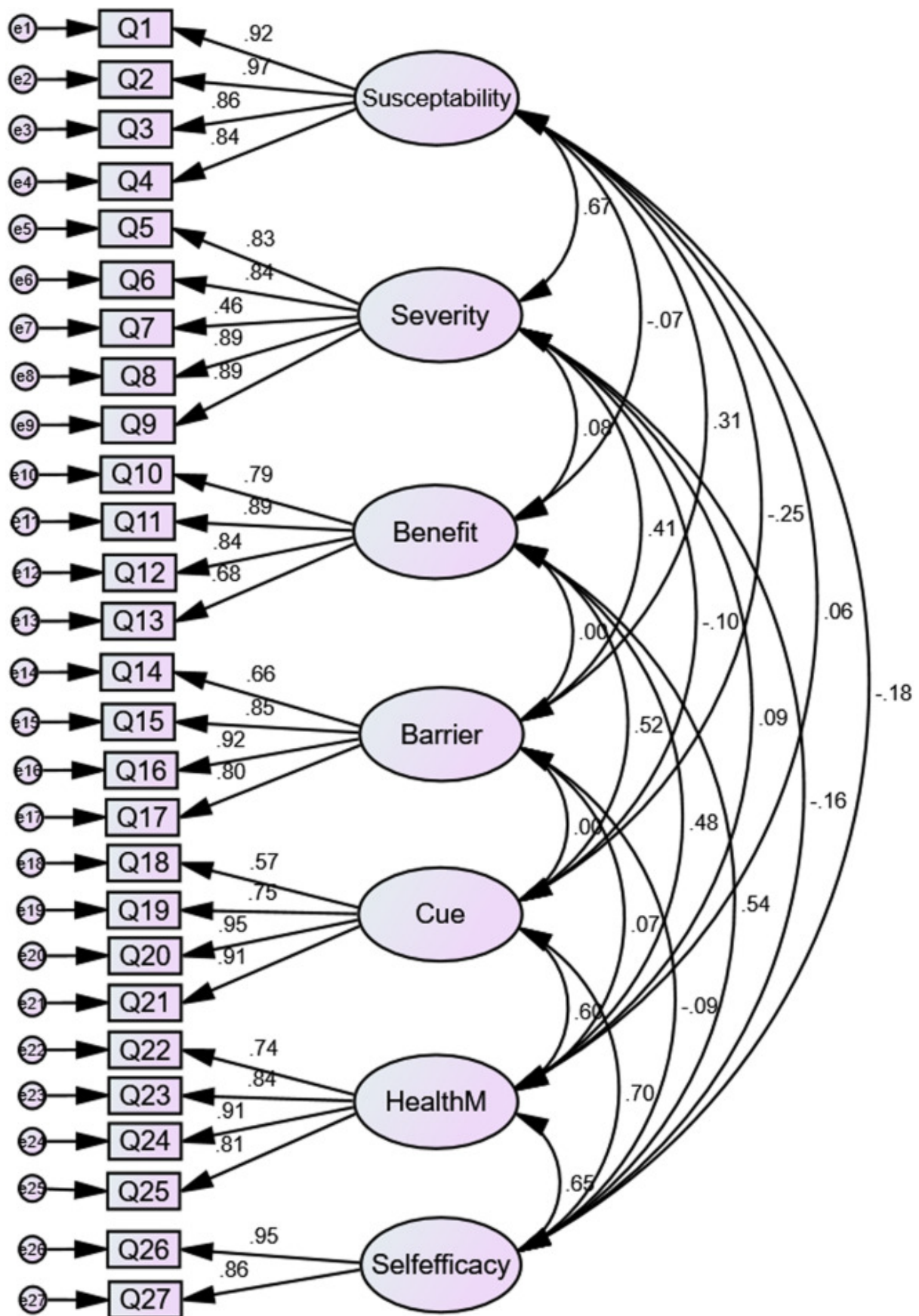


Fig. 1. Confirmatory factor analysis model with the original 27-item version of MCLHB-DRR.

