International Journal of
Mental Health Promotion

Tech Science Press

http://doi.org/10.32604/ijmhp.2026.079059

ARTICLE

Measuring Mental Health Promoting Behaviours: Development and Psychometric Properties of a Danish Act Belong Commit-Mental Health Promoting Behaviours (ABC-MHPB) Scale

Line Nielsen[1,*], Ziggi Ivan Santini[2], Malene Kubstrup Nelausen[1], Carsten Hinrichsen[3], Frederik Schou-Juul[3], Vibeke Jenny Koushede[4], Robert J Donovan[5,6] and Charlotte Bjerre Meilstrup[1]

[1]Department of Psychology, University of Copenhagen, Copenhagen, Denmark
[2]FORMS—Research in Recovery and Mental Health Promotion, Mental Health Center Amager, Amager and Hvidovre Hospital, Copenhagen, Denmark
[3]National Institute of Public Health, University of Southern Denmark, Copenhagen, Denmark
[4]Faculty of Social Sciences, University of Copenhagen, Copenhagen, Denmark
[5]School of Human Sciences, University of Western Australia, Perth, Australia
[6]School of Medical and Health Sciences, Edith Cowan University, Perth, Australia
*Corresponding Author: Line Nielsen. Email: ln@psy.ku.dk

Received: 13 January 2026; Accepted: 13 March 2026; Published: 23 June 2026

ABSTRACT: Background: The Act Belong Commit-ABCs of Mental Health campaign is the world's first comprehensive, population-wide, community-based initiative to promote mental health. In response to a growing demand for valid tools to monitor mental health promoting behaviours, this study presents the development and psychometric evaluation of the ABC-Mental Health Promoting Behaviours (ABC-MHPB) scale in a Danish population-based sample. **Methods**: A 10-item scale was developed, based on the ABC framework, to assess mental health promoting behaviours. A total of 119,221 randomly selected participants aged 18+ filled out an electronic survey, including the scale to measure the underlying construct of mental health promoting behaviours. Analyses pertaining to construct, content, reliability, discriminant, and convergent validity assessments were carried out, and an operationalization was proposed. **Results**: The initial 10-item version showed inadequate model fit, resulting in the removal of one item. Construct validity testing supported a 9-item three-factor model with satisfactory fit. Full invariance was observed across education (primary/unknown vs. higher), and partial invariance across sex (women vs. men) and age (<25 vs. 25+), with content, discriminant, and convergent validity also supported. Based on a practical operationalization of the scale, regression results showed a cross-sectional pattern characteristic of a dose-response association with the outcomes of mental well-being and loneliness. **Conclusion**: The findings suggest that the 9-item ABC-MHPB scale is an appropriate tool for assessing and monitoring mental health promoting behaviours in the general population and might be relevant as a tool to evaluate interventions aiming to promote mental health. Further validation over time and in diverse populations, along with intervention and longitudinal studies, is needed to confirm its associations with mental health outcomes.

KEYWORDS: Mental health; mental wellbeing; mental health promoting behaviours; public mental health; scale development; psychometrics

1 Introduction

To address the decline in mental health in the general population, it is essential to adopt a comprehensive and universal approach that prioritizes mental health promotion alongside treatment and prevention strategies [1,2]. Mental health promotion aims to, amongst other things, establish environments and structures that increase awareness and literacy about maintaining good mental health and well-being across the general population, while also providing opportunities for individuals to engage in behaviours that promote mental health [3]. This includes efforts targeting salutogenic determinants, i.e., factors that promote mental health and well-being, and operating across multiple levels, in accordance with the socio-ecologic model, which considers individual, interpersonal, organizational, community, and policy influences on health and well-being [4–7].

The Act Belong Commit (ABC) campaign is the world's first comprehensive, population-wide, community-based programme designed to promote mental health [8]. The campaign originated in Western Australia and has subsequently been translated, adapted, and implemented in other countries, including Denmark, Norway, Faroe Islands, Sweden, Finland, Austria, and Ireland. In Denmark, the first country outside Australia to adopt the campaign, it is known as ABC for Mental Sundhed (the ABCs of Mental Health) [9,10]. In Denmark, ABC is organized as an intersectoral partnership with community groups, local governments, health organizations, NGO's and researchers. OECD and the European Commission have highlighted the ABC as a best practice example because it serves as a practical research-based framework for promoting mental health at the population level and across various contexts including schools, workplaces, and community organizations [11,12].

Impact evaluations of the Australian ABC campaign have shown improved mental health awareness, increased participation in ABC behaviours, increased help-seeking, and a reduction in stigma related to mental health issues due to the campaign [13–15]. A process evaluation among the Danish ABC partners, showed that, among other things, the ABC framework provides a common language for mental health promotion in the partnering organizations [16]. An impact evaluation among the Danish adult population found that awareness of the ABC was related to new knowledge about mental health and well-being and to respondents being more likely to reflect on their mental health, talk to friends and family about mental health, and take action to enhance their own mental health and that of others [17].

A key component of the ABC is to promote the public's awareness and knowledge on how to enhance their mental health. Thus, Act Belong Commit/the ABC focuses on encouraging people to engage in behaviours that improve and maintain good mental health [18]. The three verbs 'Act', 'Belong', and 'Commit' form the acronym 'ABC' and represent three major domains that are widely regarded, in both the scientific literature and the general population, as contributing to mental health [19,20]. The three domains highlight that mental health promoting behaviours are, according to the ABC framework, a variety of "acting, belonging, and committing" behaviours that are conducive to good mental health. Implicit in the framework is the idea that diversity is key: mental health benefits arise not from relying on single behaviours, but from engaging in a range of activities both across the three domains and within each domain. This breadth of engagement is viewed as central to how the ABC model promotes mental health and well-being. The domains are expressed as follows: **Act**—Do something: Stay alert and engaged by keeping mentally, socially, spiritually and physically active. **Belong**—Do something with someone: Develop a strong sense of identity and belonging by keeping up family relationships and friendships, joining groups, participating in community activities and inviting others to do so. **Commit**—Do something meaningful: Do things that provide meaning and purpose in life, such as taking up challenges, supporting causes and helping others.

Conceptually, Act, Belong, and Commit represent distinct yet interrelated behavioural domains that are linked to mental health. Act reflects behavioural engagement associated with various activities, e.g., leisure activity that can cover physical, social, mental and/or spiritual activities [21], Belong captures social engagement operating through mechanisms of social support, affect regulation and shared social identity [22], and Commit reflects engagement in activities perceived as meaningful by the individual fostering a sense of purpose, coherence, and mattering [23]. Although analytically separable, the domains (and related behaviours) are often expected to co-occur and reinforce one another. For example, active engagement often takes place in social contexts, and social participation may facilitate commitment to shared purposes. Mental health promoting behaviour is therefore conceptualised as an overall pattern of behaviour that reflects the interaction between being active, being socially connected, and engaging in meaningful activities.

Research shows that these three domains are experienced as related to mental well-being among the general public across countries, although the specific articulation and emphasis of each domain may vary due to factors such as translation and cultural context [20].

By examining existing indicators of 'ABC-behaviours' (i.e., indicators of acting, belonging, and committing), previous investigations have explored if and how acting, belonging, and committing are predictive of positive mental health, or conversely, protective against mental health problems, using available data from large national and international surveys. For example, in a representative sample of the Irish population aged 50+, Act Belong Commit indicators (e.g., engaging in individual, social and community activities, being socially connected) were inversely associated with future depression, anxiety, cognitive decline [24], and problem drinking [25], and positively associated with positive mental health outcomes, such as quality of life, life satisfaction, and self-rated mental health [26]. Among children and adolescents in Denmark, engaging in multiple types of leisure activities like sports, creative hobbies, social clubs, etc., (indicating acting, belonging, and committing) was associated with increased odds for high mental well-being and reduced odds for mental health problems and substance use [27]. However, the above studies assessed ABC behaviours indirectly by examining proxy indicators rather than using an ABC scale designed to capture the underlying construct of mental health promoting behaviours.

