

# Validation for the Children Health Promotion Scale: Development and Psychometric Testing

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## Abstract

**Background:** Several investigators have developed health promoting lifestyle instruments for adult population. However, few instruments in Taiwan have focused on health-promoting lifestyle measurements from the perspective of children.

**Methods:** The Children Health Promotion scale (CHP) was developed to focus on health promotion among children. The content validity was supported on the observations of a 6-member panel of experts. Here, based on the responses of 681 Taiwanese children, we examined the construct validity and reliability of the CHP as well as its psychometric properties through factor analysis and reliability measures.

**Results:** The results of Kaiser-Meyer-Olkin (KMO) and Bartlett's sphericity tests indicated that our sample fulfilled the factor analysis criteria. Moreover, the factor analysis yielded a 6-factor instrument, explaining 52.5% of variance in all 32 items; the 6 factors were myopia prevention, stress management, health maintenance behaviors, nutritional behaviors, physical activities, and basic health-promoting behaviors. The Cronbach's alpha reliability coefficient for the total scale was 0.92 and alpha coefficients for the subscales ranged from 0.71 to 0.85.

**Conclusion:** The results of this study indicate that the CHP has satisfactory construct validity and reliability for Taiwanese children. School health providers can therefore use the CHP for children's health promotion efforts.

**Keywords:** health promotion; healthy lifestyle; instrument development; children

## 1. Introduction

Since the 1960s, health promotion research has increased substantially and has been extended to include individual, family, and community health promotion (Walker, Sechrist, & Pender, 1987). During the 1980s and early 1990s, research on health promotion increased, and the models of health enhancement were thus proposed (Pender & Barkaskas, 1992; Walker et al., 1987). This shift toward health promotion was illustrated by Pender and Barkaskas (1992), who described health-promoting behavior as an actualizing tendency "directed toward sustaining or increasing well-being, personal fulfillment, and self-actualization." This perspective has recently been expanded to include contextual or socioecological influences on health promotion.

Research has shown that practicing health promotion behaviors decreases the incidence of disease (Byers, Wick, & Beard, 2011; Gerçek & Şen, 2015), and lowers the mortality rate (Silva, 2014). Since 2013, distinguished global health leaders, health ministers, officials, and experts have been gathering in Taiwan to discuss and share insights on crucial worldwide health issues, such as communicable diseases, obesity, ageing, and health inequality (Health Promotion Administration, 2016; 2014a). Although research has long been focused on activities directed toward healthy lifestyle promotion, the special requirements of children's nursing care remain largely underreported. Many Taiwanese children follow unhealthy lifestyle practices, including high-fat diet, high-sugar diet, lack of exercise, physical inactivity (frequent use of televisions, computers, and mobile phones), and chronic exposure to environmental risk factors for vision and dental problems (Health Promotion Administration, 2014a; Lin, Chang, Luh, Hurng, & Yen, 2014; Liou, Yang, Wang, & Huang, 2015; Tsai et al., 2015). Reformation of the current status

is urgently required.

Recent evidence demonstrated that physical activity decreases from the age of school entry (Cheval, Courvoisier, & Chanal, 2016). Low physical activity is rapidly becoming the social norm in most countries and thus is becoming a critical risk factor for the obesity epidemic. In Taiwan in 2014, the prevalence of overweight and obese children was 34.0% and 25.0% for boys and girls respectively (Hsieh, Chen, Huang, Chen, Li, & Chang, 2014). Obesity also reduces physical activity, thus creating a vicious cycle of increasing body fat levels and declining physical activity. Unhealthy diet and lack of exercise are the main causes of obesity, which in turn is a major risk factor for chronic diseases and causes of several childhood morbidities (World Health Organization, 2016). Children should be encouraged to increase physical activities (Ryan, 2015) and consume various healthy foods by repeatedly and positively exposing them to new foods, by showing them that caregivers and family members enjoy healthy foods, and by limiting their exposure to unhealthy foods (to prevent developing preferences for extremely sweet foods and drinks) (De Lepeleere, De Smet, Verloigne, Cardon, & De Bourdeaudhuij, 2013; Nybery, Norman, Sundblom, Zeebari, & Schäfer Elinder, 2016). This will help to facilitate the development of healthy lifestyle habits in from an early age and improve learning ability, mental health, and well-being.