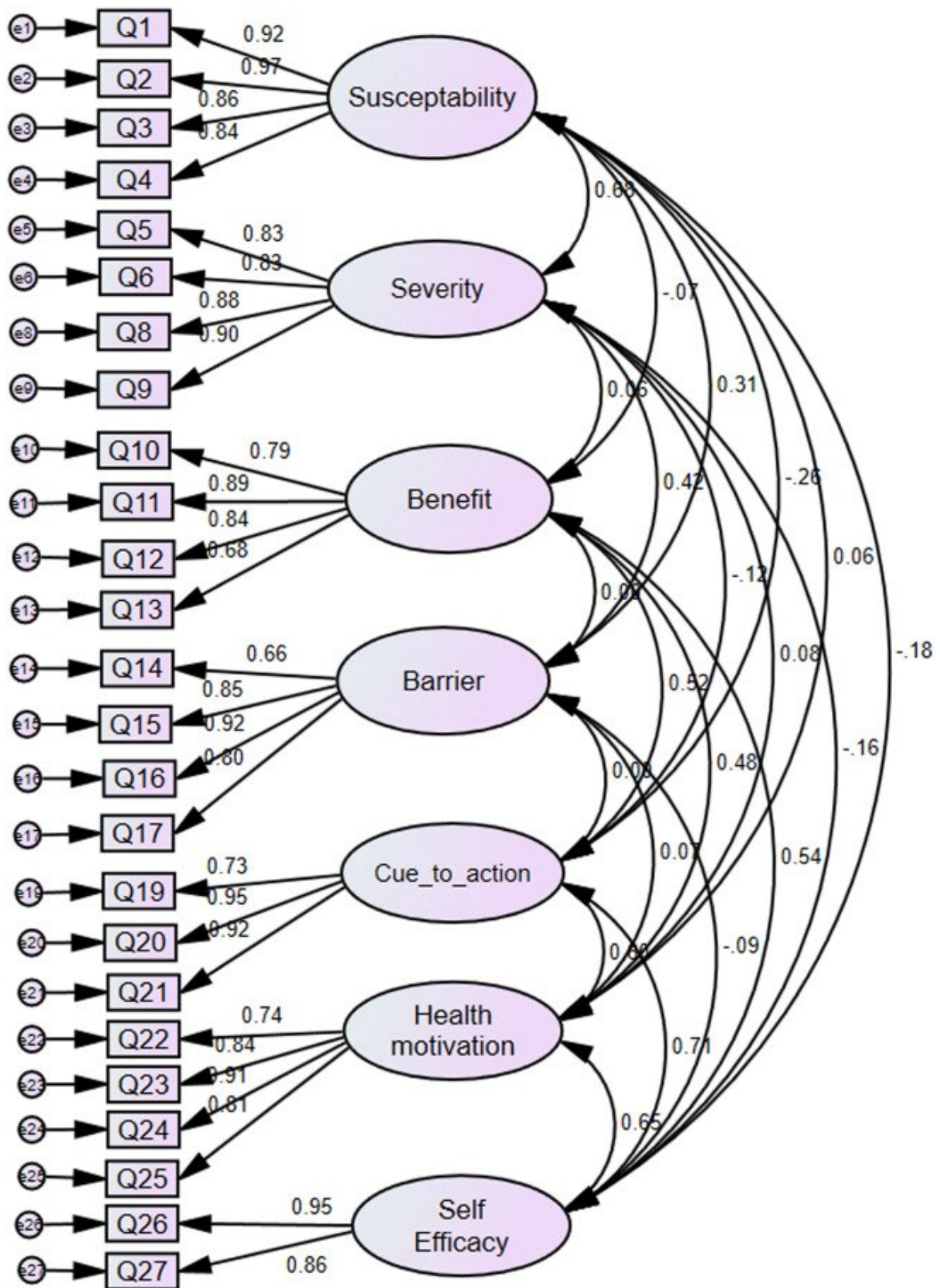


Fig. 2. Confirmatory factor analysis model with the 25-item modified version (excluding items 7, 18) of MCLHB-DRR

Internal consistency was evaluated again after excluding items 7 and 18. Cronbach's alpha for the overall scale was 0.865, while those for the perceived severity increased from 0.881 to 0.919 and those for the cue to actions subscale increased from 0.874 to 0.892.