Despite this interdisciplinary knowledge base underpinning public mental health [4,28], measurement approaches have predominantly focused on symptoms of mental disorder, subjective well-being states, or health risk behaviours, with comparatively limited attention to the systematic assessment of mental health promoting behaviours as a distinct construct [29,30]. Existing studies typically rely on proxy indicators (e.g., leisure participation, volunteering, social contact) as the section above illustrates. This creates a gap between theoretical models and interventions that emphasise behavioural and social mechanisms for promoting mental health and the tools available to test and evaluate these theories and interventions. There is a growing recognition of the need for valid tools to monitor mental health promoting behaviours, as emphasized by the ROAMER project's (*Roadmap for Mental Health Research in Europe*) principle 9, which calls for robust, standardized measures and cross-European validation in public mental health research [1]. Partner organizations in the Danish ABC are also seeking a tool to monitor and evaluate awareness and adoption of mental health promoting behaviours across target groups and the general population [31].

To our knowledge, there are no validated measures specifically targeting *mental health promoting behaviours*. In this study, mental health promoting behaviours is conceptualized as a multidimensional construct expressed through the three domains of Act, Belong, and Commit. These domains are treated as conceptually distinct but related components that together represent an overall pattern of behaviours that promote mental health. Clarifying this structure is important, as it allows examination of both the

overall behavioural construct and the potentially differential contributions of each domain. Developing and validating such an instrument is essential, as it enables monitoring of mental health promoting behaviours on a population level, evaluation of mental health promotion interventions, and exploration of associations between mental health promoting behaviours and mental health and other relevant outcomes. The aim of this study therefore is to describe the development and assessment of psychometric properties of the ABC-Mental Health Promoting Behaviours (ABC-MHPB) scale in a Danish population-based sample.

2 Methods

2.1 Development of the Scale

In 2013 the Australian Act Belong Commit team published a self-help Guide to Keeping Mentally Healthy that included a questionnaire to assess how much individuals acted (4 items), belonged (5 items) and committed (6 items) [32]. A statewide survey in 2012 had established that each of these three measures (and their combined total) correlated moderately but statistically significantly with respondents' scores on the Warwick Edinburgh Mental Well-being Scale (WEMWBS).

In 2016, the Danish ABC research team endeavoured to translate and qualitatively explore the Guide and the measurement tool [33]. The translated measurement tool was also included in a larger representative Danish survey to statistically validate the scale in a Danish context. However, the tool was developed with the primary purpose of enlightening the general public about what the domains of A, B and C cover, and hence was not consistent in separating behaviours from emotional states. The response options included both binary and continuous options leaving it unsuitable for scientific validation methods. Hence the Danish group embarked on developing a new measurement tool to capture mental health promoting behaviours suitable for research purposes. This interdisciplinary research group—comprising experts in public health, philosophy, social sciences, and health promotion, with expertise in mental health promotion and the ABC—led the development process, with several members co-authoring this study.

2.1.1 Defining Domains and Generation of Items: A Conceptual Approach

The development of the scale was guided by a conceptual approach. Item generation occurred through a series of workshops in spring 2022, where domain criteria and potential items for each ABC category were carefully defined following Boateng et al.'s guidelines [34]. First, we specified the boundaries and purpose of the domains of ABC behaviours, which facilitated the process of item generation. This conceptual clarification was guided by the theoretical assumption that Act, Belong, and Commit represent observable behaviours related to underlying psychological and social mechanisms. The aim was therefore to capture behaviours that plausibly activate mechanisms related to mental health outcomes. Once the domain was specified, various items were created, and, following discussion, a final set of items was chosen for statistical validation.

The research group developed the following criteria for the development of items to be validated: (i) all items were required to specify a behaviour, (i.e., that one 'does something') and not refer to a state or state of mind or emotion, such as 'is', 'has', or 'feels'; (ii) the items had to focus on mental health promoting *behaviours* rather than on *knowledge* of them or capturing the *state* of mental health and/or well-being itself; (iii) the items needed to be 'as distinguishable as possible' from each other and designed to differentiate between A, B, and C (e.g., pertaining only to 'active' or 'activity' in A, and pertaining only to 'social' in B, etc.; (iv) the items should be applicable across a range of everyday settings, including work and educational contexts, as well as other domains relevant to public mental health as the focus is on how much individuals engage in mental health–promoting behaviours overall, not in which settings they occur; and (v) the scale

should be applicable in survey designs, and thus be as brief as possible as questionnaire length is often limited. The items were developed to reflect prototypical behavioural expressions within each domain, ensuring coverage of diverse forms of engagement rather than specific activities. To facilitate this, it was decided that each item should be accompanied by examples in parentheses to illustrate diverse ways of engaging in the behaviour, thus helping to minimize demographic and socioeconomic biases. In the final workshop, 10 items were chosen for testing and validation (see Supplementary Table S1 for specific items and response options). The 10 items were included in a national cross-sectional survey called the Realdania Quality of Life Survey (Realdania Survey) [35].

2.1.2 Pilot Testing and Refining Items

Pre-testing was conducted to ensure that the items were relevant to and comprehensible by the target population, and hence to reduce misunderstandings and minimize measurement error [34]. A pilot testing of the questionnaire for the Realdania Survey was carried out by Statistics Denmark from 21 January until 03 February 2023. The pilot testing involved 600 respondents (age 18+) and encompassed a web survey (CAWI) (N = 300) as well as telephone interviews (CATI) (N = 300). Prior to the quantitative pilot testing, 20 cognitive interviews were conducted by three interviewers employed at Statistics Denmark. Nine of the interviews were conducted as CATI-interviews, while 11 were follow-up interviews with respondents who had answered the survey digitally. The interviews explored face validity in terms of whether the respondents found the questions meaningful and understandable, whether response categories were exhaustive, and whether the questionnaire was deemed relevant to them. In general, the questionnaire was generally perceived as easy to fill out and the topic was perceived as relevant to the respondents. Following the pilot testing, minor adjustments were made to the questionnaire as some respondents had difficulties grasping what the term 'meaningfulness' meant. Hence, examples of meaningfulness were added to the original version (e.g., doing something meaningful by setting a goal, cultivating an interest, or having a hobby).

2.1.3 Translation of Items from Danish to English

To enable international publication, a forward–backward translation from Danish to English was made. This involved translating items into the target language (here: English) and then back into the original language [36]. This procedure was employed to identify and resolve discrepancies, ensuring both linguistic and conceptual equivalence across versions of the scale [37]. As part of the *Realdania Survey* [35], the questionnaire was translated into English to accommodate respondents who did not read and understand Danish. This translation was performed using a bureau called "EasyTranslate" appointed by Statistics Denmark and served as the first step in the forward-backward translation process. The translations from English to Danish were carried out by two independent bilingual individuals who were not involved in the development of the scale. Minor revisions were subsequently made to the English version to improve consistency with the Danish translation (Note: This paper reports only on validation of the Danish version in the Danish setting. Responses to the English version were not included in the analyses; see Section 2.2).

2.2 Study Design

Our primary sample consisted of data from the national cross-sectional Realdania survey, including a random representative sample of Danish men and women aged 18 years and above drawn from the Danish Civil Registration System. Statistics Denmark sent an electronic letter to all sampled individuals in the period 23 May 2023–30 October 2023 with information about the study and an invitation to participate. In total, 346,426 persons were invited to participate, of whom 132,468 agreed to participate (a 38.2% response

rate). Of these 132,468 participants, 7189 (5.4%) were excluded because they did not answer the questions needed for this analysis, and 6699 (5.1%) were excluded because they answered the survey in a language other than Danish. Hence, the final sample size was 119,221 participants. The age range of the final study sample was 18–103 years old. 6 individuals were in the age range of 100–103 years old. All participants, including those aged 100–103 years, completed the same digital questionnaire, with no formal use of proxy respondents.

2.2.1 Measures

Mental health promoting behaviours: 10 items (listed in Supplementary Table S1) were included for a potential ABC-MHPB scale, where respondents were asked "How often do you do the following?", followed by the 10 items. Conceptually, these included: three Act items (pertaining to physical, mental, and restorative activities); three Belong items (pertaining to engagement with close social ties, broader social engagement, and weak social ties); and four Commit items (pertaining to hobbies and goal setting, charity work and volunteering, cultural engagement, and spiritual or religious engagement). Response options were: 'Never' (0); 'Less than once a year' (1); '1–3 times a year' (2); '1–2 times a quarter' (3); '1–3 times a month' (4); '1–2 times a week' (5); '3–5 times a week' (6); 'Every day or almost every day' (7).

2.2.2 Other Measures

Additional measures listed below were included in the validation study to assess relations with similar variables and other concepts expected to be associated with mental health promoting behaviours.