The prevalence of myopia had increased significantly globally. Scholars predict by 2050 there will be 4758 million people with myopia and high myopia (Holden et al., 2016). The incidence of myopia in elementary schoolchildren with aged 10-11 years is 55.53% in Taiwan (Chang, Wu, Niu, Chen, & Liao, 2016). The younger that children suffer from myopia, the faster their eyes deteriorate (Cruickshank, Logan, & Parulekar, 2015; Ohno-Matsui, Lai, Lai, & Cheung, 2016). Poor vision among schoolchildren has been a persistent main health issue considered by Taiwan's education and health authorities. Since 2010, Taiwan's implementation of its empirical vision care strategy during outdoor school activities has facilitated vision improvement among elementary schoolchildren (Wu, Tsai, Wu, Yang, & Kuo, 2013). Dental caries is one of the oral diseases in Taiwanese children. The prevalence of dental caries among 5-6-year-olds (79.32%) in Taiwan (Health Promotion Administration, 2014b) is significantly higher than the global goals for oral health among 5-6-year-olds children ( $\leq 50\%$ ) (World Health Organization, 2000). To ensure oral hygiene and cleanliness, children should learn the correct methods of brushing teeth; in addition, they should rinse their mouths after meals and brush their teeth in the morning and at night. These activities should be supervised by healthcare providers to provide comprehensive preventive oral health care (Simmer-beck et al., 2011). Parent, family, and social support is associated with health promotion behaviors of schoolchildren (Forthofer, Dowda, McIver, Pate, & Barr-Anderson, 2016; Donnelly & Springer, 2015). Most children have very few opportunities to communicate with supportive adults, their ability to survive the turbulent phases of growing up and ways for protecting their health remain underdeveloped. However, these unhealthy lifestyle risk factors of schoolchildren have not been prioritized in health services of Taiwan.

In the past, public health institutions worldwide have increasingly emphasized the importance of healthy lifestyles. Nurses, particularly school nurses and community-health nurses in primary health care settings, can easily promote healthful habits by assessing the lifestyle patterns of children, intervening to facilitate positive behaviors, and intervening to discourage negative behaviors. Several investigators have developed health promoting lifestyle instruments for adult population (Chen, Chaou, Shiou, Wang, & Liao, 1996; Walker et al., 1987). However, few instruments in Taiwan have focused on health-promoting lifestyle measurements from the perspective of children, and school nurses in Taiwan lack suitable measurements for assessing the comprehensive health of children. Such instruments could aid in evaluating the success of nursing programs in promoting healthy lifestyle development. This study assessed the psychometric properties of a newly devised Children's Health Promotion scale (CHP) in Taiwanese children.

## 2. Methods

This study was approved by the Institutional Review Board of Chang Gung Hospital in Taiwan (approval number: 101-0617A3). Both the selected children and their parents were oriented on the objectives and procedures of this study, following which they provided written informed consent for participation.

Participants in this study included a representative sample of public and private elementary school students. We employed stratified random sampling according to school districts and different classes for random selection of representative samples. Urban and rural students, ranging from grades 4 to 6, were recruited from north, central, and south Taiwan.

