Adaptation of a Composite Scale for Assessing Health-Promoting Behaviors in Adolescents and Young Adults[1]

L'adaptation d'une échelle composite d'évaluation des comportements de promotion de la santé pour les adolescents et les jeunes adultes

Adaptação de uma escala composta de avaliação dos comportamentos de promoção da saúde para adolescentes e jovens adultos

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1. The French version was published in issue 47(2) 2024: https://doi.org/10.7202/1114566ar

Key words: adaptation, adolescents, AHPB-27, health promotion, young adults

Introduction. Health promoting behaviour tools abound in English, while they are scarce or almost non-existent in French. This article aimed to validate a composite questionnaire to identify health promoting or risky behaviours. Method. The ten steps of adapting psychological tests/scales provide by Gana et al. (2021) were applied to data collected from 343 adolescents and young adults aged 15-25 (mean = 17.6 ± 1.76) who completed a questionnaire of 51 items derive from three pre-existing scales. Results. Exploratory and confirmatory analyses support the eight dimensions structure with 27 items explaining 56.69% of variances: spiritual health; interpersonal relationship; physical exercise; stress management; appreciation of life; sleep hygiene; responsibility in health; and social support. Conclusion. The Composite Health Promotion Behaviour Assessment Questionnaire (AHPB-27) is valid for identifying health promoting behaviours among adolescents and young adults in the francophonie

Mots clés : adaptation, adolescents, AHPB-27, jeunes adultes, promotion de la sante

Les outils d'évaluation des comportements de promotion de la santé abondent en anglais alors qu'ils sont rares, voire quasi-inexistants en français. Cet article vise à valider un questionnaire composite d'identification des comportements pro-santé ou à risque. Les dix étapes de l'adaptation des tests/échelles de mesure psychologique de Gana et al. (2021) ont été appliquées aux données collectées auprès de 343 adolescents et jeunes adultes de 15-25 ans (moyenne = 17,6 ± 1,76) ayant rempli un questionnaire de 51 items issus de trois échelles préexistantes. Les analyses factorielles exploratoires et confirmatoires supportent la structure à huit dimensions avec 27 items expliquant 56,69% des variances : santé spirituelle, relation interpersonnelle, exercice physique, gestion du stress, appréciation de la vie, hygiène du sommeil, responsabilité en santé et soutien social. Le questionnaire composite d'évaluation des comportements de promotion de santé (AHPB-27) est donc valide pour identifier des comportements de promotion de la santé des adolescents et des jeunes adultes en francophonie.

Palavras-chave: adaptacao, adolescentes, AHPB-27, jovens adultos, promocao da saude

As ferramentas de avaliação dos comportamentos de promoção da saúde estão amplamente disponíveis em inglês, mas raras ou praticamente inexistentes em francês. Este artigo tem como objetivo validar um questionário compósito para identificar comportamentos pró-saúde ou de risco. Foram aplicadas as 10 etapas de adaptação de testes/escalas de medição psicológica propostas por Gana et al. (2021) aos dados recolhidos junto de 343 adolescentes e jovens adultos, com idades entre 15 e 25 anos, que responderam a um questionário de 51 itens provenientes de três escalas preexistentes. As análises fatoriais exploratória e confirmatória sustentam uma estrutura com oito dimensões e 27 itens, explicando 56,69% das variâncias: saúde espiritual, relacionamento interpessoal, exercício físico, gestão do stress, apreciação da vida, higiene do sono, responsabilidade pela saúde e apoio social. Assim, o questionário (AHPB-27) é validado para a identificação destes comportamentos entre adolescentes e jovens adultos francófonos.

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Introduction

A healthy lifestyle includes health-protective behaviors and health-promoting behaviors (Pender et al., 2011; Ping et al., 2018). In recent decades, public health specialists have paid particular attention to this concept of healthy lifestyle, emphasizing its importance for individual and general population health (Nutbeam, 2000; Smith et al., 2014). Furthermore, the World Health Organization (WHO, 2004) points out that nearly 60% of the global disease burden associated with diseases is related to unhealthy lifestyles. In the current context of global syndemic (Horton, 2020), the world is facing one of its most severe health crises due to the ongoing threat of the SARS-CoV-2 pandemic and the prevalence of chronic diseases, particularly cardiovascular diseases and associated comorbidities. Given this context, studying lifestyle and health behaviors should be a central concern for policymakers, public health specialists, and in particular, health promotion and health education specialists. Health behaviors refer to any activities undertaken by a person who believes they are healthy, and who adopts them with the aim of either preventing or detecting disease at an asymptomatic stage (Kasl & Cobb, 1966). Defined in this way, health behaviors are more closely related to health-protective behaviors.

Health-protective behaviors are defined as "any behavior performed by a person, regardless of his or her perceived or actual health status, in order to protect, promote, or maintain his or her health, whether or not such behavior is objectively effective toward that end" (Harris & Guten, 1979, p. 18). Therefore, adopting a balanced diet, reducing alcohol intake, and quitting smoking are considered preventive behaviors (Shankland & Lamboy, 2011). Health-protective behaviors can also provide information about an individual's risk factors (Chen et al., 2014) and should therefore be considered as an expression of human stabilizing tendencies aimed at reducing the probability of disease occurrence in individuals (Pender et al., 2011). There is abundant grey literature on health-promoting behavior about theory and measurement, but interest in studying and evaluating health-protective behaviors is recent.

Since the Ottawa Charter (WHO, 1986), and earlier with the Lalonde Report (1974) in Canada, health promotion has attracted political interest. It is defined as the process of enabling people to increase control over and improve their health (Chen et al., 2014; WHO, 1986). Given its importance for the development of autonomy, or rather, the empowerment of individuals, the reach of health promotion has gradually been extended beyond individuals to also address families and communities (Walker et al., 1987). Health promotion activities now target both individuals who must decide to take action for their own health, and their families, who must permanently adopt essential family practices to reduce morbidity and mortality in the population (Ministry of Public Health [Minsanté], 2016). Health promotion "prevents illness, enhances well-being, and creates healthy lifestyle at all stages of life" (Teng et al., 2010, p. 1865). Consequently, health promotion is now one of the most important challenges of the 21st century (WHO, 2009), particularly among adolescents. The goal is to increase their well-being and help them to achieve self-actualization and fulfilment (Chang, 2010).

Adolescence is a complex concept to define. Often considered as a period of significant physiological and psychological change, it is regularly addressed in terms of age, as a transitional phase from one state to another. Adolescence is also considered a time for developing autonomy (Boyer & Guénard, 2014), when many adjustments and major developmental changes require significant adaptation by the young person and their entourage (Jiménez et al., 2007). According to Paré Kaboré and Nabaloum-Bakyono (2014, p. 58), adolescence is characterized by the construction of personal identity and is a "stage of development situated between childhood and adulthood (between approximately 10/11 and 18/20 years old), characterized by significant physical, psychological and social changes". However, as Le Bigot et al. (2004) acknowledge, "adolescence today takes time – a lot of time – and lasts a long time: it starts earlier and ends later; it begins at eleven and continues until the age of twenty-three or twenty-five" (p. 12).

The study of health-promoting behaviors among adolescents merits particular attention for several reasons. First, research shows that experiences during childhood and adolescence have an impact on health in adulthood (Menahem, 2004; Pender et al., 2011). Therefore, both childhood and adolescence are preparatory stages that provide information about how people will live as adults. Hendricks et al. (2006), for example,

report that good health-promoting behaviors in adulthood depend on the lifestyle adopted in the early stages of development. For example, obese children and adolescents are more likely to remain obese in adulthood. As a dynamic transitional period linking childhood to adulthood (Chen et al., 2014), action should be taken before certain habits become entrenched. In this regard, actions could include, for example, the development of the Five Cs - competence, confidence, character, connection, and compassion - which are key attributes for positive youth development (Pender et al., 2011). Developing these Five Cs necessarily involves the school system, because at this age, in all countries around the world, the majority of children and adolescents attend primary and secondary school. School programs focusing on developing these attributes can help children and adolescents to become healthy, productive adults (Pender et al., 2011).