SWEMWBS: The Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS) is a 7-item measure used to monitor mental well-being in the general population based on a conceptualization of mental well-being as feeling good and functioning well. The scale has been validated in Denmark [38]. It consists of 7 positively worded questions asking respondents to describe their experience of each statement within the past two weeks using a 5-point Likert scale: from 1 (none of the time) to 5 (all of the time). Summing item scores lead to a score ranging from 7 to 35, where higher scores indicate higher mental well-being. The final scores are transformed to a metric score to enhance scaling properties (also ranging from 7–35, for more information see [39]). Cut-points for SWEMWBS have been developed in prior research [40,41] for three mental well-being categories in the general population: low, moderate, and high. These cut-points have recently been shown to significantly predict differential risk for common mental disorders [42]. The cut-points for SWEMWBS are as follows: low mental well-being 7.00–19.98; moderate mental well-being 19.99–29.30; high mental well-being 29.31–35.00. In this study, we utilized the SWEMWBS continuous variable to assess correlations, and the SWEMWBS three-category variable as an outcome in a multinomial logistic regression.

Life satisfaction: Life satisfaction was assessed with a single question: "Overall, how satisfied are you with your life nowadays?" with 11 response options ranging from 'not at all' (0) to 'completely satisfied' (10).

Satisfaction with life situation, health and social relations: Using the same response options as for life satisfaction, respondents were asked how satisfied they were with the following: (a) your education, (b) your current job, (c) your economic situation, (d) your housing, (e) the area you live in (your neighbourhood, local area), (f) your health, (g) your social relations (to family, friends, neighbours, etc.).

Loneliness: The short form of the University of California, Los Angeles (UCLA) Loneliness Scale (also referred to as the Three-Item Loneliness Scale—T-ILS) was used to assess loneliness [43,44]. The scale is comprised of three negatively worded questions relating to feelings of isolation, feeling left out, and lacking companionship. The three response options are coded as 1 (hardly ever), 2 (some of the time) and 3 (often).

Scores are summed to create a total score ranging from 3 to 9, with higher scores indicating a greater degree of loneliness. In accordance with previous literature, a score of 7 or above was used as a cutoff-point for loneliness [45]. In this study, we utilized the loneliness continuous variable to assess correlations and the loneliness binary variable as an outcome in a logistic regression.

Other variables included in the present study were sex (male, female), age, education (primary or unknown; youth education; tertiary education—low to high), employment status (employed, not employed or unknown), country of origin (Denmark; other), and living arrangements (not in a relationship; married or in a relationship—not living with a partner; married or in a relationship—living together), and finally, the region where people live (The North Denmark Region; Central Denmark Region; The Region of Southern Denmark; The Capital Region of Denmark; Region Zealand).

2.3 Steps of Validation and Statistical Procedures

Validation of the ABC-MHPB scale examined: (1) factor structure assessing content validity, goodness-of-fit through confirmatory factor analysis (CFA), as well as measurement invariance testing (also through CFA); (2) internal consistency by Cronbach's alpha; and (3) relations to relevant measures. Psychometric analyses were conducted using Stata.

We hypothesized a first-order three-factor model, Act (A: items a–c), Belong (B: items d–f), and Commit (C: items g–j)—in which each observed item was specified to load on its respective latent factor, with unique measurement error terms for each item, and the three latent factors freely allowed to correlate. This specification accounts for the shared variance among items within each factor and separates true score from error variance. Although this was our main hypothesis of the scale structure, we also tested a one-factor model. CFA was estimated using Stata's SEM (version 18; StataCorp, College Station, TX, USA) with Satorra-Bentler corrections for non-normality, i.e., vce(sbentler). As recommended by Hoyle and Panter [46], we used several fit indices including the Root Mean Square Error of Approximation (RMSEA), the standardized root mean square residual (SRMR), the Comparative Fit Index (CFI), and the Tucker-Lewis Index (TLI). Values of 0.95 or greater for the CFI and TLI were considered to reflect good model fit. RMSEA and SRMR values of 0.06 or less were considered to indicate good fit, although values up to 0.08 were considered acceptable [47]. A factor loading of at least 0.30 is considered the minimum criterion for an item [48]. We assessed measurement invariance across sex (women vs. men), age groups (18–24 years of age vs. 25–80+), and education (primary or unknown vs. youth-tertiary education), examining differences in Alternative Fit Indexes. We considered a model invariant when the respective constraint produced at most −0.01 change in CFI and TLI, paired with changes of up to 0.015 in RMSEA, and 0.030 (for metric invariance) or 0.015 (for scalar or residual invariance) in SRMR [49]. If full measurement invariance did not hold, we used partial invariance testing, which means we allowed the specific item(s) that differed between groups to vary freely while keeping the rest of the model the same. This approach keeps the overall structure intact but makes small adjustments, so that the model fits fairly across groups [50].

Distributions were examined for normality and any floor and ceiling effects. We also examined individual items and total scores for floor and ceiling effects. Instruments exhibit floor or ceiling effects if more than 15% of respondents record the lowest or highest score [51]. Next, internal consistency (reliability) was evaluated using Cronbach's alpha, with a conventional threshold of 0.70 considered to reflect good reliability (39, 41). For short scales with few items (e.g., three-item subscales), lower alpha values are expected due to the limited number of items, and values around 0.50–0.60 can still be considered reasonable. Discriminant validity was assessed by calculating Pearson correlations between the ABC-MHPB scale and level of education. Convergent validity was assessed by calculating Pearson correlations between

the ABC-MHPB scale and mental well-being, life satisfaction, health satisfaction, and loneliness. We hypothesized that ABC-MHPB average scores would be positively correlated with mental well-being, life satisfaction, health satisfaction and education, and negatively correlated with loneliness [24,26,52]. The size of correlation coefficients was based on Cohen's rule of thumb, i.e., weak: r = 0.1; moderate = 0.3; strong = 0.5 [53].

Finally, we conducted simple linear regressions with mental well-being and loneliness, and we also proposed an alternative practical operationalization reflecting high versus low ABC engagement, where associations were investigated with the categorical three-level mental well-being scale (multinomial logistic regression) and the binary loneliness scale (logistic regression).

3 Results

3.1 Respondent Characteristics

Sample characteristics are shown in Table 1. The mean age of the study sample was 52.1 years (SD = 19.1), and 54.9% were females.

Table 1: Characteristics of the study sample.

Characteristic/Category	N (%) or Mean ± SD
Total number of respondents, N (%)	119,221 (100)
Sex, N (%)	
Male	53,733 (45.1)
Age (years)	
18–24	12,096 (10.2)
25–34	16,442 (13.8)
35–44	13,456 (11.3)
45–54	18,335 (15.4)
55–64	22,227 (18.6)
65+	36,665 (30.8)
Education, N (%)	
Primary or unknown	23,036 (19.3)
Youth education	48,418 (40.6)
Tertiary education—low to high	47,767 (40.1)
Employment status, N (%)	
Employed	84,837 (71.2)
Not employed, other or unknown	34,384 (28.8)
Country of origin, N (%)	
Denmark	110,019 (92.3)
Other (not Denmark)	9202 (7.7)
Living arrangements, N (%)	
Single	30,425 (25.2)
Married or in relationship, not living with partner	10,543 (8.8)
Married or in relationship, living with partner	74,243 (62.3)
Unknown or refuse to answer	4010 (3.4)
Region, N (%)	
The North Denmark Region	12,304 (10.3)
Central Denmark Region	27,866 (23.4)
The Region of Southern Denmark	26,490 (22.2)
The Capital Region of Denmark	35,443 (29.7)
Region Zealand	17,118 (14.4)
Self-rated health (range 0 low–10 high), Mean ± SD	7.1 ± 2.4
Missing data, N (%)	394 (0.3)
Mental well-being (continuous, range 7–35), Mean ± SD	24.2 ± 4.0

Table 1: *Cont.*

Characteristic/Category	N (%) or Mean ± SD
Mental well-being (categorical), N (%)	
Low	6876 (5.8)
Moderate	84,587 (71.0)
High	27,758 (23.3)
Loneliness (continuous, range 3–9), Mean ± SD	4.5 ± 1.7
Loneliness (categorical), N (%)	
Present	15,168 (12.7)

3.2 Factor Structure

Table 2 shows intercorrelations between the 10 ABC-MHPB items.

Table 2: Intercorrelations between individual items.