The CHP was formulated on the basis of the Adolescent Health Promotion scale (AHP) conducted by Chen, Wang, Yang, & Liou (2003) and a review of literature. With consent from the author, a portion of the items were extracted for use in this study. The CHP was constructed in a 5-point response format to obtain data regarding the frequency of reported behaviors (never, rarely, sometimes, usually, always), with scores ranging from 1 to 5. The validity of

the content was assessed by 6 child counseling experts, employed at elementary schools, junior colleges, and universities; these experts included psychologists, health educators, and physicians at school health centers and nursing faculties. All experts were asked to rank the items' priorities, to delete or add information, and to provide an agreement score for each item. All experts rated more than 85% of the 35 items as "appropriate." On the basis of feedback from the content experts, we made editorial changes to the AHP, deleted some items, and added other items, produce a CHP instrument.

Next, this CHP instrument was tested among 12 children (elementary school students). Chinese Zhuyin phonetic symbols were used in this scale so that schoolchildren could read and understand the questions easily. As our CHP scale was adapted for children 9-12 years of age, hence five non-applicable questions were deleted from the original scale. 'Observe my body at least monthly', 'search for health information', 'search for health information', 'use adequate responses to unreasonable issue', and 'make an effort to choose foods without additives' were removed from the questionnaire. The questionnaire was 35 questions.

### 3. Results

There were 681 participants aged 9–12 years (mean, 11.2 years; median, 11 years). 326 (47.9%) were female and 355 (52.1%) male. The educational level of 335 (49.2%) of the participants' fathers was grade 12 (high school or vocational level) and that of 86.7% of the participants' mothers was grade 7–12. Most participants lived with both their parents (81.4%), whereas the other participants had single parents.

#### 3.1 Content Validity

To understand the health promotion activities for schoolchildren's health, this scale adopted a structured survey, with a design based on literature reviews, focus group interviews, suggestions of health promotion experts and researchers with school health promotion experience. This research team selected survey items conforming to the aim of this study. The initial questionnaire contained 35 questions, with 5 points for "always: approximately 90% of the time, I have done it (81–100%)," 4 for "frequently: approximately 70% of the time, I have done it (51–81%)," 3 for "approximately half: approximately 50% of the time, I have done it (31–50%)," 2 for "occasionally: occasionally participate in this behavior, approximately 30% of the time, I have done it (11–30%)," and 1 for "never: never participated in this behavior, or less than approximately 10% of the time, I have done it (0–10%)." Relatively high scores on the scale represented relatively high levels of success in healthy lifestyle promotion. After the survey had been constructed and piloted, it was administered to 681 third to sixth grade schoolchildren. The Cronbach's alpha of the final scale was 0.92.

#### 3.2 Factor Analysis

Before exploratory analysis, Kaiser-Meyer-Olkin (KMO) and Bartlett's sphericity tests were used to measure the sampling adequacy. The results showed that the KMO measure was 0.92 and the significance of Bartlett's sphericity was 0.000 ( $\chi^2 = 8065.88$ ,  $df = 681$ ,  $p = 0.000$ ), indicating that the samples met the criteria for factor analysis (Hair, Anderson, Tatham, & Black, 1998). Principal component factor solution explained a variance of 52.5% and had eigenvalues of  $>1.00$ . According to the scree plot (Figure 1), the slope of the curve became emergent at the sixth point, and factors 7-9 only contributed 5% of the accumulated variance. We eliminated 3 items because they did not load strongly on a single factor; thus, we decided on using a 6-factor instrument. The remaining 32 items were entered into the factor analysis. All items loaded on the expected factors, and the variance was 0.45 for most items, except for two items with variance  $<0.4$  (Table 1). The factor analysis of the resulting 32-item instrument yielded a 6-factor solution with an explained variance of 52.49% (Table 2).