Finally, adolescence is a fragile period. Good health is generally prevalent during this period, but with limits. According to the WHO (2014), adolescents' behavioral patterns can change rapidly leading to health problems such as irregular meals, poor sleep, inactivity, unhealthy eating habits, and tobacco and alcohol use. Other issues include reproductive health problems, illicit drug use, fatal road accidents, homicides, violent crimes, unplanned pregnancies, chronic diseases, and suicide. In short, despite adolescence being a period of vitality and vigor, resilience is not a given in adolescents. Therefore, efforts must be made to ensure their continued growth and development (Saboga-Nunes et al., 2020), enabling individuals to live as long as possible and age in good health. To this end, researchers have set out to study the determinants of health and to develop and evaluate psychometrically valid tools for measuring healthy lifestyles.

Over the past two decades, tools have been developed to assess health behaviors either as a whole or as part of a lifestyle (Bandari et al., 2020; Hampson et al., 2019; Teng et al., 2010; Walker et al., 1987). Other tools have been developed specifically to evaluate health-protective behaviors (Harris & Guten, 1979; Ping et al., 2018; Westra, 1989). Several of these tools assess health-promoting behaviors (Chen et al., 2003, 2014; Chen, M.-L. et al., 2017; Hendricks et al., 2006; Gaete et al., 2019; Wang et al., 2015). These tools have been designed for all socioeconomic categories, including adults (Wang et al., 2015), children (Chen, M.-L. et al., 2017), and adolescents (Chen et al., 2003, 2014).

In the early 2000s, the Adolescent Health Promotion Scale (AHP-40) was developed and validated in Taiwan (Chen et al., 2003). The AHP-40 questionnaire has 40 items for assessing health-promoting behaviors in adolescents in six areas: nutrition, social support, life satisfaction, health responsibility, stress management, and physical exercise. Around 15 years later, the scale had been used in almost 15 countries and translated into five languages (Chen et al., 2014). It had been used by over 212 researchers in different professional fields such as nutrition, school health, clinical pediatrics, dental health, and mental health. However, a few years later, Chen and his collaborators identified two major limitations: first, the time required for administering the questionnaire; and second, redundancy of certain items following exploratory factor analyses of the AHP-40 in the assessment of health-promoting behaviors. In light of these limitations, Chen and his collaborators developed a short-form version of the AHP-40, the Adolescent Health Promotion Scale Short Form ([AHP-SF], Chen et al., 2014). Despite this development, both the AHP-40 and the AHP-SF have certain limitations for application to French-speaking African populations (Borsa et al., 2012; Caron, 1999; Gana et al., 2021). The first limitation concerns the language of the two questionnaires, and the second concerns the dimensions assessed. Indeed, twenty years later, there is no French version of these tools, and furthermore, they do not assess two important dimensions of health-promoting behaviors: spiritual and mental health.

In the Bangkok Charter of 2005, the WHO recognized that health promotion encompasses mental and spiritual well-being (WHO, 2005), yet few tools address all these dimensions. According to the health promotion model (Pender, 1982; Pender et al., 2011), the basis for developing scales to measure health-promoting behaviors, there is more to health promotion than a physical assessment. It adds at least eight elements, such as "functional health patterns, physical activity, nutrition, life stress, spiritual health, social support, health beliefs and lifestyle" (p. 94). Therefore, the inclusion of spiritual health in health promotion questionnaires is justified.

Spirituality addresses the need to give meaning to life events, and is characterized by relationships with oneself, with others, and with the universe (Gaillard Desmedt & Shaha, 2013). It is each individual's private space where they construct the meaning of their life, questioning their presence in the world and the possibility of transcendence. It is therefore not linked to any religious order, but forms the basis of a person's identity, because transferring spiritual values is the ideal of all education (Bwalwel,

1998; Kamara, 2007). Spiritual education clearly benefits overall health in all age groups. For example, at school it contributes to adolescents' mental health (Estrada et al., 2019; Michaelson et al., 2016, 2021). Spiritual health is assessed by determining whether an adolescent has religious beliefs or practices meditation (Gaete et al., 2020). Many questionnaires designed to measure health-promoting behaviors take this dimension into consideration (Gaete et al., 2020). Assessing spiritual health-promoting behaviors in adolescents is particularly important, since a correlation has been shown between these behaviors and adolescents' lifestyles in the African context (Jacobs et al., 2012). Furthermore, Paré Kaboré and Nabaloum-Bakyono (2014, p. 114) state that "the African context is characterized by the importance of spirituality in the daily lives of its peoples".

Although no theoretical model considers all dimensions of health promotion, several authors emphasize the importance of taking the mental health dimension into account when evaluating health-promoting behaviors (Bandari et al., 2020; WHO, 2005). The WHO (2018) defined mental health as a state of well-being where an individual can fulfil their potential, cope with normal life stresses, work productively, and contribute to their community. Adopting a positive perspective, mental health can be viewed as the basis for an individual's well-being and an effectively functioning community. However, the AHP-40 and AHP-SF, in their current form, do not assess adolescents' mental health. They therefore seem incomplete for application to the African context, where a significant burden of young people's mental health (Brits, 2021) on the healthcare system is recognized. A recent study revealed a high prevalence of mental health disorders and mental health symptoms among adolescents in 16 sub-Saharan African countries, where this burden is greater than in high-income countries (Jörns-Presentati et al., 2021). Jörns-Presentati and his colleagues also estimate that 10-20% of children and adolescents worldwide experience mental health problems. However, in the case of sub-Saharan Africa specifically, they reported that one in seven adolescents experiences psychological difficulties, and that nearly 10% meet criteria for psychiatric diagnosis (Jörns-Presentati et al., 2021). Taking mental health into account when assessing health-promoting behaviors is therefore vital, as are interventions in schools, clinics, and communities. This is particularly important when we consider that approximately 50% of mental health conditions begin before the age of 14, and 75% begin before the age of 25 (Brits, 2021).

In addition to these shortcomings, these tools have never been validated with an African population and there is no French-language version. Yet, there are French-speaking populations worldwide, in 114 countries and on all five continents. Furthermore, French is spoken by over 300 million people around the world, including around 177 million Africans (International Organization of La Francophonie, 2019). To address these issues, we proposed the adaptation of a composite scale to assess health-promoting behaviors in adolescents and young adults in the French language. This study thus fulfils Teng et al.'s (2010) wish to see valid psychometric tools developed across all cultures to evaluate innovative interventions that encourage the adoption of healthy behaviors.

Methodology

Objective and hypotheses

The general objective of this study was to develop a composite scale to assess health-promoting behaviors in French-speaking adolescents and young adults. Considering the initial dimensions selected and the contextual contingencies, we hypothesized that an eight-dimensional factor structure would harmoniously fit our data (Hypothesis 1). Furthermore, we expected the newly developed tool to demonstrate construct validity and acceptable internal consistency (Hypothesis 2). Finally, due to contextual influences, we expected a new distribution of items between the dimensions to emerge from the data, unlike that for the initial tools (Hypothesis 3).