Item	A	b	c	d	e	F	g	h	I	j
a	1									
b	0.29*	1								
c	0.40*	0.38*	1							
d	0.21*	0.20*	0.23*	1						
e	0.23*	0.18*	0.21*	0.23*	1					
f	0.22*	0.20*	0.26*	0.29*	0.32*	1				
g	0.33*	0.34*	0.40*	0.31*	0.33*	0.37*	1			
h	0.20*	0.20*	0.26*	0.24*	0.40*	0.37*	0.37*	1		
i	0.24*	0.25*	0.28*	0.22*	0.34*	0.29*	0.28*	0.29*	1	
j	0.11*	0.17*	0.25*	0.14*	0.18*	0.24*	0.28*	0.36*	0.26*	1

Note: *Statistically significant ($p < 0.05$).

CFA (see Table 3) was conducted with all items, both as a single-factor and three-factor model. None of these produced good model fit results. Examination of factor loadings revealed that item h (items are listed in Supplementary Table S1) had a factor loading of less than 0.30. Hence, this item was omitted from a further CFA (see Table 3) conducted on the remaining 9 items, which produced a good model fit for the three-factor solution only: χ^2 (24) = 5196.1; CFI = 0.96; TLI = 0.95; SRMR = 0.048; RMSEA = 0.026. The same table shows the factor loadings and factor correlations for the 9-item three-factor model. The factor correlations suggest that Commit (C) overlaps more with Act (A) and Belong (B), than Act (A) and Belong (B) overlap with each other.

Table 3: Goodness-of-fit indices based on confirmatory factor analysis.

Item	SBχ^2	Df	χ^2/df	CFI	TLI	SRMR	RMSEA
10 items; one-factor model	20,445.8	35	584.2	0.88	0.85	0.048	0.079
10 items; three-factor model	14,963.1	32	467.6	0.92	0.88	0.042	0.070
9 items; one-factor model	12,370.2	27	458.2	0.91	0.88	0.062	0.041
9 items; three-factor model	5196.1	24	216.5	0.96	0.95	0.048	0.026
Factor loadings for the 9 item three-factor model		Act (A)		Belong (B)		Commit (C)	
Item a		0.55***					
Item b		0.55***					
Item c		0.69***					
Item d				0.46***			

Table 3: *Cont.*

Item	SBχ^2	Df	χ^2/df	CFI	TLI	SRMR	RMSEA
Factor loadings for the 9 item three-factor model		Act (A)		Belong (B)		Commit (C)	
Item e				0.54***			
Item f				0.59***			
Item g						0.65***	
Item i						0.51***	
Item j						0.38***	
Factor correlations for the 9 item three-factor model		Act (A)		Belong (B)		Commit (C)	
Act (A)		-					
Belong (B)		0.30		-			
Commit (C)		0.77		0.77		-	

Note: ***$p < 0.001$. SBχ^2, Satorra-Bentler scaled chi-square; df, degrees of freedom; CFI, comparative fit index; TLI, Tucker-Lewis index; RMSEA, Root mean square error of approximation; SRMR, Standardized root-mean-square residual.

Given the 9-item model was the best fit, representing a three-factor model of mental health promoting behaviours, we further studied measurement invariance across different groups. Measurement invariance (Table 4) was supported for education. For sex, partial scalar invariance was achieved by freeing items c and e, and for age, partial scalar invariance was achieved by freeing item d. After these adjustments, differences in alternative fit indexes (ΔCFI, ΔTLI, ΔRMSEA, ΔSRMR) remained below our cut-off points.

Table 4: Measurement invariance for the 9-item ABC-MHPB scale by sex, age, and education, estimated through differences in alternative fit indices.

Measure	ΔCFI	ΔTLI	ΔSRMR	ΔRMSEA	Decision
ABC-MHPB (9 items; three-factor model) (sex)					
Configural	–	–	–	–	
Metric invariance	−0.001	0.005	0.002	−0.002	Accept
Scalar invariance	**−0.021**	**−0.016**	0	0.007	Do not accept
Scalar partial invariance, items c and e no equality constraints	−0.012	−0.007	0	0.003	Accept
ABC-MHPB (9 items; three-factor model) (age)					
Configural	–	–	–	–	
Metric invariance	−0.001	0.006	0.003	−0.003	Accept
Scalar invariance	**−0.024**	**−0.020**	0.005	0.009	Do not accept
Scalar partial invariance, item d no equality constraints	−0.011	−0.006	0	0.003	Accept
ABC-MHPB (9 items; three-factor model) (education)					
Configural	–	–	–	–	
Metric invariance	−0.001	0.004	0.004	−0.002	Accept
Scalar invariance	−0.014	−0.008	0.001	0.004	Accept

Note: Bold values violate criteria. ABC-MHPB, ABC Mental Health Promoting Behaviour scale; CFI, comparative fit index; TLI, Tucker-Lewis index; RMSEA, Root mean square error of approximation; SRMR, Standardized root-mean-square residual.

Five individual items (a, b, c, d and g) in the 9-item ABC-MHPB scale showed ceiling effects, and floor effects were observed for three individual items (e, h and j) (Supplementary Figs. S1 and S2). Neither floor nor ceiling effects were observed for the Belong (B) and Commit (C) subscales. The Act (A) subscale displayed a tendency towards ceiling effects, although it did not qualify as having a ceiling effect according to our criterion (due to the fact that averaging scores for three items produces additional values relative to

the number of response options for each item). The final 9-item ABC-MHPB scale is shown in Table 5 and illustrated in Fig. 1.

Table 5: The ABC-Mental Health Promoting Behaviours (ABC-MHPB) scale.

Subscale	Item	Preamble
		*How often do you do the following?**
Act (A)	Act 1	*I do something physically active (*e.g., *go for a walk, work in the garden or play sports).*
	Act 2	*I do something that requires me to think and concentrate (*e.g., *read, paint, play music, solve a crossword, or play a game).*
	Act 3	*I do something that makes me feel calm (*e.g., *meditate or spend time in nature).*
Belong (B)	Belong 1	*I spend time with people I feel good being around (*e.g., *family, friends or colleagues).*
	Belong 2	*I do something with others in an association, club, group or similar (*e.g., *a knitting club, football club or volunteer group).*
	Belong 3	*I do something to connect with people I do not know well (*e.g., *chat with checkout staff or colleagues I do not work closely with).*
Commit (C)	Commit 1	*I do something that I find meaningful (*e.g., *setting a goal, cultivating an interest or having a hobby).*
	Commit 2	*I make use of cultural activities and services (*e.g., *visit museums, go to concerts or the theatre).*
	Commit 3	*I engage in something bigger than myself (*e.g., *reflect on life, practice a faith or do something spiritual).*

Note: * The introductory question 'How often do you do the following?' was presented once and applied to all items. This wording was identical to the version used in the pilot study. Response options: 'Never' (0); 'Less than once a year' (1); '1–3 times a year' (2); '1–2 times a quarter' (3); '1–3 times a month' (4); '1–2 times a week' (5); '3–5 times a week' (6); 'Every day or almost every day' (7).

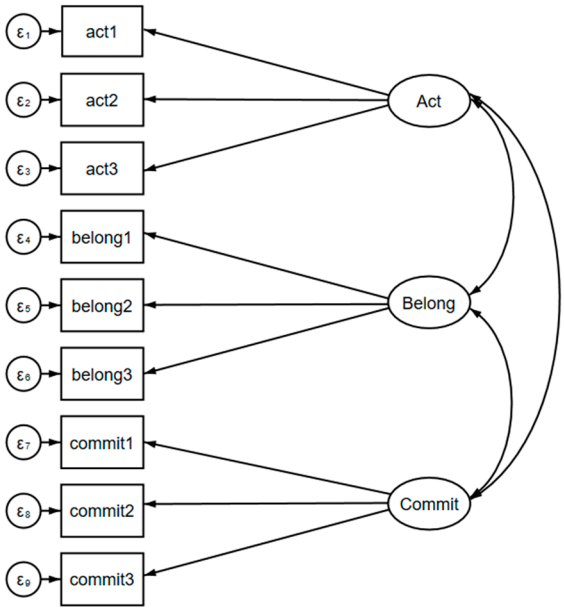

Figure 1: The first order three-factor ABC-MHPB model. This figure illustrates the final first-order three-factor ABC-MHPB model used in the analyses. Observed variables (items) are represented as rectangles, latent factors as circles, and single-headed arrows indicate factor loadings. Double-headed arrows indicate correlations between factors. Numerical estimates are not shown.