For the analysis based on stratified age group, a significant difference was noted in the cue to action subscale ($p = 0.001$) with a medium effect ($\eta^2 = 0.093$) and perceived benefits ($p = 0.046$) with small effect ($\eta^2 = 0.043$) (Supplementary material 2). Tukey's HSD test revealed that participants aged ≤ 65 scored significantly lower than both those aged 65 to 75 ($p = 0.003$) and those aged ≥ 75 ($p = 0.003$) in cue to action subscale. In addition, in the perceived benefits subscale, individuals aged ≤ 65 scored significantly lower ($p = 0.042$) than the 65 to 75 age group. The assessment of internal consistency within the three age groups yielded satisfactory Cronbach's alpha values (aged ≤ 65 : ICC = 0.849-0.916; aged 65 to 75: ICC = 0.815-0.816; aged ≥ 75 : ICC = 0.802-0.913).

Discussion

This study evaluated the reliability and validity of the Chinese version of MCLHB-DRR in a sample of 150 Chinese adults aged 50 or above. Our findings provided evidence supporting the reliability of the Chinese version of the MCLHB-DRR. Specifically, the internal consistency of the scale, as demonstrated by both Cronbach's alpha for the whole scale and average inter-item correlations for the subscales, was found to be acceptable. These values were similar to those reported in previous studies examining the English, Hebrew, Turkish, and Dutch versions of the scale. Furthermore, the two-week test-retest reliability was found to be high, indicating that the scale can reliably measure participants' performance over time.

In the perceived severity subscale, item 7 (“My feelings about myself would change if I develop dementia”) was found to have poor item loading, compared to items 6 and 8 (which measure emotional responses to the impact of dementia) as reported in the Hebrew version. Such inconsistency may imply the influence of cultural variations on individuals' perceptions and emotional responses to dementia. In Chinese culture, dementia is perceived as an internal stressor, representing the fear of how demanding caregiving tasks can become a burden to their family and a significant disruption to familial harmony.^{44, 45, 46} This perception is deeply rooted in traditional family values influenced by Confucianism, which places great importance on harmony within family units.⁴⁷ These concerns align with the concept of filial piety, which emphasizes the duty of children to respect, care for, and support their aging parents.⁴⁸ On the other hand, Western societies tend to experience fear related to dementia that is more externally driven. Individuals in these cultures often worry about the stigma and blame they might face upon receiving a dementia diagnosis.⁴⁹ Their fear is influenced by society's perception and reaction to dementia, rather than solely focusing on the personal consequences experienced by individuals and their families. These findings emphasize the importance of tailoring dementia education messages to specific cultural groups.^{50,51}

Additionally, our findings indicate that the Chinese population perceives a greater threat of developing dementia compared to Western countries, as reflected in a higher score on perceived severity subscale (calculated based on items included in the original version). These findings align with previous research, which shows that Chinese participants rate dementia as the most feared disease, surpassing cancer and other cerebrovascular diseases,⁴⁸ while in Western countries such as the United Kingdom and the United States, cancer tends to be the most feared than Alzheimer's disease.^{52,53} These findings revealed a great opportunity to reinforce dementia prevention initiatives at the population health level to transfer such fear into conducive

behavior changes. Public health initiatives and educational campaigns should prioritize raising awareness about dementia prevention strategies and promoting healthy lifestyle behaviors.

In the cue to action subscale, item 18 (“Being forgetful makes me think I have to change my lifestyle and behavior”) was found to have a poor item loading to the subscale. This result may imply that the interpretation of memory loss among the Chinese community appears to be distinct from the Western perspective, where memory loss is often associated with dementia. Instead, Chinese individuals often perceive memory loss as a normal part of aging,⁵⁴ a manifestation of mental illness, an imbalance in yin-yang, or even as a retribution for family sins.⁵⁵ Interestingly, similar beliefs were also observed among Chinese American immigrants,⁴⁶ suggesting that these cultural attitudes towards memory loss and dementia risk might persist even in different cultural contexts. Consequently, the association between memory problems and dementia risk may not serve as a strong cue to prompt preventive actions in these populations.

In the self-efficacy subscale, item 27 (“I am able to make differences that will change the risk of developing dementia”) exhibited a weak correlation with the overall scale. In contrast, item 26 (“I am certain that I can change my lifestyle so I can reduce the risk of developing dementia”) which demonstrated a stronger correlation. This inconsistency may be attributed to the fact that item 27 did not convey the necessary actions required to decrease the risk of developing dementia, potentially causing confusion and subsequently poor performance. On the other hand, item 26 emphasized participants' certainty in their ability to modify their lifestyle and behaviors to reduce their risk of developing dementia. Our findings aligned with the previous studies,^{46, 56} indicating that Chinese population has a strong understanding of the cognitive

benefits associated with lifestyle changes. This is evident by scoring higher in the subscales of cue to action and perceived benefit compared to studies conducted in Australia, Turkey, America, Israel, and the Netherlands. Their acknowledgment of cognitive benefit of active lifestyle, together with their expressed motivation to change, may explain why item 26, related to health beliefs, showed a stronger correlation to the self-efficacy subscale.