Type of study, participants, and data collection procedure

We adopted a quantitative, descriptive methodological approach. Participants were selected using a two-stage probabilistic sampling process. When selecting the sample, stratified random sampling and cluster sampling, both based on the simple random sampling method, were applied successively (Ajar et al., 1983). First, we used stratified random sampling to select the secondary schools from which data would be collected. These were categorized into four groups or strata: public secondary schools, private secular secondary schools, private religious secondary schools, and technical secondary schools. We then used cluster sampling to select the sample. In this technique, the sampling unit comprises more than one element of the population, rather than a single element in other methods. In this simple random sampling method, the sampling unit is defined by

a group of elements (Ajar et al., 1983). For the first stage, three classes or clusters (10th, 11th, and 12th grades) were targeted in each school selected, as they were likely to include learners aged 15 and over. All learners in these classes were invited to participate in the study, provided they met the following inclusion criteria: (a) aged between 15 and 25 years; (b) able to read and write in French; (c) be of Cameroonian nationality; and (d) agree to sign the informed consent form (for participants aged 18 and over) or have it signed by their parents or guardians (for those under 18). The exclusion criteria were: (a) diagnosed with a chronic illness by a certified doctor and undergoing treatment, and (b) unable to complete the questionnaires due to personal reasons or language barriers (not being able to read and understand the French language).

Before collecting the data, we sent authorization requests to randomly selected school principals, with the survey protocol, questionnaire, and consent form. Once agreement had been obtained from the school principals, we made an appointment to visit the classrooms where school officials informed the participants about the survey. We then explained the purpose of the survey, the data collection process, the content of the questionnaire and how to complete it, and the importance of a signed consent form. At the same time, we gave each student a consent form to sign, or be signed by a parent or guardian, and a copy of the questionnaire to complete. The next day, attendance was called with the list of students who had collected the forms the previous day. Thus, the students were able to hand in the consent forms, whether signed by their parents or not, along with the questionnaire, completed or not, in order. On this second day, the questionnaires completed at home were collected. Students who had a signed consent form but had not completed their questionnaire were invited to do so on the spot. However, they were informed that their parents' consent did not oblige them to complete the questionnaire. By the end of the process, 71% of students had completed the questionnaire.

As a result of this process, we recruited 343 participants: 231 girls (67.3%) and 112 boys (32.7%). The sample size was limited to 343 for factor analysis feasibility (Ferguson & Cox, 1993; Gana et al., 2021; Worthington & Whittaker, 2006). According to Dancey and Reidy (2004/2007), it is advisable to have at least five times as many participants as variables. Following this standard, our analyses required at least 255 participants (5 × 51 items). Participants' ages ranged from 15 to 23 years, with a 95% confidence interval of [17.40–17.77], a mean of 17.59,

and standard deviation of 1.75. Of the participants, 193 (56.3%) attended public secondary schools, 106 (30.9%) attended public technical schools, and 44 (12.8%) attended private secular secondary schools. School administrators of private religious secondary schools refused our many requests for access, which explains the lack of that student population in the statistical data. Of the participants, 21 (6.1%) were in tenth grade, 183 (53.4%) were in eleventh grade, and 139 (40.5%) were in twelfth grade.

The instruments

The new tool proposed in this article is based on three pre-existing questionnaires which we present in this section. The main instrument is the AHP-40 (Chen et al., 2003). The other instruments are the spiritual health dimension of the Adolescent Lifestyle Profile-Revised 2 ([ALP-R2], Gaete et al., 2019) and the mental health dimension of the Healthy Lifestyle Questionnaire for the Elderly ([HEAL], Bandari et al., 2020). We also present another tool, which we used to assess the convergent construct validity of the new tool: the Health Behavior Checklist ([HBC], Hampson et al., 2019), chosen due to the importance of health-promoting behaviors for overall quality of life.

The AHP-40 and the two additional dimensions

The AHP-40

The original version of the AHP-40 is a 40-item self-administered questionnaire where respondents position themselves on a 5-point Likert scale ranging from 1 = Never to 5 = Always (Chen et al., 2003). A pioneering questionnaire in the field of health promotion for assessing health-promoting behaviors among adolescents, the AHP-40 is based on Pender's (Pender & Barkauskas, 1992) theoretical model of health promotion. Initial results from the AHP-40 revealed a Kaiser-Meyer-Olkin (KMO) index value of 0.942, with a Bartlett's sphericity test reaching significance at $p < 0.001$ (Chen et al., 2003). Principal component analysis, performed using Varimax rotation with Kaiser normalization, identified six factors: (a) nutrition, (b) social support, (c) life satisfaction, (d) health responsibility, (e) stress management, and (f) physical exercise. Cronbach's alpha was 0.932 for the entire questionnaire and ranged from 0.748 to 0.878 for the six dimensions, specifically 0.755 for eating behaviors, 0.836 for social support, 0.878 for life satisfaction, 0.789 for health responsibility, 0.770 for stress management, and 0.748 for physical exercise (Chen et al., 2003).

Spiritual health

This study considers the spiritual health dimension derived from the Adolescent Lifestyle Profile-Revised 2 or ALP-R2 (Gaete et al., 2019), which is an adaptation of the original Adolescent Lifestyle Profile (Hendricks et al., 2006) based on a sample of 572 Chilean adolescents. The ALP-R2's validity was tested using confirmatory factor analysis (CFA) with unweighted least squares and a polychoric correlation matrix. Following the CFA, the ALP-R2 showed adequate fit indicators. The total scale had an internal consistency of 0.87, with the highest reliabilities being found among the physical activity and spiritual health subscales, at 0.85 and 0.78, respectively. However, four of the seven subscales had Cronbach's alpha values below 0.65: stress management (0.49), nutrition (0.55), interpersonal relationships (0.61), and positive outlook on life (0.64). The spiritual health dimension consisted of six items (Hendricks et al., 2006; Gaete et al., 2019).

Mental health

We also addressed mental health in this study using a lifestyle measurement tool, HEAL or the Healthy Lifestyle Questionnaire for the Elderly (Bandari et al., 2019). This instrument is used to determine healthy lifestyle behaviors and addresses mental health, sleep, and rest. HEAL items therefore measure attitudes that contribute to productivity, sleep quality, and managing leisure time. Initial HEAL results revealed a KMO index value of 0.85 and a Bartlett's sphericity index of $p < 0.0001$. Latent factors were extracted using maximum likelihood estimation and varimax rotation. Based on the results of the factor analysis, the final questionnaire comprises 35 items, grouped into eight factors that explain 57.1% of the observed variance. Cronbach's alpha coefficients for the different dimensions ranged from 0.70 to 0.97, well above the acceptable threshold, and the overall scale had an alpha coefficient of 0.89. The mental health dimension considered in this study had internal consistency of 0.73 and consists of five items.

We created an initial questionnaire comprising 51 items by combining the 40 items from the AHP-40, the 6 items from the spiritual health dimension of the ALP-R2 (Gaete et al., 2019), and the 5 items from the mental health dimension of HEAL (Bandari et al., 2020). Each statement represents a healthy behavior. Adolescents and young adults were asked to indicate how often they engaged in each behavior using a 5-point Likert scale, where 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Usually, and 5 = Always. The statements are divided into eight subscales that assess the following areas:

- Nutrition: assesses nutritional habits.
- Social support: assesses subjective feelings of attachment, acceptance and love, and whether help is available when needed.
- Health responsibility: assesses whether adolescents take care of their health.
- Life satisfaction: assesses whether adolescents have a positive outlook on the present and future in terms of goals and expectations.
- Exercise or physical activity: assesses whether adolescents engage in physical activity or participate in sports.
- Stress management: assesses personal attitudes and behaviors that help reduce anxiety.
- Spiritual health: assesses whether the adolescent has religious beliefs and/or practices meditation.
- Mental health: assesses whether the adolescent has attitudes that help them fulfil their potential, cope with normal stresses, do productive work, and contribute to the community.