Regarding distribution, the Act (A) subscale displayed a left-skewed distribution, while the Belong and Commit subscales displayed normal distributions. The mean (SD) for each of the three subscales were as follows: Act (A) 5.4 (1.1); Belong (B) 4.3 (1.4); Commit (C) 3.3 (1.4). In terms of internal consistency (reliability) and discriminant validity (see Table 6), each factor in the ABC-MHPB scale had alphas around 0.5–0.6, and positive weak correlations with education, positive moderate correlations with mental well-being, life satisfaction, and health satisfaction, and negative moderate correlations with loneliness. All correlations were statistically significant.

Table 6: Internal consistency within each factor and relations to other or similar measures.

Measure	α	Act (A)	Belong (B)	Commit (C)
Act (A)	0.62	-	-	-
Belong (B)	0.52	0.39*	-	-
Commit (C)	0.51	0.47*	0.50*	-
Education	-	0.13*	0.07*	0.17*
Mental well-being	0.85	0.31*	0.38*	0.29*
Life satisfaction	-	0.24*	0.32*	0.20*
Health satisfaction	-	0.22*	0.25*	0.20*
Loneliness	0.83	−0.21*	−0.35*	−0.18*

Note: * Statistically significant ($p < 0.05$). Education was a single variable and life and health satisfaction were both single-items. Hence, internal consistency cannot be calculated for those.

Reflecting the multidimensional structure identified in the CFA, the ABC-MHPB scale should be applied as three distinct subscales (Act, Belong, and Commit), with subscale means serving as the primary scoring method, as this approach most accurately reflects the underlying model. This represents the standard scoring approach. In what follows, we also propose an alternative practical operationalization to aid interpretation.

Finally, linear regressions using the continuous subscale means (rounded to whole numbers) were estimates with continuous outcomes on mental well-being and loneliness. The results consistently showed that Belong (B) was more strongly associated with the outcomes than Act (A) and Commit (C). With regard to loneliness, associations for the two were similar, whereas for mental well-being, Act (A) was more strongly associated with the outcome than Commit (C). Further, a practical operationalization of the ABC-MHPB scale was proposed, based on weekly activity (corresponding to at least 1–2 times per week) on each Act (A), Belong (B), and Commit (C) subscale mean (subscale means were rounded to whole numbers). Weekly activity was chosen because the most frequent responses to the majority of the items were weekly activity and because prior research has indicated that mental health benefits are experienced particularly when engaging in ABC-related behaviours on a minimum weekly basis [54,55]. At least weekly engagement at the domain-level was defined as ‘high engagement’ and below weekly engagement at the domain-level was defined as ‘low engagement’. The subscale mean represents an estimate of the domain itself: the individual items function as indicators of that broader behavioural tendency, so the mean score reflects the domain-level engagement rather than just the simple average of the specific activities.

A four-point variable was generated with the following operationalization: 0 (low engagement in A and B and C); 1 (high engagement in A, B, or C); 2 (high engagement in A and B, A and C, or B and C); 3 (high engagement in A, B and C). The distribution was as follows: 0-low engagement in A, B, and C: 12,803 (10.7%); 1-high engagement in either A, B, or C: 45,771 (38.4%); 2-high engagement in AB, AC, or BC: 43,093 (36.2%); 3-high engagement in A, B, and C: 17,554 (14.7%).

Subsequently, a multinomial logistic regression model was performed, with the three-level mental well-being variable as the outcome (relative to the moderate mental well-being group), and a logistic

regression model with the binary loneliness variable as the outcome. For each, the predictor was the Act Belong Commit (ABC) variable, with high engagement in either A, B or C as the reference category. The models were adjusted for sex (binary), age (continuous), country of origin (categorical), education (categorical), employment status (binary), living arrangements (categorical), region (categorical), and health satisfaction (continuous).

Table 7 shows the results of the regressions. People who had low ABC engagement were twice as likely to have low mental well-being, and almost 50% more likely to be lonely, as compared to people who had high engagement in either A, B or C. People who had low ABC engagement were also about 30% less likely to have high mental well-being. Regarding people who engaged in more ABC domains than the reference group: People who had high engagement in two out of three ABCs were about 60% less likely to have low mental well-being, and about 50% less likely to be lonely. They were also about 75% more likely to have high mental well-being. Finally, people who had high engagement in both A, B, and C were about 70% less likely to have low mental well-being and 70% less likely to be lonely, and they were more than two and a half times (OR = 2.68) more likely to have high mental well-being.

Table 7: Act Belong Commit (ABC) predicting mental well-being and loneliness in the Danish general population.

Linear Regression			
Subscale	**Mental Well-Being (Range 7–35)**		
	Coef	**95% CI**	***p*-Value**
Act (A) subscale (range 0–7), mean	0.66	0.64, 0.68	<0.001
Belong (B) subscale (range 0–7), mean	0.74	0.73, 0.76	<0.001
Commit (C) subscale (range 0–7), mean	0.55	0.54, 0.57	<0.001
Subscale	**Loneliness (Range 3–9)**		
Act (A) subscale (range 0–7), mean	−0.15	−0.16, −0.15	<0.001
Belong (B) subscale (range 0–7), mean	−0.29	−0.30, −0.29	<0.001
Commit (C) subscale (range 0–7), mean	−0.14	−0.14, −0.13	<0.001
Multinomial Logistic Regression (Reference = Moderate Mental Well-Being)			
	Low Mental Well-Being		
	RRR	**95% CI**	***p*-Value**
Act Belong Commit (ABC)			
Low engagement in ABC	2.02	1.89, 2.16	<0.001
High engagement in either A, B, or C	1		
High engagement in AB, AC, or BC	0.41	0.38, 0.44	<0.001
High engagement in ABC	0.27	0.23, 0.31	<0.001
	High Mental Well-Being		
Act Belong Commit (ABC)			
Low engagement in ABC	0.71	0.67, 0.76	<0.001
High engagement in either A, B, or C	1		
High engagement in AB, AC, or BC	1.75	1.69, 1.81	<0.001
High engagement in ABC	2.68	2.57, 2.80	<0.001
Logistic Regression			
	Loneliness		
	OR	**95% CI**	***p*-Value**
Act Belong Commit (ABC)			
Low engagement in ABC	1.45	1.38, 1.53	<0.001

Table 7: *Cont.*

Logistic Regression			
High engagement in either A, B, or C	1		
High engagement in AB, AC, or BC	0.49	0.43, 0.47	<0.001
High engagement in ABC	0.33	0.31, 0.36	<0.001

Note: All models were adjusted for sex, age, country of origin, education, employment status, living arrangements, region, and health satisfaction. RRR, relative risk ratio; OR, odds ratio; CI, confidence interval.

4 Discussion

This study presents the development and validation of the first scale specifically designed to measure mental health promoting behaviours grounded in the Act Belong Commit (ABC) framework. The scale addresses a gap in the field and provides a tool with potential relevance for cross-cultural and international mental health promotion research. Ten items were developed initially. Based on prior research on the development of the ABC framework [20,56], we hypothesized that the data would fit a three-factor model reflecting the Act, Belong, and Commit domains. Accordingly, we employed confirmatory factor analysis (CFA) to test the structure of the hypothesized model [34,57]. Neither a three-factor nor a one-factor model yielded acceptable fit for the initial 10-item version. After removing one item with a low factor loading, the revised 9-item scale demonstrated acceptable model fit, with three items loading on each of the three theorized factors. This pattern confirms that the ABC-MHPB scale captures a multidimensional construct encompassing three complementary domains of mental health promoting behaviours. In practice, such behaviours can be understood as a set of related but distinct tendencies to engage in actions that support mental health and well-being. Empirically, the construct is best represented by three correlated yet separable domains—Act (A), Belong (B), and Commit (C)—each capturing specific behavioural patterns. Each factor represents a distinct behavioural tendency, but the factors are positively correlated, indicating that individuals who engage in behaviours in one domain (e.g., Act) also tend to engage in behaviours in the other domains (Belong and Commit), although this is not true for everyone. Each domain is considered modifiable, open to change through awareness, habit formation, and education [10,56]. With regard to practical use, the scale should be used as three subscales—Act (A), Belong (B), and Commit (C)—with subscale means serving as the primary scoring approach. Subscale means provide practical observed scores reflecting the Act (A), Belong (B), and Commit (C) domains, capturing the broader behavioural tendencies these factors represent rather than merely the three individual items in each factor.

