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## Research Article

## Psychometric Testing of Behavior Assessment for Children

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## SUMMARY

**Purpose:** The purpose of this study was to test the reliability and validity of the Behavior Assessment for Children (BAC) in a community of school-aged children in Taiwan.**Method:** A school-based sample comprising third grade and fourth grade students was recruited from Taichung City in Taiwan. The parents ( $n = 248$ ) and teachers ( $n = 15$ ) of these students completed structured questionnaires, including the Child Behavior Checklist (CBCL) and the proposed BAC. Content validity, concurrent validity, construct validity, internal consistency, and inter-rater reliability of the BAC were assessed.**Results:** The BAC comprised three subscales (attention, emotion, and self-control) that included 17 items. The content validity index (CVI) score was 0.98. The result of the confirmatory factor analysis (goodness of fit = .90, root mean square of residual = .03, root mean square error of approximation = .06, and comparative fit index = .94) supported the construct validity of the three BAC subscales. The concurrent validity of the BAC subscales significantly correlated with the compatible CBCL subscales ( $r = .59-.78$ ,  $p < .001$ ). Cronbach  $\alpha$  of the subscales of the BAC ranged from .78 to .92. The intraclass correlation coefficient between the parents and teachers ranged from .31 to .44, and the joint probability of agreement ranged from 31.4% to 92.2%.**Conclusions:** The BAC is a valid and reliable instrument for evaluating behavioral problems in school-aged children.Copyright © 2016, Korean Society of Nursing Science. Published by Elsevier. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## Introduction

Because of changes in social structures and economic development, many children are wallowing in this age of technology [1] and requiring extended classes after school [2], which can evoke serious behavioral problems in children. The incidence of behavioral problems in school-aged children is approximately 8.0%–24.0% in China [3,4], the United State [5], and Germany [6], as well as in Taiwan [7]. This high incidence rate indicates the importance of behavioral problems in children. Additionally, Taiwan's low birth rate, competition among peers, and education reform policies have forced many school-aged children to do extended classes after school [2]. Participation in after-school programs predicted poorer

behavioral adjustment [8]. Therefore, school-aged children are in heavy academic pressures and are at high risk of behavioral problems in Taiwan. An efficient tool to screen for behavioral problems in Taiwanese children is needed.

Children's behavioral performance is closely related to the development of self-regulation. Children with poor self-regulation may be more likely to perform negative or undesired behaviors [9–11]. The concept of self-regulation comprises cognitive, affective, and behavioral aspects [9,10]. The cognitive component of self-regulation focuses on judgment of “doing the right things” that includes interpretation of creating “meaning” in behavior and then guiding behavior toward the goal [10]. The affective component of self-regulation describes an individual's expression of emotions in socially adaptive ways [10]. Emotional problems fostered by early childhood experiences can lead to behavioral problems in children [12]. The behavioral component of self-regulation focuses on the self-control of impulse behavior. Age-appropriate self-control

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behavior in children can lead to better environmental adaptation [10]. Generally, self-control behavior is used to overcome a wide range of self-generated impediments to desired performance. The development of cognitive and affective components may mutually influence the course of self-control behavior [13]. Therefore, a child behavioral assessment tool should include these three components (cognitive, affective, and behavioral aspects).

A tool should be short, broad-banded, and easy to score with good psychometric properties [14]. Good psychometric properties are essential for any measure; broad-band tools cover a wide range of problems and suit most population; short and simple scoring can minimize computational errors [14], and be easy to use for both parents and health providers. Otherwise, the social environment provides rules that shape the child's behavioral expressions. Cultural norms may influence individual values and expectations [10]. Numerous child behavioral problems are based on the social environment and cultural norms. Therefore, cultural sensitivity is also important for screening children's behavioral performance [15].

Glascoe [14] and Weitzman et al [16] reviewed widely used measures for assessing children's behavioral problems. Many of these measures have good psychometric properties, breadth of coverage, and clear scoring procedures. However, some tools are fairly long such as Child Behavior Checklist (138 items) and Behavior Assessment System for Children (126 items). Participants spend approximately 20 minutes completing all items, and completed items need another 10 minutes to be scored on computer [16]. Thus, it may increase computational errors [14], and be too time consuming in practice and in research [16]. In fact, time constraints and lack of disclosure by parents remain important barriers to children behavioral screening [16]. Thus, a short form that is easy to use by parent and health providers may be most needed. Therefore, we developed the Behavior Assessment for Children (BAC), which is short, broad-band, and easy to score. Furthermore, the context of items was made according to Taiwanese culture, thus making it culturally sensitive. The current study was designed to examine the psychometric properties of the BAC in a community of school-aged children in Taiwan.