The Health Behavior Checklist ([HBC], Hampson et al., 2019)

The Multidimensional Health Behavior Checklist is a 40-item questionnaire originally developed by Vickers et al. (1990) to evaluate behaviors that promote well-being. A new version with 16 items, known as Good Health Practices, was developed by Hampson et al. (2019). Unlike the original version, which measured four factors (well-being behaviors, accident control, road risk-taking, and psychoactive substance use), the Good Health Practices version measures three dimensions: good health practices, risk avoidance, and other health problems. As in the original version, participants respond by rating how typical each item is for them on a 5-point scale ranging from 1 = Not at all like me to 5 = Very much like me. This multidimensional construct is often used when more objective or longer measures are not feasible. This was the case in our study, where the final tool consisted of 51 items plus questions about sociodemographic information. To verify the convergent construct validity of the new tool, we used the HBC in Step 8 of the adaptation process developed by Gana et al. (2021), selected for this study.

The translation and validation procedure: psychometric

From the many existing questionnaire translation and validation procedures, for this study we chose the ten-step procedure for adapting psychological tests and measurement scales, as proposed by Gana and his colleagues. As recommended by the authors (Gana et al., 2021), we made several adjustments to the procedure.

According to this ten-step procedure, the first step is to request authorization from the copyright holder of the tests/measurement scales in question (Gana et al., 2021). Regardless of whether they are protected or in the public domain, requesting authorization reduces the risk of replicating a study already conducted elsewhere, that we may not have found despite our efforts (Beaton et al., 2000; Gana et al., 2021). Given that one of our co-authors is the author of the main tool used for this study, this was a mere formality. No authorization from the copyright holders was required for the other two tools as we only used one section, and they are published under a Creative Commons license. Both the article by Gaete et al. (2019) and the article by Bandari et al. (2020) were published under a Creative Commons CC BY-NC-ND license (http://creativecommons.org/licenses/by/4.0/), which allows users to share, copy, distribute, and communicate the retrieved material by any means and in any format, provided the author's name is mentioned. However, this license prohibits commercial use of all or part of the material and restricts the terms of use to those defined in the license of the original work. We then moved on to the next step: the initial translation.

Three bilingual social science researchers carried out a traditional translation, separately and in parallel, of the 51 items from the three questionnaires to create the new questionnaire proposed in this study. Each researcher independently proposed a preliminary version of the items, response system, and instructions (Tachom Waffo et al., 2022). These researchers were a health psychologist, an epidemiologist, and a linguist. The latter, who is not directly involved in the field of health, was chosen for their interest in the effectiveness of communication between education professionals and secondary school learners, and their experience in analyzing the determinants of effective communication in education. These three individuals are not professional translators (Gana et al., 2021), but are all native French speakers (Ndibnu Messina Ethé, 2013). Furthermore,

we followed recommendations by Beaton et al. (2000) to ensure the quality of the translation, and did not explain the objectives of the translation to one of them (the epidemiologist).

Following the initial translation stage, the research team created a final preliminary version by synthesizing the three separate translations with the help of a linguist. Not all the translators were involved in creating this first preliminary French version. We sought the linguist's assistance to ensure the items were written in the correct form of the language. Next, a bilingual Cameroonian professional translator conducted a back-translation. They are from the Northwest region, where English is the first official language (Beaton et al., 2000). Cameroon is a bilingual country, with English and French as official languages of equal status. The population is 20% Anglophone (two out of ten regions) and 80% Francophone (eight out of ten regions). In the education system, however, the languages are used in a complementary manner, rather than simultaneously for teaching and assessing learning. Depending on the education subsystem, French is used as the first language and English as the second, or vice versa. The involvement of a second translation professional, as recommended by some authors (Beaton et al., 2000), was unnecessary (Caron, 1999). The back-translator was assisted by the authors of this work, who have a fairly strong command of both languages.

We recruited a sample of seven adolescents and young adults (n = 7) to pilot the preliminary French version of the questionnaire, after approval by the research team, to verify the language level and comprehension of the items (Vallerand, 1989). In the fourth stage of the study (Gana et al., 2021), we asked participants to read the initial 51 items aloud and report any difficulties understanding the instructions, certain words, specific items, or response options. Participants were asked to rate the clarity of the instructions for each item on a 5-point Likert scale ranging from 1 = Not at all clear to 5 = Completely clear, and invited to suggest alternative wording for any items they found unclear (Borsa et al., 2012). They were also asked to express their opinion on their understanding of the scale as a whole. Following this exercise, the research team rewrote four items and added examples in brackets to produce a second version of the questionnaire. This second version was empirically evaluated using a larger sample (n = 33) than the sample used for the first version, drawn from the target population (Caron, 1999). No further adjustments were required after the

second evaluation, confirming the intelligibility of the 51 items in the first French version of the tool. We therefore submitted it to an even larger sample to test its final characteristics.

Data analysis

The data were analyzed using Jamovi statistical software version 1.8.2 (www.jamovi.org). If two items from a dimension were missing, the participant's score for that dimension was excluded from the statistical analysis (Perkins et al., 2018). However, if only one item was missing, the mean value for that dimension and participant was used to replace it (Josse et al., 2009; Rousseau & Bertrand, 2005).

Four analyses were conducted to evaluate the metrological qualities of this new tool: (a) descriptive statistical analysis (Step 5); (b) exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) Step 6); (c) internal consistency (Step 7); and (d) convergent construct validity (Step 8). The descriptive analysis determined the characteristics of each item and of the overall scale for distribution normality. The EFA provided evidence of validity based on the internal structure of the new tool. This analysis was based on Bartlett's sphericity test and the KMO index. Only factors with an eigenvalue equal to or greater than 1 were retained to determine the final structure of our tool (Guadagnoli & Velicer, 1988). Factors consisting of only one or two items were also eliminated. We applied a rigorous double selection process to the items (Dancey & Reidy, 2004/2007):

- Only items with a factor loading of at least 0.50 were retained to ensure a significant contribution to the identified latent structure.
- Items with cross-loadings (i.e. significantly correlating with several factors at a level of at least 0.40) were excluded to preserve structural simplicity and discriminant validity.

We used CFA to assess the similarity and adequacy of the theoretical model to the data collected from its battery of indices, including absolute, incremental, and parsimony indices (Xia & Yang, 2019). Absolute fit indices assess the extent to which the theoretical model correctly reproduces the collected data. They also enable verification of the similarity between the proposed theoretical model and the observed data (Gana & Broc, 2018; Xia & Yang, 2019). Examples of absolute fit indices include the standardized root mean-square residual (SRMR), which should be less than 0.05, and the root mean square error of approximation (RMSEA), which should

be less than 0.08 (Awang, 2012), 0.06 (Hu & Bentler, 1999) or, ideally, less than 0.05 (Byrne, 1994; Hu & Bentler, 1999). For these indices, values close to 0 represent a good fit. There are also the goodness of fit index (GFI) and the adjusted goodness of fit index (AGFI), for which the threshold values are 0.95 and 0.90 respectively (Byrne, 1994). Incremental indices, on the other hand, are used to assess improvement in the model's fit by comparing it with a more restrictive reference model (Xia & Yang, 2019). The main incremental indices are the normal fit index (NFI), the relative fit index (RFI), and the comparative fit index (CFI). Their threshold values range from 0.90 (Byrne, 1994; Nyock Ilouga & Moussa-Mouloungui, 2019) to 0.95 (Hu & Bentler, 1999; Schumacker & Lomax, 2004). Finally, parsimony indices indicate the extent to which each estimated coefficient fits well (Xia & Yang, 2019). They control for model overfitting by determining the number of parameters that need to be estimated to achieve a specific level of fit (Hooper et al., 2008; Swami & Barron, 2019). The aim is to strike a better balance between maximizing the fit and minimizing the number of estimated coefficients. The chi-squared (χ^2) model is used to evaluate the overall fit, as well as the difference between the sample and adjusted covariance matrices. The p-value must be greater than 0.05 (i.e. the hypothesis of a perfect fit cannot be rejected). However, the overall fit of the model is often assessed using standardized chi-squared (χ^2/df), which should ideally be less than 3 and, at the very least, less than 5 (Hooper et al., 2008; Nyock Ilouga & Moussa Mouloungui, 2019).