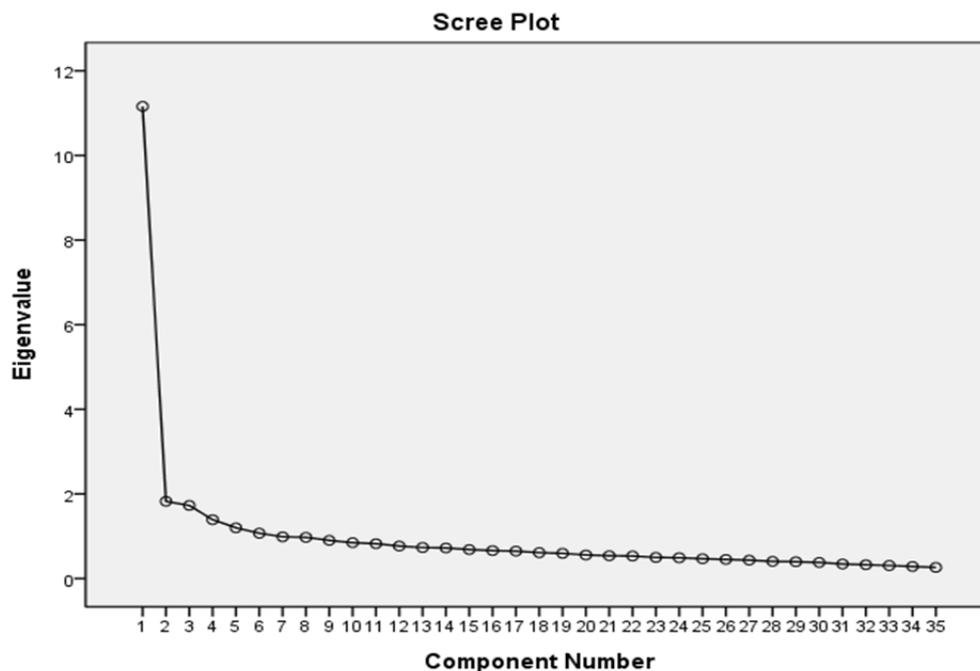


Figure 1 The scree plot

Table 1. Factor loadings and factor structure of the Children Health Promotion scale (N=681)

	1	2	3	4	5	6
28. When watching television, I take a 10-min break for every 30 min of television.	0.89					
29. When using computers and cellphones, I take a 10-min break for every 30 min of use.	0.78					
27. When reading or writing diligently, I take a break for 10 min every 30 min.	0.75					
32. During the day, I don't strain my eyes by looking at a computer, television, or cellphone screen for longer than 1 h.	0.73					
30. I quietly sit down and rest my eyes, away from any harmful light or glowing screens for some time.	0.64					
26. When writing, I maintain a distance of approximately 35 cm between my eyes and the book.	0.63					
31. I watch television or use computers in well-lit rooms.	0.43					
34. I wear a hat when I perform outdoor activities.	0.40					
8. I talk about my concerns with others.		0.88				
10. I talk about my troubles with others.		0.87				
23. Every time I am depressed, I try to find the reason for that feeling.		0.56				
9. I laugh or smile every day.		0.53				
7. When I have concerns, I contact healthy persons on my own initiative.		0.51				
15. I appreciate myself.		0.50				
12. After a meal, I brush and floss my teeth.			0.76			
17. It is somewhat depressing to me to recognize that my life will end.			0.67			
13. I wash my hands before each meal.			0.65			

11.	I obey laws when I buy consumable items.	0.60
16.	I detect and correct all my mistakes.	0.47
18.	When I am faced with a tough situation, I come up with new ways to handle it.	0.44
14.	I read the newspaper for news concerning health.	0.41
25.	I adjust my daily timetable to avoid haste.	0.40
20.	At least 3 times every week, I exercise enough to break a sweat for at least 20–30 minutes.	0.86
21.	In addition to physical education classes, I perform other physical activities (such as walking, swimming, and playing ball) weekly.	0.82
33.	When I go to school, I participate in outdoor activities during breaks.	0.65
19.	I commit myself to maintain daily habits of exercise.	0.60
3.	I consume high-fiber foods (such as whole grains, fruits, and vegetables).	0.60
2.	I try to eat no greasy and nonoil food every day.	0.58
5.	I include five food groups in each meal.	0.53
6.	I eat breakfast daily.	0.69
24.	I sleep for 6–8 h each night.	0.61
1.	I eat 3 meals per day at fixed times.	0.47