It is crucial to highlight that despite the poor correlation or loadings of certain items, we did not exclude them from the original instrument, which is well-grounded in existing theory. Instead, we recognize the need for further research to delve into how these items might impact the Chinese population. Of particular interest is considering the potential influence of cross-cultural factors, especially among immigrants, on the motivation to prevent dementia within the Chinese ethnicity.

Our analysis validates the reliability of the MCLHB-DRR as a measurement tool across age groups. This supports its application in community-dwelling middle-aged and older individuals. Future research should explore its effectiveness in populations with varying health conditions and activity levels, facilitating tailored interventions among people with specific needs. Notably, participants aged ≤ 65 exhibited the lowest cue to action, possibly stemming from the lack of awareness about cognitive benefits of lifestyle change. A study exploring the motivations of middle-aged individuals for dementia prevention, revealed that half of the participants expressed skepticism citing a lack of robust evidence supporting preventive guidelines.²⁰ This underscores the need for interventions promoting benefits of active lifestyle backing by robust research data and evidence. This is particularly important since middle age

marks cognitive decline onset,⁵⁷ and people in this phase are physically better positioned for lifestyle change than older adults.⁵⁸

Limitations

This study has several limitations. First, no formal cognitive assessment was conducted, so we cannot be certain about the participants' cognitive levels. Future research could use cognitive assessment tools such as the Montreal Cognitive Assessment to compare attitudes toward dementia prevention among individuals with different cognitive levels. Second, the sample size was relatively small with only 150 participants, meeting the minimum requirement for factor analysis.⁵⁹ A larger sample size would improve fit indices' accuracy and offer more robust insights into the scale's dimensionality. Third, the study covered a sample across broad age range. Although further analysis was done for internal consistency, it was not conducted for CFA and test-retest reliability due to the limited number of participants included. Fourth, the absence of randomization in recruiting participants for test-retest reliability potentially may introduce selection bias.

Implications for future research

The findings of our study have significant implications for future public health initiatives. First, the Chinese version of MCLHB-DRR demonstrated satisfactory reliability and validity. It can be used in public health surveillance to assess dementia attitudes in the Chinese population, as well as in healthcare settings for high-risk groups like older adults and relatives of dementia patients, to tailor health advice. Moreover, this instrument can be used for future cross-sectional studies to investigate its correlations with other socio-economic and health variables, and for interventional studies to determine pre-post changes.

Second, our findings affirm the importance of promoting an active lifestyle as a timely and effective strategy for dementia prevention. This is especially true when the Chinese participants in our study have already demonstrated a strong understanding of the cognitive benefits associated with physical activity,⁴⁸ and displayed a proactive attitude towards accepting and proactive attitude towards early dementia diagnosis. While it is still important to disseminate knowledge about other strategies for dementia prevention, prioritizing and fostering lifestyle changes can be particularly effective.

Third, building upon this knowledge, it is crucial to provide specific recommendations on how to practically implement an active lifestyle in daily life. Education content should include guidance on recommended exercise durations (at least 150 minutes per week), suitable exercise types (including cognitive stimulation and moderate-level physical exercise), and optimal intensity levels. By providing targeted education, individuals can make informed decisions and adopt healthy habits that effectively reduce their risk of dementia. Furthermore, education efforts should also address the emotional, physical, and financial burdens related to caregiving responsibilities. Emphasizing these potential issues that dementia can have on family dynamics, individuals are likely to be further motivated to adopt preventive behaviors.

To ensure effective dissemination of education, it is important to target on populations with lower awareness about dementia, including older adults over the age of 60, those with lower education levels, and those living in rural areas. Prioritizing these groups for education outreach can help bridging existing knowledge gaps and enhance motivation to engage in preventive measures. In terms of the mediums for information delivery, digital platforms

such as mobile applications and TV broadcasts offer the dual benefits of widespread reach and content customization. Such platforms are especially impactful for enhancing dementia literacy among individuals with limited access to information and those residing in less urbanized areas.⁶⁰ Although our study did not specifically explore dementia knowledge level, the widespread misconceptions surrounding dementia is well-documented.^{46,48,61} Therefore, educational program should provide a comprehensive overview of dementia diagnosis, symptoms, and treatment options. By enhancing knowledge levels, individuals can better understand the importance of timely implementation of prevention measures, further motivate their active engagement in lifestyle changes.