Next, we used two indicators to test the internal consistency of the overall scale and its dimensions: Cronbach's alpha coefficient (Cronbach, 1951) and McDonald's omega coefficient (McDonald, 1999; cited in Béland & Michelot, 2020). The omega coefficient is denoted by the symbol ω in the remainder of this paper. Each coefficient is accompanied by its confidence interval, as recommended by some authors (Dunn et al., 2013). We used these two criteria simultaneously to align our results with new methodological recommendations suggesting the use of the omega coefficient for multidimensional tools (Béland & Michelot, 2020; Cho, 2016; Dunn et al., 2013; Gana et al., 2021). It also made our results comparable to results of previous studies that only used Cronbach's alpha coefficient.

Finally, we conducted two complementary analyses, in accordance with Step 8 of Gana et al.'s (2021) approach, which involves providing evidence of validity based on the relationships between the new tool and other constructs within the nomological network. First, we tested convergent construct

validity. This involved analyzing the correlations between the new questionnaire and the HBC (Gana et al., 2021). Second, the relationship with certain demographic variables, such as gender, age, and educational background, was tested to determine whether these variables differ in relation to the new tool and to assess its ability to distinguish between individuals.

Results

Descriptive statistics

In this step we administered the version that was adopted, adapted, and approved at the end of the pre-test (Step 4) to a representative sample of the target population to analyze the items (Gana et al., 2021). The aim of this analysis was to examine the essential characteristics of the items, such as their mean, median, and variance; distribution normality, degree of difficulty, and potential for discrimination (Gana et al., 2021). The analyses in the fifth step of our approach were performed on the initial 51 items. The results showed that all items in the distribution, the dimensions, and the instrument as a whole are normally distributed. The results of the descriptive analyses of the items selected for the new tool are shown in Table 1.

Exploratory factor analysis

EFA was performed using varimax rotation with Kaiser normalization. This identified 8 factors comprising 27 items (see Figure 1), with the following statistics: Bartlett's sphericity test: $\chi^2 = 1{,}896$, $df = 351$, $p < 0.001$; KMO = 0.75. These eight factors together explain 56.69% of the total variance, ranging from 9.42% to 5.99% (see Table 2). The possible total score for the scale ranges from 27 to 135. The mean total score was 3.35 (SD = 0.50). In practice, 24 items were removed from the initial set of 51 items for three main reasons. First, 13 items were excluded due to their low factor weight of less than 0.50 (Gana et al., 2021; Guadagnoli & Velicer, 1988). These items were: 1, 2, 3, 4, 5, 6, 8, 16, 17, 26, 34, 39, and 45. Second, nine items were not retained because they contributed acceptable proportions to more than one factor. These items were: 15, 20, 21, 22, 23, 25, 32, 40, and 51. Finally, two items were discarded because they contributed to the formation of a factor. These were items 49 and 50. The final structure, comprising eight factors and 27 items, was obtained after 15 iterations (see Table 3). Therefore, the possible total scores for

Table 1
Descriptive statistics for all items in the AHPB-27 questionnaire

No.	Items	Median	Mean	SD	95% CI Low.	95% CI Sup.	Skewness	Flatness	Shapiro-Wilk
1	I talk and share my feelings with others.	3.00	3.13	0.06	3.00	3.26	0.093	-0.989	0.901***
2	I discuss my concerns with others.	3.00	3.12	0.06	2.98	3.25	0.108	-0.957	0.895***
3	I make an effort to smile or laugh every day.	5.00	4.39	0.05	4.29	4.50	-1.667	2.105	0.661***
4	I like to stay in touch with my loved ones.	4.00	3.96	0.06	3.83	4.10	-0.934	-0.327	0.786***
5	I make an effort to have the right friendships.	5.00	4.07	0.06	3.94	4.19	-1.071	0.081	0.772***
6	I discuss my problems with others.	3.00	2.76	0.06	2.62	2.89	0.404	-0.764	0.891***
7	I read food labels when I go shopping.	3.00	3.27	0.07	3.12	3.42	-0.060	-1.386	0.859***
8	I brush my teeth and use toothpaste after meals.	4.00	3.59	0.07	3.45	3.73	-0.490	-1.016	0.851***
9	I wash my hands before meals.	5.00	3.97	0.06	3.83	4.10	-0.816	-0.626	0.778***
10	I usually think positively.	4.00	3.74	0.06	3.62	3.87	-0.467	-0.827	0.860***
11	I make an effort to know what is important to me.	5.00	4.32	0.05	4.22	4.43	-1.536	1.815	0.703***
12	I make an effort to feel interesting and face each day.	4.00	4.02	0.06	3.90	4.14	-0.883	-0.307	0.798***
13	I make an effort to believe that my life has a purpose.	5.00	4.41	0.05	4.31	4.52	-1.760	2.394	0.644***
14	I do stretching exercises every day.	3.00	2.74	0.06	2.60	2.87	0.432	-0.805	0.887***

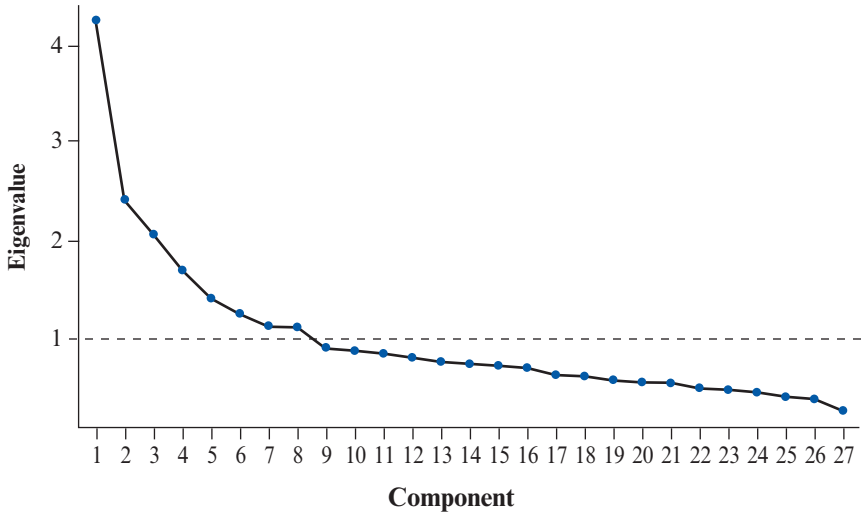
Table 1
Descriptive statistics for all items in the AHPB-27 questionnaire (continued)

No.	Items	Median	Mean	SD	95% CI Low.	95% CI Sup.	Skewness	Flatness	Shapiro-Wilk
15	I do 30 minutes of vigorous exercise at least 3 times a week.	2.00	2.53	0.07	2.39	2.67	0.635	-0.701	0.860***
16	I participate in physical fitness activities at school or in my neighborhood every week.	4.00	3.58	0.08	3.42	3.73	-0.465	-1.274	0.815***
17	I make an effort to devote time to relaxation every day.	3.00	3.12	0.07	2.97	3.27	-0.045	-1.266	0.889***
18	I make an effort to determine the source of my stress.	3.00	3.11	0.07	2.96	3.26	-0.088	-1.174	0.892***
19	I make an effort to monitor my mood swings.	3.00	3.29	0.07	3.14	3.43	-0.221	-1.040	0.894***
20	I sleep 6 to 8 hours every night.	3.00	3.37	0.07	3.23	3.52	-0.202	-1.164	0.880***
21	I discuss my spiritual beliefs with others.	2.00	2.39	0.07	2.24	2.54	0.602	-0.988	0.830***
22	I feel that there is a higher power guiding my life.	4.00	3.30	0.09	3.12	3.47	-0.282	-1.583	0.793***
23	I attend a group that shares my spiritual beliefs.	2.00	2.31	0.08	2.15	2.47	0.717	-1.017	0.779***
24	I participate in activities to help me grow spiritually.	2.00	2.63	0.08	2.47	2.79	0.397	-1.285	0.843***
25	I use my spiritual beliefs as a guide for what I do.	4.00	3.41	0.07	3.25	3.56	-0.421	-1.163	0.857***
26	I am satisfied with my nights' sleep.	3.00	3.46	0.06	3.34	3.58	-0.191	-0.818	0.894***
27	I go to bed on time at night.	3.00	2.91	0.06	2.78	3.05	0.242	-0.941	0.899***

Note. *** $P < 0{,}001$.

the scale range from 27 to 135. The average total score was 3.35 (*SD* = 0.50). Based on the results of the statistical analyses, the number of items retained, the behavior measured, the target population, and the underlying measurement instruments, we named the new tool the Composite Scale for Assessing Health-Promoting Behaviors in Adolescents and Young Adults, abbreviated to AHPB-27.