Table 2. Eigenvalues, cumulative percentage of variance explained by six factors on the Children Health Promotion scale (N=681)

Factor	Factor label	Eigenvalue	Variance Explained	Cumulative percentage %
1	Myopia prevention	11.16	31.88	31.88
2	Stress management	1.82	5.21	37.09
3	Health maintenance behavior	1.73	4.93	42.02
4	Physical activity	1.39	3.97	46.00
5	Nutritional behaviors	1.23	3.42	49.43
6	Basic health promoting behaviors	1.19	3.05	52.49

Factor 1, myopia prevention, was the strongest factor-explaining the greatest percentage of variance of the CHP. This factor was loaded with 8 items: when watching television, I take a 10-min break for every 30 min of television; when using computer and cellphones, I take a 10-min break for every 30 min of use; when reading or writing diligently, I take a break for 10 min every 30 min; During the day, I don't strain my eyes by looking at a computer, television, or cellphone screen for longer than 1 h; I quietly sit down and rest my eyes, away from any harmful light or glowing screens for some time; When writing, I maintain a distance of approximately 35 cm between my eyes and the book; I watch television or use computers in well-lit rooms; I wear a hat when I perform outdoor activities.

Factor 2 was stress management and included the following 6 items: When I have concerns, I contact healthy persons on my own initiative; I talk about my concerns with others; I laugh or smile every day; I talk about my troubles with others; I appreciate myself; Every time I am depressed, I try to find the reason for that feeling.

Factor 3 was health maintenance behaviors and included the following 8 items: I obey laws when I buy consumable items; After a meal, I brush and floss my teeth; I wash my hands before each meal; I detect and correct all my mistakes; When I am faced with a tough situation, I come up with new ways to handle it; I read the newspaper for news concerning health; I adjust my daily timetable to avoid haste; It is somewhat depressing to me to recognize that my life will end.

Factor 4 is physical activities and included the following 4 items: I commit myself to maintain daily habits of exercise; At least 3 times every week, I exercise enough to break a sweat for at least 20–30 minutes; when I go to school, I participate in outdoor activities during breaks; In addition to physical education classes, I perform other

physical activities (such as walking, swimming, and playing ball) weekly.

Factor 5 was nutritional behaviors and included the following 3 items: I consume high-fiber foods (such as whole grains, fruits, and vegetables); I try to eat non-greasy and non-oily food every day; I include five food groups in each meal.

Factor 6 contained basic health-promoting behaviors and included the following 3 items: I eat breakfast daily; I sleep for 6–8 h each night; I eat 3 meals per day at fixed times.

### 3.3 Reliability

Cronbach alpha was calculated as the measure of internal consistency for the final 32-item instrument; the total instrument demonstrated high internal consistency, with an alpha coefficient of 0.92 (Table 3). Alpha coefficients for the 6 subscales were in the range 0.71–0.85.

Table 3. Internal consistency of the Children Health Promotion scale and its subscale (N=681)

Subscale	Items	Item-subscale r	Alpha
1. Myopia prevention	8	0.43-0.88	0.85
2. Stress management	6	0.49-0.88	0.79
3. Health maintenance behavior	8	0.38-0.76	0.81
4. Physical activity	4	0.60-0.86	0.76
5. Nutritional behaviors	3	0.53-0.60	0.72
6. Basic health promoting behaviors	3	0.47-0.69	0.71
Total scale	32		0.92

### 3.4 Scoring

When the instrument was used as a whole, the possible range of scores was 32-160. The total mean score of the 681 respondents on the CHP was 102 (range, 41-143). Histograms of the distributions of the scores on the total instrument and the 6 subscales were fairly symmetrical within the range of scores used (skewness = -0.381, kurtosis = -0.099).