Measurement invariance testing showed that the three-factor model was fully invariant across education, but only partially invariant across sex and age. This indicates that most items function equivalently across groups, while a few items may be interpreted somewhat differently depending on participants' sex or age. However, holding the other items constant, the scale performs well for all groups, and this partial variation is realistic, as it is unlikely that all items are interpreted identically by all groups in practice [50]. It may be noted though that comparisons of latent means across sex and age may be interpreted with caution, as these few items did not function identically across the groups. Internal consistency (reliability) within each factor was below the conventional 0.70 criterion, with alpha values of 0.60 for Act and 0.50 for Belong and Commit. This is likely due to the small number of items per factor (three), which naturally limits Cronbach's alpha even when the items are conceptually coherent and reasonably correlated. For very short scales, alpha values in the 0.50–0.60 range are commonly observed and can still be considered acceptable, particularly when factor loadings from CFA are adequate and the subscales reflect meaningful constructs [48]. We consider this a minor concern, as the good model fit from the CFA

provides stronger evidence of internal consistency than Cronbach's alpha alone. Some of the single items showed ceiling effects, and the same tendency was exhibited for the Act factor. The Act factor accordingly displayed a left-skewed distribution, while the Belong and Commit factors displayed normal distributions. The left-skewed distribution of the Act factor likely reflects ceiling effects for all three Act items, as the behaviours captured by this domain are common, easily accessible, and can be performed individually without social involvement or engagement in structured or meaning-oriented activities, resulting in higher response frequencies compared with the other domains. Composite mean scores correlated as expected, i.e., positively with measures of well-being and health, and negatively with loneliness.

As a means to aid interpretation, we have also proposed an operationalization of the ABC-MHPB scale. The operationalisation reflects high versus low engagement in mental health promoting behaviours within the ABC domains. This approach presupposes not only engagement across the three broad domains (Act, Belong, Commit) but also diversity of activities within each domain, consistent with the ABC framework, which holds that mental health promotion is likely to arise especially from a varied pattern of activities rather than reliance on a single or isolated behaviour. Thus, with this operationalisation, individuals who engage frequently in only one activity within a domain but rarely in the others may not meet the high threshold at the domain-level, because each domain captures a broader behavioural tendency. This also aligns with the reflective measurement logic of CFA, in which each item taps part of the underlying construct and the domain-level score reflects the overall behavioural pattern rather than any single behaviour. Also, the operationalisation does not collapse the three factors into a single score; it classifies participants based on each subscale separately and therefore remains consistent with the established three-factor structure. The results are cross-sectional and hence causality inference is not possible. That said, the results show a cross-sectional pattern characteristic of a dose-response association with both outcomes, where low Act Belong Commit (ABC) engagement is consistently associated with poorer outcomes (greater risk of low mental well-being and loneliness), while increasingly higher ABC engagement across domains is associated with more favourable outcomes (greater likelihood of high mental well-being and lower risk of loneliness). It may be noted that the operationalisation represents one way to organise the data, but there may be other ways to operationalise scores on the ABC-MHPB scale that are also useful. Future research to explore this is warranted. Importantly, the high/low categorisation is not intended to be normative or to suggest that individuals who do not meet the 'high' threshold are not engaging in mentally healthy behaviours. Rather, it is a practical way of organising the data into broad categories, allowing the scale to be used more effectively for scientific analysis and comparison.

4.1 Strengths and Limitations

To our knowledge, no validated instruments exist that specifically target mental health promoting behaviours as a distinct construct. Some existing measures include items that may indirectly reflect such behaviours, such as items on physical activity, social engagement, or purpose in life, but these are typically embedded within broader well-being or lifestyle scales and are not structured around a coherent theoretical framework. Moreover, these instruments often focus on outcomes or attitudes rather than on behaviours that can be actively promoted to support mental health. The ABC-MHPB scale addresses this gap by offering a brief, theory-driven measure that captures concrete behaviours aligned with the Act (A), Belong (B), and Commit (C) domains. The ABC-MHPB scale may serve as a useful tool for monitoring population-level engagement in mental health promoting behaviours, evaluating the impact of interventions, and exploring behavioural pathways to mental health outcomes. However, compared to broader well-being measures, the

ABC-MHPB scale may not capture more nuanced psychological or emotional dimensions. It focuses on frequency of behaviour and not on motivational or contextual factors.

While the ABC-MHPB scale offers a theory-driven approach to measuring and monitoring mental health promoting behaviours, we acknowledge that it does not represent an exhaustive list of all behaviours that may support mental health. The scale is grounded in the Act Belong Commit (ABC) framework, which emphasizes various forms of active engagement. However, other important behaviours such as adequate sleep or healthy eating also play significant roles in promoting mental health but fall outside the scope of this scale.

Several limitations should be considered. One limitation concerns the scale's face validity, which could have been explored more thoroughly. As part of the pilot testing, 20 qualitative interviews were conducted by trained interviewers at Statistics Denmark to explore respondents' understanding of the questionnaire. While the interviews contributed to assessing face validity, they focused on the overall questionnaire rather than specifically on the items developed for this scale, which may have limited the depth of insight into those particular items. Future research could benefit from a more extensive cognitive testing phase to further strengthen the scale's face validity. The response rate of the survey was relatively low (38.2%). While this is not uncommon in large-scale population surveys, it raises the possibility of selection bias. In line with this, the current validation was based on a single, albeit large, sample of an adult population in Denmark. If individuals with lower levels of mental well-being were less likely to participate, and were also less likely to engage in Act, Belong, and Commit behaviours, the sample may underrepresent individuals with lower well-being and lower behavioural engagement. This could result in overestimation of average engagement levels and average well-being in the population. In addition, restricted variability due to underrepresentation of individuals at the lower end of the well-being distribution could attenuate observed associations between behavioural engagement and well-being. However, if respondents were disproportionately health-conscious individuals with relatively high engagement but varying well-being, associations could also be overestimated. Thus, mean levels and effect sizes should be interpreted with this in mind. Future research should aim to improve participation rates and assess potential non-response bias, for example by comparing respondents and non-respondents on available demographic characteristics or through registry linkage where feasible. Longitudinal studies would also help clarify the directionality of associations between engagement in mental health promoting behaviours and subsequent changes in mental well-being. Additionally, studies specifically targeting populations with lower levels of well-being may provide important insights into whether the observed associations differ in more vulnerable groups. Finally, the current study was cross-sectional in nature, and the scale has not yet been tested for its sensitivity to change over time, and the regression results are subject to the possibility of reverse causality or a third variable driving associations.

4.2 Implications

Future research should investigate the applicability and psychometric properties of the ABC-MHPB scale in other populations, including adolescents and individuals with specific mental health vulnerabilities. Replicating the validation process in more diverse and international samples will be essential to assess the scale's generalizability across cultural and socio-demographic contexts. To determine the scale's suitability for use in intervention studies, such as pre-post evaluations or longitudinal designs, future studies should examine its test-retest reliability and sensitivity to change. Establishing these properties will clarify whether the scale can effectively detect changes in mental health promoting behaviours over time. Furthermore,

prospective and intervention studies are warranted to explore associations between ABC-MHPB scores and mental health outcomes.

Practically, the ABC-MHPB scale offers a standardized method for comparing mental health promotion initiatives and interventions. Within organisations applying the ABC framework, it may support the identification of interventions that most effectively foster behavioural engagement. If adopted internationally, the scale could facilitate cross-national comparisons. The scale has been forward-backward translated into English to enable the inclusion in this paper but has not been tested and validated in other contexts or languages than Danish. If the scale is being used internationally, thorough translations and validations of the scale are needed (see Availability of Data and Materials section for how to register use of the scale).

Conceptually, the ABC-MHPB scale advances the field by defining and operationalizing mental health promoting behaviours as a distinct and measurable construct. The development and validation of this scale confirms the theory that three distinct, yet related behavioural factors belong under the same overall multidimensional ABC-behavioural construct. This emergent construct enables systematic investigation of such behaviours in empirical research and contributes to the broader theoretical understanding of mental health promoting behaviours.