Figure 1
Number of factors with an eigenvalue > 1



Note. Graph showing the number of factors with an eigenvalue greater than 1

The AHPB-27 is a 27-item instrument designed to measure health-promoting behaviors in adolescents and young adults. Each statement represents a healthy behavior, and respondents are asked to indicate how often they engage in each behavior, using a 5-point Likert scale where 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Usually, and 5 = Always. The following areas of health are assessed: spiritual health, interpersonal relationships, physical exercise, stress management, life satisfaction, sleep hygiene, health responsibility, and social support.

Table 2
Descriptive statistics for the AHPB-27 factors

No.	Factors	Items	*Mean*	SD	Min	Max	Asymmetry	Flattening	% variance explained
1	Spiritual health	5	2.80	1.064	5	25	0.240	-0.679	9.42
2	Interpersonal relationship	3	3.00	1.011	3	15	0.139	-0.454	7.56
3	Physical exercise	3	2.83	1.06	3	15	0.115	-0.760	7.17
4	Stress management	3	3.17	1.04	3	15	-0.183	-0.705	7.13
5	Life satisfaction	4	4.13	0.72	4	20	-0.932	0.631	6.73
6	Sleep hygiene	3	3.25	0.91	3	15	-0.086	-0.460	6.41
7	Health responsibility	3	3.60	0.96	3	15	-0.310	-0.685	6.28
8	Social support	3	4.14	0.82	3	15	-0.934	0.340	5.99
	AHPB-27	**27**	**3.35**	**0.50**	**27**	**135**	**-0.085**	**0.389**	**56.69**

Table 3
Factor structure and distribution of AHPB-27 items

Items	F1	F2	F3	F4	F5	F6	F7	F8	Originalité
43. I attend a group that shares my spiritual beliefs.	0.820								0.301
44. I participate in activities to help me grow spiritually.	0.777								0.370
46. I use my spiritual beliefs as a guide for what I do.	0.671								0.465
41. I talk to others about my spiritual beliefs.	0.635								0.479
42. I feel that there is a higher power guiding my life.	0.576								0.505
7. I talk about and share my feelings with others.		0.797							0.311
9. I discuss my concerns with others.		0.781							0.324
13. I discuss my problems with others.		0.750							0.340
30. I do stretching exercises every day.			0.811						0.299
31. I do 30 minutes of vigorous exercise at least 3 times a week.			0.793						0.311
33. I warm up before intense physical exercise.			0.590						0.547
36. I make an effort to determine the source of my stress.				0.783					0.326
37. I make an effort to monitor my mood swings.				0.695					0.429
35. I make an effort to devote time to relaxation every day.				0.673					0.485

Table 3
Factor structure and distribution of AHPB-27 items (Continued)

Items	F1	F2	F3	F4	F5	F6	F7	F8	Originalité
29. I make an effort to believe that my life has a purpose.					0.719				0.446
28. I make an effort to feel interesting and face each day.					0.699				0.459
27. I make an effort to know what is important to me.					0.514				0.513
24. I usually think positively.					0.500				0.578
38. I sleep 6 to 8 hours every night.						0.706			0.470
48. I go to bed on time at night.						0.670			0.443
47. I am satisfied with my nights' sleep.						0.629			0.491
14. I read food labels when I go shopping.							0.693		0.447
18. I brush my teeth and use toothpaste after meals.							0.688		0.431
19. I wash my hands before meals.							0.606		0.546
12. I make an effort to have the right friends.								0.734	0.406
10. I make an effort to smile or laugh every day.								0.711	0.436
11. I like to stay in touch with my loved ones.								0.591	0.532

Note. F1 = Spiritual health; F2 = Interpersonal relationships; F3 = Physical exercise; F4 = Stress management; F5 = Life satisfaction; F6 = Sleep hygiene; F7 = Health responsibility; F8 = Social support.

Confirmatory factor analysis

We conducted confirmatory factor analysis (CFA) of the AHPB-27 using the same dataset (Ferguson & Cox, 1993). The results are presented in Table 4. The absolute, incremental, and parsimony indices indicate that the eight-factor, multidimensional model is a very good fit for the actual data, which is consistent with the CFA findings. This result thus confirmed our first hypothesis. Overall, the new tool is well adjusted. While the incremental indices are good, the absolute indices are excellent (χ^2/df = 1.38, *RMSEA* = 0.033, *SRMR* = 0.048, *TLI* = 0.918, *CFI* = 0.931). These indices are consistent with and sufficient for Kline's (2015) recommendations that the following indices should be reported following CFA: chi-square, *RMSEA*, *CFI* and *SRMR*.

Table 4
Results of the confirmatory factor analysis of the AHPB-27

Indices	Criteria	AHPB-27
$\chi^{2(df)}$	-	407(296) ***
$\chi^{2/df}$	1-3 Very good; 3-5 Good	1.38
RMSEA	< 0.05 Very good; < 0.08 Good	0.033
90% *CI RMSEA*	Lower	0.024
	Higher	0.040
SRMR	< 0.05 Very good; < 0.08 Good	0.048
TLI	> 0.95 Very good; > 0.90 Good	0.918
CFI	> 0.95 Very good; > 0.90 Good	0.931

Note. *** $p < 0{,}001$

Internal consistency of the AHPB-27

The seventh step in Gana et al.'s (2021) process for validating psychological measurement instruments involves providing evidence of the reliability and accuracy of the scores. In other words, it involves assessing the internal consistency of the new tool. Once the previous step has been successfully completed — i.e. once the factor structure has been confirmed and the factor loadings are satisfactory — the same data can be used to analyze the instrument's reliability and validity, thereby providing evidence to support the accuracy of the scores obtained using the new test (Gana et al., 2021). The internal consistency of the AHPB-27 was assessed using

two coefficients, as indicated in the methodology: Cronbach's alpha coefficient and the Omega coefficient. The results show that the internal consistency is very good for this multidimensional model with 27 items, with α = 0.878 and ω = 0.885. The 95% confidence interval for Cronbach's alpha is [0.842, 0.911]. The Cronbach's alpha and Omega coefficient values for the eight dimensions range from 0.616 to 0.844 and from 0.622 to 0.854, respectively (see Table 5).