## 4. Discussion

The original CHP scale contained 35 questions. Three components were extracted through factor analysis. Because their coefficients were less than the absolute value of 0.32, question numbers 4 (drink at least 1500 mL of water daily), 22 (perform warm-up exercises before engaging in strenuous exercises), and 35 (make an effort to deal with unreasonable orders) were omitted; finally, only 32 questions were included. In Taiwan, the current health promotion scales analyze elderly, adult, and adolescent populations; however, no health promotion scales suitable for children has been reported thus far. A salient feature of this scale is the addition of Chinese Zhuyin phonetic symbols so that 9-12-year-old children can read and understand the questions.

Because children represent the future, ensuring their healthy growth and development must be a prime concern of all societies. Myopia is the primary threat to children's vision (Holden et al., 2016). Features of this scale were eye health care strategies included 8 protective behaviors (I quietly sit down and rest my eyes, away from any harmful light or glowing screens for some time; when writing, I maintain a distance of approximately 35 cm between my eyes and the book; etc) to avoid environmental risk factors for myopia during early life (Lyu, Zhang, Gong, Wang, Chen, & Guo, 2015; Ramamurthy, Yu Lin Chua, Lin Chua, & Saw, 2015). Health maintenance behaviors should be established in early and middle childhood. Specially, the protective behaviors of dental health in Taiwanese schoolchildren need to be assessed and oral hygiene activities should be educated from school-based child oral hygiene programs and supervised by adults to provide comprehensive preventive oral health care (Lai, Fann, Yen, Chen, Lai, & Chiu, 2016). The item 'I obey laws when I buy consumable items'. Unfortunately, most markets are overrun with adulterated food items. From an early age, schoolchildren should be encouraged to develop the habit of checking the ingredients and expiry dates of food items before purchasing them. The item 'When I am faced with a tough situation, I come up with new ways to handle it', can encourage schoolchildren to develop a positive outlook starting from an early age.

The results of this study not only make the government and schools more aware of the health protective factors that

are beneficial for schoolchildren, but they also propose an effective program to rectify the health promotion factors, resulting in an improvement on the healthy lifestyles of schoolchildren in Taiwan. In this study, the CHP measured the concept of health promotion and the health protection behaviors. This result is different from a study by Chen et al. (2003) who developed Adolescence Health Promotion (AHP) for Taiwanese adolescents defined health lifestyles only included the concept of health promoting. The research design and sample in this study had some limitations. Nevertheless, this CHP still focuses only on health promotion and therefore is unsuitable for detecting or identifying risk behaviors in Taiwanese children. This CHP scale focused on assessing physical health promotion. It may be appropriate that the number of mental health promotion questions can be increased in this instrument. Moreover, because the survey was conducted in the form of self-assessment questionnaires, inaccuracies in the results may be present because of young-age-related limitations in the participants (e.g., cognition and seriousness of questionnaire completion). Future researchers may elect to train pilot instructors to offer explanations while the children are completing the questionnaire to increase the accuracy of the survey.

This study supported the content validity of the CHP on the basis of reported studies and judgments of content experts. The instrument appeared to have sufficient validity and reliability for assessing health promotion behaviors of children populations. This CHP is designed to assess culture-specific health promotion of children in Taiwan aged 9–12 years and can be used as a practical guide for schoolchildren health assessment and identification of healthy behaviors for school health providers. Moreover, this instrument is an easy, practical and comprehensive screening tool for school nurses to assess health-promoting lifestyle behaviors of Taiwanese schoolchildren and can be used as an evaluation tool in school health centers for daily health counseling. The strength of this study is its focus on protection behaviors for health promotion. Specific interventions can be developed to promote healthy behaviors to children and to improve their well-being.

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#### Competing Interests Statement

The authors declare that there is no competing or potential conflict of interest regarding the publication of this paper.

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