## Methods

### *Developing initial items*

Based on the concept of self-regulation of child behaviors, we developed the BAC. It comprises cognitive, affective, and behavioral aspects, and includes 17 items based on the relevant literature [9,17–20]. In this study, the cognitive component was defined as “regulating the stream of thought to force oneself to concentrate” [9,11] and was named attention. The affective component was defined as “mood vulnerability such as frustration or depression” [9] and was named emotion. The behavioral component was defined as “avoidance of impulsive actions or restraint of undesirable impulses” [11] and was named self-control. Therefore, the original instrument comprised three subscales: attention (6 items), emotion (4 items), and self-control (7 items). In order to be suitable for most Taiwanese, the context of items was related to the most common behavioral problems in children such as attention problems, aggressive behavior, and anxiety/depression [3,21,22]. A few amendments were also made according to Taiwanese culture. Additionally, a 3-point Likert scale was used, in which a 0 signified “no match” to the given situation, a 1 signified a “moderate match,” and a 2 signified a “relatively strong to strong match.” This scale was reported by parents. A higher score denotes poorer performance.

### *Content validity*

The original items were sent to an expert panel to examine its content validity index (CVI) [23]. Panel experts (including 1 elementary school teacher, 1 clinic physician who was an expert in child behavior problems, 1 clinical consultant for children, and 2 experienced researchers who were experts in child care) were asked to rate each item of the BAC based on relevance, clarity, and simplicity as 1 (*not relevant*), 2 (*somewhat relevant*), 3 (*relevant*), or 4 (*very relevant*). Only items that scored a 3 or 4 were considered relevant and therefore used to calculate the actual CVI. The results from the panel experts yielded a .98 scale-level CVI, and item-level CVIs ranged from .93 to 1.0. These values meet the criteria of scale-level CVI  $\geq .90$  [24] and item-level CVI at 1.00 with 3–5 experts [23]. No items were deleted from the instrument, and minor revisions regarding the clarity or wording of the items were suggested. Those revisions were incorporated into the instrument, and the revised items were used in the subsequent reliability and validity test.

### *Establishing psychometric properties*

After developing initial BAC items and content validity test, the authors conducted a cross-sectional survey for item analysis and establishing psychometric properties. First, item analysis of the corrected item-total correlation was performed for item selection. Psychometric properties of the final scale, including construct validity, concurrent validity, internal consistency, and the intraclass correlation coefficient (ICC) were then tested. Based on the concept of self-regulation of child behaviors, confirmatory factor analysis (CFA) assessed BAC construct validity. The Child Behavior Checklist (CBCL) was used to verify concurrent validity of the BAC. Finally, the teachers of the children were asked to complete the BAC. The information from teachers was used for calculating the ICC of parents and teachers.

### *Design, sample and data collection*

We used a cross-sectional study design with stratified random sampling in this study. Two administrative areas in Taichung City were selected from a list of eight areas (Xitun, Beitun, Nantun, West District, North District, Central District, East District, and South District) using random sampling. One elementary school was then chosen from each of the two administrative areas from a list of 11 areas. After receiving written permission from the school administrators and teachers, a formal letter of consent was sent to the parents of the children for their approval of their participation in this study. After receiving the written consent, the participants (parent and teachers of the students) completed the questionnaire. The following inclusion criteria for the parents were established: (a) they must be able to read Chinese; and (b) they must be the primary caregiver of the student. Figure 1 shows the flow chart of the recruiting process.

All the third grade and fourth grade classes from the participating elementary schools were recruited, and all their parents and teachers were asked to complete the questionnaire. A total of 396 primary caregivers of third grade and fourth grade students participated in this study, and 257 (64.6%) primary caregivers completed this study. Nine of the primary caregivers were excluded because they were not parents (they were grandparents, aunts, or nursemaids; Figure 1). Finally, 248 parents completed the BAC and the CBCL. The parents took approximately 21 minutes to complete all items. Additionally, a total of 15 teachers completed the BAC, with a 100.0% response rate. The information from teachers was

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