Table 5
Internal consistency of the AHPB-27 and its factors

No.	Factors	Items	α	ω	95% CI of α
1	Spiritual health	5	0.844	0.854	0.798-0.885
2	Interpersonal relationship	3	0.828	0.831	0.774-0.874
3	Physical exercise	3	0.702	0.743	0.623-0.770
4	Stress management	3	0.749	0.799	0.679-0.809
5	Life satisfaction	4	0.687	0.696	0.611-0.654
6	Sleep hygiene	3	0.643	0.662	0.611-0.754
7	Health responsibility	3	0.616	0.622	0.519-0.699
8	Social support	3	0.639	0.645	0.548-0.718
	Total	**27**	**0.878**	**0.885**	**0.842-0,911**

Convergent construct validity of the AHPB-27

For a test score to be considered valid, it is crucial to implement a validation process that enables the gradual accumulation of evidence supporting its validity. This may include evidence of relationships between the scores of the new tool and those on similar, related constructs (Gana et al., 2021), for example, whether the scores obtained on our test can actually predict future behaviors or attributes as expected, in other words, predictive validity. Whether scores on different but related tests are significantly correlated may also be established, which is referred to as convergent validity. These techniques provide evidence confirming the validity of test scores. In our analysis of the eighth step, we verified the convergent construct validity of the AHPB-27. The HBC was used for this purpose. The results (see Table 6) show that the AHPB-27 and its dimensions (with the exception of the interpersonal relationship dimension) correlate significantly with the HBC. These two results reinforced our second hypothesis.

Table 6
Correlation between the different factors of the AHPB-27 and the HBC

	F1	F2	F3	F4	F5	F6	F7	F8	AHPB-27	HBC
F1	—									
F2	0.086	—								
F3	0.171**	0.112*	—							
F4	0.184***	0.207***	0.256***	—						
F5	0.139*	0.227***	0.254***	0.340***	—					
F6	-0.006	0.133*	0.280***	0.109*	0.147**	—				
F7	0.057	0.004	0.256***	0.167**	0.283***	0.241***	—			
F8	0.061	0.306***	0.223***	0.263***	0.306***	0.125*	0.151**	—		
AHPB-27	0.545***	0.463***	0.592***	0.588***	0.602***	0.425	0.471***	0.511***	—	
HBC	0.120*	0.097	0.305**	0.332**	0.254**	0.275**	0.372**	0.112*	0.426**	—

Note. * $p < 0{,}05$, ** $p < 0{,}01$, *** $p < 0{,}001$; F1 = Spiritual health; F2 = Interpersonal relationships; F3 = Physical exercise; F4 = Stress management; F5 = Life satisfaction; F6 = Sleep hygiene; F7 = Health responsibility; F8 = Social support

Sociodemographic factors and the AHPB-27

Analysis of variance and Student's t-test were used to assess the discriminative ability of the AHPB-27. The results showed that gender was not statistically significantly associated with the AHPB-27 scores: Wilks' $\Delta = 0.578$, $F(1, 338) = 2.293$, $p = 0.131$, $\eta^2 = 0.007$. Analysis of the subdimensions showed that gender was not significantly associated with spiritual health (Wilks' $\Delta = 0.602$, $F(1, 338) = 0.530$, $p = 0.467$, $\eta^2 = 0.002$), interpersonal relationships (Wilks' $\Delta = 0.257$, $F(1, 338) = 0.250$, $p = 0.617$, $\eta^2 = 0.001$), or with stress management (Wilks' $\Delta = 0.010$, $F(1, 338) = 0.009$, $p = 0.923$, $\eta^2 = 0.000$). Nor is there an association between gender and life satisfaction (Wilks' $\Delta = 1.703$, $F(1, 338) = 3.299$, $p = 0.070$, $\eta^2 = 0.010$), sleep hygiene (Wilks' $\Delta = 0.133$, $F(1, 338) = 0.160$, $p = 0.689$, $\eta^2 = 0.000$), or social support (Wilks' $\Delta = 2.268$, $F(1, 338) = 3.333$, $p = 0.069$, $\eta^2 = 0.010$). However, gender was related to physical exercise, with the average for male participants ($M = 3.29$, $SD = 1.05$) being higher than that for female participants ($M = 2.61$, $SD = 1.00$) (Wilks' $\Delta = 34.452$, $F(1, 338) = 33.137$, $p < 0.001$, $\eta^2 = 0.089$). The boys participate in sports more than girls. However, on average, girls are more health-conscious ($M = 3.70$, $SD = 0.93$) than boys ($M = 3.40$, $SD = 0.99$). The test confirms that gender is significantly associated with health responsibility (Wilks' $\Delta = 6.726$, $F(1, 338) = 7.411$, $p < 0.007$, $\eta^2 = 0.021$). Our results also show that age is not significantly related to the full set of 27 items of the AHPB-27 (Wilks' $\Delta = 1.138$, $F(8, 330) = 0.493$, $p = 0.879$, $\eta^2 = 0.011$), or to its sub-dimensions. The same is true when comparing adolescents (13-17 years old) with young adults (18-25 years old). Overall, we found that the difference was not significant (Wilks' $\Delta = 0.557$, $F(2, 337) = 1.102$, $p = 0.333$, $\eta^2 = 0.006$). The situation is almost identical in the sub-dimensions.

Discussion

In multilingual, multicultural, and multiregional societies, the development of culture-fair tests — that is, culturally impartial assessments free from any form of ethnic or cultural influence unrelated to the construct in question that could bias the measurement — is a long-standing requirement of fairness and ethics (Cattell, 1940, cited in Gana et al., 2021). To comply with this requirement, our study aimed to adapt a composite scale to assess health-promoting behaviors in adolescents and young adults, and to examine its implications and limitations for clinical use with this

age group. Adolescence is a fragile and decisive phase during which experiences can have an impact on a person's current and future health (Chen et al., 2014; Hendricks et al., 2006; Menahem, 2004; Pender et al., 2011; Saboga-Nunes et al., 2020). Individuals aged 15–25 were invited to respond to the initial 51 items of the AHPB-27, which is composed of items from the AHP-40 (Chen et al., 2003) combined with the spiritual health dimensions of the ALP-R2 (Gaete et al., 2019) and the mental health dimensions of HEAL (Bandari et al., 2020).

Initial analyses of a database comprising 51 items from three pre-existing questionnaires revealed a multidimensional structure consisting of ten specific, interrelated dimensions. However, subsequent analyses, including factor analysis and internal consistency analysis, showed that an eight-factor model comprising 27 items and explaining 56.69% of the total variance was a good fit for the data (Hypothesis 1). This is why the new tool was named the AHPB-27. In this study, which involved Cameroonian adolescents and young adults, factor saturation was set at 0.50 (Dancey & Reidy, 2004/2007). This justifies the total number of items (n = 27) and factors (n = 8) retained. The eight factors have different levels of importance within our sample. We found that spiritual health was the most important factor and social support was the least important. These factors explain 9.42% and 5.99% of the total variance, respectively. This reveals the importance that Cameroonian adolescents and young adult attach to beliefs and the practice of spirituality, as well as to other factors. According to Rojas-Barahona et al. (2017), cultural realities can explain the weight of each factor resulting from a factor analysis. In our study, however, the difference in the proportion of variance explained by each factor is quite small. In other words, the different factors are of roughly equal importance for our sample. This is consistent with Paré Kaboré and Nabaloum-Bakyono's (2014) description of a holistic approach in the African socio-psychological context. Therefore, Cameroon would tend to prioritize a holistic approach in its educational process.

The AFC revealed that the AHPB-27 is well suited to our population. It displays eight factors, as theoretically expected. However, three observations emerged:

1. The initial dimension, called eating behavior (nutrition), does not emerge from the eight factors.

2. The items in the initial dimension called social support now constitute two independent factors.
3. A new dimension, called sleep hygiene, has been formed from the items of two initial factors (Hypothesis 3).

Various reasons may help to explain these adjustments among the Cameroonian population.