5 Conclusions

In this study, we reported the development and psychometric properties of the ABC-Mental Health Promoting Behaviour (ABC-MHPB) scale for assessing mental health promoting behaviours in the Danish population. We hypothesized that the data would fit a first-order three-factor model, and a confirmatory factor analysis revealed that optimal model fit was obtained after removal of one item, resulting in a 9-item three-factor ABC-MHPB scale. The scale shows full invariance across education and partial invariance across sex and age, supporting its use for latent group comparisons with minor caution. Despite some unmet criteria regarding Cronbach's alpha, ceiling effects, and a left-skewed distribution in one factor, the scale shows satisfactory validity. The findings confirm the psychometric soundness of the scale and validate a multidimensional psychological construct underlying mental health promoting behaviours. To our knowledge, this has not been articulated or demonstrated previously in the psychological sciences or outside of the Act Belong Commit/ABCs articulations. Regarding practical use, the scale should be applied as three subscales—Act (A), Belong (B), and Commit (C)—each representing a distinct dimension of mental health promoting behaviour. We also proposed a practical operationalization of the ABC-MHPB scale reflecting high versus low ABC engagement. Based on this operationalization, the results showed clear dose-response associations with both mental well-being and loneliness, where low ABC engagement is consistently associated with poorer outcomes (greater risk of low mental well-being and loneliness), while higher ABC engagement across domains is increasingly associated with more favourable outcomes (greater likelihood of high mental well-being, lower risk of loneliness). Overall, the scale conceptualizes mental health promoting behaviour as a measurable construct and contributes to advancing mental health promotion practice and research.

Acknowledgement: The authors would like to thank Henrik Mahncke and Realdania for including the items in the scale in their survey and making this thorough validation of the ABC-MHPB scale possible. We would also like to thank Cristian Ritz for kindly reviewing an earlier version of the manuscript and providing valuable methodological input. We gratefully acknowledge Nicoline Johanne Huusfelt and Signe Boe Rayce for their valuable assistance in translating the ABC-MHPB scale from English to Danish. During the preparation of this work, the authors used ChatGPT and Copilot (OpenAI) to support conceptual discussions regarding study design, statistical analyses, interpretation of findings, and relevant literature, as well as to assist in revising sections of the manuscript for clarity

and structure. All AI-generated output was critically reviewed, verified, and edited by the authors. The authors take full responsibility for the content of the published article.

Funding Statement: The authors received no specific funding.

Author Contributions: The authors confirm contribution to the paper as follows: conceptualization: Line Nielsen, Charlotte Bjerre Meilstrup, Ziggi Ivan Santini, Frederik Schou-Juul, Carsten Hinrichsen, Malene Kubstrup Nelausen; investigation: Ziggi Ivan Santini, Frederik Schou-Juul; writing, original draft preparation: Line Nielsen, Charlotte Bjerre Meilstrup, Ziggi Ivan Santini; writing, review and editing: Carsten Hinrichsen, Frederik Schou-Juul, Vibeke Jenny Koushede, Robert J Donovan, Malene Kubstrup Nelausen; project administration: Charlotte Bjerre Meilstrup, Line Nielsen. All authors reviewed and approved the final version of the manuscript.

Availability of Data and Materials: The ABC-MHPB scale is available for use upon registration at the following site: https://psychology.ku.dk/abc/registration-abc-mhpb/.

Ethics Approval: There is no formal agency for ethical approval of questionnaire-based survey studies in Denmark. However, the study complies with the Helsinki declaration on ethics and is registered with the Danish Data Protection Authority. The application of the survey met confidentiality and privacy requirements. The respondents' voluntary completion and returning of the survey questionnaires implied consent.

Conflicts of Interest: The authors declare no conflicts of interest.

Supplementary Materials: The supplementary material is available online at https://www.techscience.com/doi/10.32604/ijmhp.2026.079059/s1.

References

1. Forsman AWK, Aaro LE, Alonso J, Barry MM, Brunn M, Cardoso G, et al. Research priorities for public mental health in Europe: Recommendations of the ROAMER project. Eur J Public Health. 2015;25(2):249–54. [CrossRef].
2. Anwar-McHenry J, Donovan RJ. The development of the Perth charter for the promotion of mental health and wellbeing. Int J Ment Health Promot. 2013;15(1):58–64. [CrossRef].
3. Barry MM. Concepts and principles of mental health promotion. In: Implementing mental health promotion. Berlin/Heidelberg, Germany: Springer; 2019. p. 3–34. [CrossRef].
4. Golden TL, Wendel ML. Public health's next step in advancing equity: Re-evaluating epistemological assumptions to move social determinants from theory to practice. Front Public Health. 2020;8:131. [CrossRef].
5. Antonovsky A. The salutogenic model as a theory to guide health promotion. Health Promot Int. 1996;11(1):11–8. [CrossRef].
6. Langeland E, Vinje HF. The significance of salutogenesis and well-being in mental health promotion: From theory to practice. In: Mental well-being. Dordrecht, The Netherlands: Springer; 2012. p. 299–329. [CrossRef].
7. Mittelmark MB, Bauer GF, Vaandrager L, Pelikan JM, Sagy S, Eriksson M, et al. The handbook of salutogenesis. Berlin/Heidelberg, Germany: Springer; 2022. [CrossRef].
8. Donovan RJ, James R, Jalleh G, Sidebottom C. Implementing mental health promotion: The Act–Belong–Commit mentally healthy WA campaign in western Australia. Int J Ment Health Promot. 2006;8(1):33–42. [CrossRef].
9. Koushede V, Nielsen L, Meilstrup C, Donovan RJ. From rhetoric to action: Adapting the Act-Belong-Commit mental health promotion programme to a Danish context. Int J Ment Health Promot. 2015;17(1):22–33. [CrossRef].
10. Koushede V, Donovan R. The application of salutogenesis to communitywide mental health promotion: The Act-Belong-Commit/ABC's of mental health campaign and framework. In: Mittelmark MB, editor. Handbook of salutogenesis. Berlin/Heidelberg, Germany: Springer; 2022.
11. OECD. How to make societies thrive? Coordinating approaches to promote well-being and mental health. Paris, France: OECD Publishing; 2023. [CrossRef].
12. Best practice portal—Act Belong Commit [Internet]. 2024 [cited 2025 Nov 20]. Available from: https://webgate.ec.europa.eu/dyna/bp-portal/best-practice-file/427.