Conclusion

This study supports the validity and reliability of the Chinese version of MCLHB-DRR as an instrument for measuring attitudes and motivation towards lifestyle and behavioral changes related to dementia prevention. The findings suggest that the Chinese version holds value as a research tool to examine the effectiveness of dementia prevention interventions or in evaluative research aimed at understanding the attitudes and motivation towards dementia among different populations. Future studies should consider cultural differences in dementia perception when tailoring interventions to address the unique needs and motivations across different populations.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

1 – Chinese translated version of the MCLHB-DRR

改變生活方式和健康行為從而降低認知障礙症風險的動機量表						
下列陳述了人們對認知障礙症的感受。請按照閣下的情況圈上適當的數字。						
<div style="display: flex; justify-content: space-between; align-items: center;"> 十分不同意 ←————→ 十分同意 </div>						
1.	我患上認知障礙症的機會很高。	1	2	3	4	5
2.	我覺得我將來患上認知障礙症的機會很高	1	2	3	4	5
3.	有很大的機率我會得認知障礙症	1	2	3	4	5
4.	在未來 10 年我將會患上認知障礙症	1	2	3	4	5
5.	想到認知障礙症我感到害怕	1	2	3	4	5
6.	當我想到認知障礙症時我的心跳加快	1	2	3	4	5
7.	我會改變對自己的看法如果我患上認知障礙症	1	2	3	4	5
8.	當我想到認知障礙症我就感到噁心	1	2	3	4	5
9.	對我來說患上認知障礙症比患上其他疾病更嚴重	1	2	3	4	5

10.	專家的信息和建議可能會給我一些沒從未想到的事物，並且可能會降低我患上認知障礙症的機會	1	2	3	4	5
11.	改變我的生活方式和健康習慣能幫助我降低患上認知障礙症的機會	1	2	3	4	5
12.	我有很多收穫通過改變我的生活方式和健康行為	1	2	3	4	5
13.	採用更健康的生活方式和行為可以幫助我預防認知障礙症	1	2	3	4	5
14.	我忙得沒有時間改變我的生活方式和健康習慣	1	2	3	4	5
15.	我的經濟狀況不允許我改變生活方式和行為	1	2	3	4	5
16.	家庭責任讓我難以改變我的生活方式和行為	1	2	3	4	5
17.	改變生活方式和行為干擾我的日程安排	1	2	3	4	5
18.	健忘讓我認為我不得不改變我的生活方式和行為	1	2	3	4	5
19.	有認知障礙症的風險因素令我認為我不得不改變我的生活方式和行為	1	2	3	4	5
20.	從媒體學到更多關於認知障礙症讓我覺得我不得不改變我的生活方式和行為	1	2	3	4	5
21.	瞭解患有認知障礙症的家人讓我認為我不得不改變我的生活方式和行為	1	2	3	4	5

22.	沒有什麼事情像健康一樣對我重要	1	2	3	4	5
23.	我常常思考我的健康	1	2	3	4	5
24.	我想我不得不關注我自己的健康	1	2	3	4	5
25.	我擔心我的健康	1	2	3	4	5
26.	我確信我可以改變我的生活方式和行為從而降低患 認知障礙症的風險	1	2	3	4	5
27.	我能夠有所作為來改變患認知障礙症的風險	1	2	3	4	5

2 – Mean score of the subscale of the Chinese translated version of the MCLHB-DRR

Subscale mean score	Overall sample	≤ 65 years	Between 66 and 75	Age > 75	p-value
Perceived susceptibility	8.34	9.229	7.307	9.906	0.055
Perceived severity	12.01	11.222	11.959	13.813	0.292
Perceived benefits	16.70	15.25	17.56	16.25	0.046
Perceived barriers	9.48	9.417	9.270	10.531	0.602
Cues to action	16.02	13.639	16.770	17.387	0.001
General health motivation	20.97	20.147	21.082	21.594	0.243

Self-efficacy	8.91	8.472	9.213	8.563	0.134
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