Our statistical results regarding nutrition excluded this dimension. Furthermore, none of the six items that make up this dimension contribute to the formation of another factor. This may be because Cameroonian adolescents do not consider healthy eating to be important for their health (Gaete et al., 2019). Consequently, they are unaware that eating three meals a day, selecting foods with low oil content, consuming fiber-rich foods (such as fruit and vegetables), drinking at least 1.5 liters of water daily (i.e. six to eight glasses), and incorporating the five main food groups (bread, meat, milk, fruit, and vegetables) are essential for their health, which is detrimental. However, it seems unrealistic to suggest that young people are unaware of the health benefits of a balanced diet, given Cameroon's primary school curricula (Ministry of Basic Education [MINEDUB], 2018a, 2018b, 2018c, 2018d). It is therefore more likely that young people are well aware that eating well is good for their health but are unable to do so for various reasons. In Cameroon, dietary diversity is not guaranteed for everyone (Minsanté & UNICEF, 2008). A similar attitude has been observed among Chilean adolescents. They do not consider eating breakfast to be a behavior that promotes health. Conversely, not eating breakfast is perceived as a way of combating obesity (Gaete et al., 2019). The nutrition dimension in the initial questionnaire was ultimately excluded from the AHPB-27. This is not uncommon in the literature where it is common practice to remove items (or factors) from the final tool for various reasons. In their initial project, Chen et al. (2003) aimed to design a tool that would measure both health-promoting and health-protective behaviors. To that end, variables measuring health-protective behaviors were introduced. However, following analysis, none of these items were retained. Chen et al. (2003) provide several explanations for this situation: distribution was not normal and the items had low factor saturation. They also suggest that this indicates that "no participant was engaged in adopting the said behaviors" (Chen et al., 2003, p. 109). This last explanation is more likely to apply to our adolescent sample, given that "10–20% of them suffer from malnutrition" (Minsanté & UNICEF, 2008, p. 11).

In the second situation, where items from an initial factor split to form two independent factors, analysis of the different groups of items revealed that they should remain as two independent factors. The first group was designated as "interpersonal relationships" (Dancey & Reidy, 2004/2007; Gaete et al., 2019) and consists of three items: "I talk and share my feelings with others", "I talk about my concerns with others", and "I talk about my problems to others". Analysis of these items revealed an idea or desire to externalize one's internal state. This can be interpreted as a desire to inform, invite, and imbue others with one's suffering in order to benefit from their support. Furthermore, with a few exceptions, these items correspond to those in the interpersonal relationships factor identified by Gaete et al. (2019). The second group retained its initial name of "social support". This group also consists of three items: "I make an effort to have good friendships", "I make an effort to smile or laugh every day", and "I like to stay in touch with loved ones". In our view, these items clearly reflect a desire to contribute to the group's happiness. Therefore, it is completely relevant to retain them.

Finally, despite the items regarding Point 3 being a synthesis of two initial factors, we deemed it necessary to retain it. The new factor consists of two items from the initial dimension called "mental health": ("I go to bed on time at night" and "I am satisfied with my sleep at night") and one item from the initial dimension called "stress management": ("I sleep for six to eight hours every night"). This factor is called "sleep hygiene". Careful observation revealed that all these items address the issue of health-promoting behaviors in relation to sleep management. Furthermore, there is a wealth of literature on the relationship between sleep, stress management, and general health (Guichard et al., 2020; Soh et al., 2022).

The AHPB-27 is a multidimensional questionnaire, and the results show that it has fairly good internal consistency, with $\alpha = 0.878$ and $\omega = 0.885$ (Hypothesis 2). The Cronbach's α and Omega ω values for the eight dimensions range from 0.616 to 0.844 and from 0.622 to 0.854, respectively. According to Taber (2017, p. 1278), these values are considered "adequate", and according to Nunnally (1978), they are acceptable. However, low coefficient values for certain dimensions may be due to the small number of items in each factor of the overall scale (Tavakol & Dennick, 2011) and/or the low correlation between factors (Taber, 2017). Compared to other studies on the design and/or adaptation of psychological measurement scales, these values are much better than those reported by Mun

et al. (2015) for their scale, which ranged from 0.50 to 0.60. Nevertheless, these coefficients should be considered in a relative sense. They do not always accurately reflect the consistency between items (Taber, 2017). A tool may have an acceptable Cronbach's alpha value even if the items do not measure the same thing (see Mun et al., 2015).

The results of this study showed that the AHPB-27 is not significantly associated with gender. Conversely, a significant difference was found in the practical dimension of physical exercise between girls and boys, with boys scoring higher than girls. The same result was obtained by Gaete et al. (2019) among Latin American adolescents. These conclusions are logical for more than one reason. First, according to Miller et al. (1993), boys consistently report being more physically active than girls across all age groups. Furthermore, the school environment tends to promote participation in sport for boys more than for girls (Gaete et al., 2019). For instance, physical education in schools is still dominated by sports such as football, which is generally more popular among boys than girls. This can increase boys' interest in sports while discouraging girls from participating in physical activities. Our analysis also reveals significant differences between boys and girls in responsible health-behaviors, with girls scoring higher.

Strengths and weaknesses of the AHPB-27

The new questionnaire's strengths lie primarily in the wide range of health-promoting behaviors it measures. It is the first tool to measure eight domains of exclusively health-promoting behaviors. Another strength lies in the high factor saturation of all 27 of the AHPB-27 items with factor loadings over 0.50. Administering the questionnaire also takes less time. With 27 items, the AHPB-27 is the second shortest tool for measuring health-promoting behaviors after the AHP-SF (Chen et al., 2014).

However, this study also has limitations. Cultural differences may exist between adolescents from different geographical regions of Cameroon, or between the country's four major cultural areas. Our study was conducted in a small area of Yaoundé, the country's capital city. While Yaoundé is a cosmopolitan city, it would be interesting to test the metrological qualities of this new tool in other regions of the country. Additionally, the AFE and AFC were not performed on two separate samples, as recommended by some studies. Hence, there was a risk of overfitting due to the limited size of our study sample which we were unable to divide in two for analysis on different samples. The sample size should therefore be increased in

future studies. According to many sources, adolescence begins around the age of 13, yet the sample for this study only included participants aged 15 and over. The validity of the instrument should therefore be tested in the younger age group. Also, contrary to our plans at the start of the project, our questionnaire does not measure all aspects of health-promoting behavior. For instance, it does not evaluate adolescents' eating habits. Further research is needed to address these limitations.

Finally, we based our validation process on the stages of cross-cultural adaptation of psychological tests and measurement scales as described by Gana et al. (2021). According to this approach, ten steps are necessary to achieve a valid adaptation. However, we only implemented the first eight steps. We did not proceed to Step 9, which is called counter-validation/replication and recommends conducting a new study with a fairly large sample size ($n > 500$) to replicate the initial study to obtain the same results for internal structure, internal consistency, and score validity. In short, it is a verification step. Subsequent studies using the AHPB-27 could help verify this step. Finally, we did not conduct Step 10, which aims to establish clinically meaningful standards or scores for the new test. If the cross-validation study had fulfilled its potential, this step would have enabled the data to be used to create a calibration and define threshold and clinically significant scores for diagnosing or detecting the phenomenon under study (Gana et al., 2021). The fact that these two steps were not carried out in our study is undeniably a limitation. However, our approach remains consistent with the recommendations of Gana et al. (2021), who recognize the need for the rigorous application of these steps but do not rule out the possibility of adaptation.

Conclusion

Health-promoting behaviors are a current issue, yet developing a tool to assess these behaviors among French-speaking adolescents of African origin had not yet been explored. Furthermore, no existing tool captured all the potential dimensions. Therefore, this study aimed to adapt a comprehensive composite tool for assessing health-promoting behaviors. The Adolescent Health-Promoting Behaviors Scale (AHPB-27) is a questionnaire designed to assess health-promoting behaviors among Cameroonian adolescents and young adults. It has valid psychometric properties and can be useful for professionals in various contexts. We recommend its use by

school health officials to assess health-promoting behaviors among pupils. The AHPB-27 will also be useful for nurses and community health workers to assess adolescent health and identify unhealthy behaviors.

Proofreading: Caroline Lefour

Formatting: Emmanuel Gagnon

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