13. Anwar-McHenry J, Donovan RJ, Jalleh G, Laws A. Impact evaluation of the Act-Belong-Commit mental health promotion campaign. J Public Ment Health. 2012;11(4):186–94. [CrossRef].
14. Donovan R, Jalleh G, Robinson K, Lin C. Impact of a population-wide mental health promotion campaign on people with a diagnosed mental illness or recent mental health problem. Aust N Z J Public Health. 2016;40(3):274–5. [CrossRef].
15. Donovan RJ, Drane CF, Santini ZI, Jalleh G. Impact on help-seeking behaviours of a campaign perceived to decrease stigma and increase openness around mental health. Health Promot J Austr. 2024;35(4):1378–85. [CrossRef].
16. Hinrichsen C, Koushede VJ, Madsen KR, Nielsen L, Ahlmark NG, Santini ZI, et al. Implementing mental health promotion initiatives-process evaluation of the ABCs of mental health in Denmark. Int J Environ Res Public Health. 2020;17(16):5819. [CrossRef].
17. Santini ZI, Nelausen MK, Kusier AO, Hinrichsen C, Schou-Juul F, Madsen KR, et al. Impact evaluation of the "ABCs of Mental Health" in Denmark and the role of mental health-promoting beliefs and actions. Ment Health Soc Inclusion. 2022;26(3):271–91. [CrossRef].
18. Donovan RJ, Koushede VJ, Drane CF, Hinrichsen C, Anwar-McHenry J, Nielsen L, et al. Twenty-one reasons for implementing the Act-Belong-Commit—'ABCs of mental health' campaign. Int J Environ Res Public Health. 2021;18(21):11095. [CrossRef].
19. Donovan RJ, Henley N, Jalleh G, Silburn SR, Zubrick SR, Williams A. People's beliefs about factors contributing to mental health: Implications for mental health promotion. Health Promot J Austr. 2007;18(1):50–6. [CrossRef].
20. Nielsen L, Sørensen BB, Donovan RJ, Tjørnhøj-Thomsen T, Koushede V. 'Mental health is what makes life worth living': An exploration of lay people's understandings of mental health in Denmark. Int J Ment Health Promot. 2017;19(1):26–37. [CrossRef].
21. Fancourt D, Aughterson H, Finn S, Walker E, Steptoe A. How leisure activities affect health: A narrative review and multi-level theoretical framework of mechanisms of action. Lancet Psychiatry. 2021;8(4):329–39. [CrossRef].
22. Andersen LMB, Rasmussen AN, Reavley NJ, Bøggild H, Overgaard C. The social route to mental health: A systematic review and synthesis of theories linking social relationships to mental health to inform interventions. SSM Ment Health. 2021;1:100042. [CrossRef].
23. Steger MF. Meaning in life and wellbeing. In: Slade M, Oades L, Jarden A, editors. Wellbeing, recovery and mental health. Cambridge, UK: Cambridge University Press; 2017. p. 75–85. [CrossRef].
24. Santini ZI, Koyanagi A, Tyrovolas S, Haro JM, Donovan RJ, Nielsen L, et al. The protective properties of Act-Belong-Commit indicators against incident depression, anxiety, and cognitive impairment among older Irish adults: Findings from a prospective community-based study. Exp Gerontol. 2017;91:79–87. [CrossRef].
25. Santini ZI, Nielsen L, Hinrichsen C, Tolstrup JS, Vinther JL, Koyanagi A, et al. The association between Act-Belong-Commit indicators and problem drinking among older Irish adults: Findings from a prospective analysis of the Irish Longitudinal Study on Ageing (TILDA). Drug Alcohol Depend. 2017;180:323–31. [CrossRef].
26. Santini ZI, Nielsen L, Hinrichsen C, Meilstrup C, Koyanagi A, Haro JM, et al. Act-Belong-Commit indicators promote mental health and wellbeing among Irish older adults. Am J Health Behav. 2018;42(6):31–45. [CrossRef].
27. Santini ZI, Meilstrup C, Hinrichsen C, Nielsen L, Koyanagi A, Koushede V, et al. Associations between multiple leisure activities, mental health and substance use among adolescents in Denmark: A nationwide cross-sectional study. Front Behav Neurosci. 2020;14:593340. [CrossRef].
28. Mead J, Fisher Z, Kemp AH. Moving beyond disciplinary silos towards a transdisciplinary model of wellbeing: An invited review. Front Psychol. 2021;12:642093. [CrossRef].
29. Iasiello M, Ali K, van Agteren J, Kolovos E, Kyrios M, Kashdan TB, et al. What's the difference between measures of wellbeing, quality of life, resilience, and coping? An umbrella review and concept map of 155 measures of positive mental health. Intnl J Wellbeing. 2024;14(2):1–25. [CrossRef].
30. VanderWeele TJ, Trudel-Fitzgerald C, Allin P, Farrelly C, Fletcher G, Frederick DE, et al. Current recommendations on the selection of measures for well-being. Prev Med. 2020;133:106004. [CrossRef].
31. ABC. ABC's of mental health. 2025 [cited 2026 Jan 1]. Available from: https://psy.ku.dk/abc/.
32. Robinson K, Donovan RJ, Anwar McHenry J. A great way to live life. The Act-Belong-Commit guide to keeping mentally healthy. Perth, Australia: Mentally Healthy WA, Curtin University; 2013.

33. Hammelsvang SNL, Koushede V. Guide til selvhjælp. En kvalitativ undersægelse af ABC-guiden som brugbart redskab til mental sundhedsfremme. København, Denmark: Statens Institut for Folkesundhed, Syddansk Universitet; 2016. (In Danish).
34. Boateng GO, Neilands TB, Frongillo EA, Melgar-Quiñonez HR, Young SL. Best practices for developing and validating scales for health, social, and behavioral research: A primer. Front Public Health. 2018;6:149. [CrossRef].
35. Mahncke H, Wiking M. Vores Livskvalitet. Hvad kan vi lære af de lykkeligste danskere? Copenhagen, Denmark: RealDania; 2025. (In Danish).
36. Sousa VD, Rojjanasrirat W. Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: A clear and user-friendly guideline. J Eval Clin Pract. 2011;17(2):268–74. [CrossRef].
37. Wild D, Grove A, Martin M, Eremenco S, McElroy S, Verjee-Lorenz A, et al. Principles of good practice for the translation and cultural adaptation process for patient-reported outcomes (PRO) measures: Report of the ISPOR task force for translation and cultural adaptation. Value Health. 2005;8(2):94–104. [CrossRef].
38. Koushede V, Lasgaard M, Hinrichsen C, Meilstrup C, Nielsen L, Rayce SB, et al. Measuring mental well-being in Denmark: Validation of the original and short version of the Warwick-Edinburgh mental well-being scale (WEMWBS and SWEMWBS) and cross-cultural comparison across four European settings. Psychiatry Res. 2019;271:502–9. [CrossRef].
39. Stewart-Brown S, Tennant A, Tennant R, Platt S, Parkinson J, Weich S. Internal construct validity of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS): A Rasch analysis using data from the Scottish Health Education Population Survey. Health Qual Life Outcomes. 2009;7:15. [CrossRef].
40. Stewart-Brown S, Samaraweera PC, Taggart F, Kandala NB, Stranges S. Socioeconomic gradients and mental health: Implications for public health. Br J Psychiatry. 2015;206(6):461–5. [CrossRef].
41. Santini ZI, Stougaard S, Koyanagi A, Ersbøll AK, Nielsen L, Hinrichsen C, et al. Predictors of high and low mental well-being and common mental disorders: Findings from a Danish population-based study. Eur J Public Health. 2020;30(3):532–8. [CrossRef].
42. Santini ZI, Ekholm O, Koyanagi A, Stewart-Brown S, Meilstrup C, Nielsen L, et al. Higher levels of mental wellbeing predict lower risk of common mental disorders in the Danish general population. Ment Health Prev. 2022;26:200233. [CrossRef].
43. Hughes ME, Waite LJ, Hawkley LC, Cacioppo JT. A short scale for measuring loneliness in large surveys: Results from two population-based studies. Res Aging. 2004;26(6):655–72. [CrossRef].
44. Russell D, Peplau LA, Cutrona CE. The revised *UCLA* Loneliness Scale: Concurrent and discriminant validity evidence. J Pers Soc Psychol. 1980;39(3):472–80. [CrossRef].
45. Boehlen F, Herzog W, Quinzler R, Haefeli WE, Maatouk I, Niehoff D, et al. Loneliness in the elderly is associated with the use of psychotropic drugs. Int J Geriatr Psychiatry. 2015;30(9):957–64. [CrossRef].
46. Hoyle RH, Panter AT. Writing about structural equation models. In: Hoyle RH, editor. Structural equation modeling: Concepts, issues and applications. London, UK: Sage; 1995. p. 158–98.
47. Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Struct Equ Model A Multidiscip J. 1999;6(1):1–55. [CrossRef].
48. Acock AC. Discovering structural equation modeling using stata. Collage Station, TX, USA: Stata Press; 2013.
49. Chen FF. Sensitivity of goodness of fit indexes to lack of measurement invariance. Struct Equ Model A Multidiscip J. 2007;14(3):464–504. [CrossRef].
50. Kang Y, McNeish DM, Hancock GR. The role of measurement quality on practical guidelines for assessing measurement and structural invariance. Educ Psychol Meas. 2016;76(4):533–61. [CrossRef].
51. McHorney CA, Tarlov AR. Individual-patient monitoring in clinical practice: Are available health status surveys adequate? Qual Life Res. 1995;4(4):293–307. [CrossRef].
52. Farnier J, Shankland R, Kotsou I, Inigo M, Rosset E, Leys C. Empowering well-being: Validation of a locus of control scale specific to well-being. J Happiness Stud. 2021;22(8):3513–42. [CrossRef].
53. Cohen P, West SG, Aiken LS. Applied multiple regression/correlation analysis for the behavioral sciences. East Sussex, UK: Psychology Press; 2014. [CrossRef].
54. Pollard CM, Alati R, Lawrence D, Clary M, Walton A, Dunne J, et al. The association between participation in mental health protective behaviours and mental well-being: Cross sectional survey among Western Australian adults. SSM Ment Health. 2025;7:100441. [CrossRef].

55. Santini ZI, Meilstrup C, Hinrichsen C, Nielsen L, Koyanagi A, Krokstad S, et al. Formal volunteer activity and psychological flourishing in Scandinavia: Findings from two cross-sectional rounds of the European social survey. Soc Curr. 2019;6(3):255–69. [CrossRef].
56. Donovan RJ, Anwar-McHenry J. Act-belong-commit: Lifestyle medicine for keeping mentally healthy. Am J Lifestyle Med. 2014;10(3):193–9. [CrossRef].
57. Johnston R. Confirmatory factor analysis (CFA). In: Encyclopedia of quality of life and well-being research. Berlin/Heidelberg, Germany: Springer; 2023. p. 1313–4. [CrossRef].