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ORIGINAL ARTICLE

Attention and behavioral control skills in Iranian school children

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Abstract
This study assessed quality of life, emotional and behavioral problems, prosocial behavior, and functional impairment in a sample of Iranian children based on their attention and behavioral control skills. The sample consisted of 280 male and female children aged between 6 and 12 years old who were divided into strong, moderate, and weak groups based on parental ratings of attention and behavioral control skills on the strengths and weaknesses of ADHD symptom and normal behavior rating scale (SWAN). In addition, parents completed the pediatric quality of life inventory version 4.0 generic core scales (PedsQL 4.0), the strengths and difficulties questionnaire, and the Weiss functional impairment rating scale-parent report (WFIRS-P). The strong group generally showed better quality of life than the weak group. The strong group was better than the moderate group, and the moderate group was better than the weak group on school functioning. The weak group had more conduct problems and hyperactivity/inattention and less prosocial behavior than the moderate group and the strong group. The moderate group had more hyperactivity/inattention than the strong group. The weak group showed more impairment than the moderate group and the strong group on all subscales and the total scale of the WFIRS-P. The quality of life, behavioral problems, prosocial behavior, and functional impairment can be different in children based on their attention and behavioral control skills.

Keywords Attention and behavioral control skills · Quality of life · Emotional and behavioral problems · Functional impairment · SWAN

Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurobiologically based disorder (Rutter and Nikapota 2002) that affects 5.9–7.1% of children and adolescents (Willcutt 2012). Despite that the Diagnostic and Statistical Manual-5 (DSM-5; American Psychiatric Association 2013) describes ADHD as a binary diagnostic classification, ADHD is often conceptualized as dimensional (Pennington 2002; Coghill and Sonuga-Barke 2012; Frazier et al. 2007). This dimensional approach involves the quantification of ADHD symptom severity in which some people are high and some are low. While traditionally some may identify being low in a particular symptom cluster as indicative of not endorsing certain behavioral symptoms (e.g., a lack of difficulty concentrating), others may identify being low in a particular symptom cluster as indicative of endorsing a particular strength (e.g., a strong ability to concentrate). Consistent with the latter, the dimensional perspective allows for identifying positive attributes, or behavioral strengths, such as a strong ability to pay attention or inhibit impulsive comments. Emphasizing positive traits can be useful in promoting social functioning and quality of life (Huber et al. 2016).

To our knowledge, there is only one ADHD scale that measures the full continuum of attention and behavioral control skills from weaknesses (i.e., at a symptomatic level) to strengths (i.e., at an adaptive level): the strengths and weaknesses of ADHD symptom and normal behavior rating scale (SWAN; Swanson et al. 2012). In a recent study of adolescents, parental ratings on three scales indicated that the SWAN was relatively better at capturing the full range of the spectrum of attention and behavioral control skills in comparison with two traditional symptom scales that do not capture behavioral strengths (Greven et al. 2018). In another study of children aged 5–7 years, the SWAN showed

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incremental validity over the Disruptive Behavior Rating Scale (DBRS; Barkley and Murphy 1998) that does not measure symptomatic strengths for predicting strong cognitive performance and demonstrated more variance at the low end of the DBRS—findings indicated that the SWAN was a useful scale for measuring both the positive and symptomatic extremes of the attention and behavioral control skills continuum (Arnett et al. 2013). Another study compared the SWAN with the *DSM-IV*-oriented Australian Twin Behavior Rating Scale that does not measure symptomatic strengths in a sample of twins aged 6–20 years old and concluded that the SWAN was more able to reflect the different ADHD phenotypes including low, moderate, and high ADHD traits in comparison with the *DSM-IV*-oriented Australian Twin Behavior Rating Scale (Hay et al. 2007).

Due to the ability of the SWAN to measure both the strengths and weaknesses in attention and behavioral control skills (Greven et al. 2018; Arnett et al. 2013; Hay et al. 2007), we used this property of the SWAN to categorize children into one of the strong, moderate, or weak groups based on parent report of attention and behavioral control skills. To our knowledge, no published studies have examined the differences between children with strong, moderate, or weak attention and behavioral control skills in quality of life, emotional and behavioral problems, prosocial behavior, and functional impairment. In the current study, we validated the internal consistency and factor structure of the translated SWAN in a population of normal school children in Iran. Second, we aimed at comparing children with strengths in attention and behavioral control skills with those who are moderate and weak in these constructs in quality of life, emotional and behavioral problems, prosocial behavior, and functional impairment. We hypothesized that children with strong attention and behavioral control skills have better quality of life, less emotional and behavioral problems, more prosocial behavior, and less functional impairment than children with moderate or weak attention and behavioral control skills.

Methods

Participants

Participants were parents of 280 students (aged between 6 and 12 years old) recruited from two public elementary schools in Shiraz, Iran. The sample of this study was a population sample, not selected for psychopathology, but also not a group in which psychopathology was excluded. The sample was 51.1% ($n=143$) female. Fourteen participants (5%) were enrolled in grade 1, 36 (12.9%) in grade 2, 62 (22.1%) in grade 3, 49 (17.5%) in grade 4, 59 (21.1%) in grade 5, and 60 students (21.4%) in grade 6. Inclusion criteria included enrollment in grades 1 through 6 in the two participating schools. Participation did not require an ADHD diagnosis or any other psychiatric history.

Procedure

In order to gather the data of the current study, we used multistage sampling. First, one school board district that was the closest one to Shiraz University was selected from four school board districts in Shiraz, Iran. Second, among the elementary schools in this district, two elementary schools including one girls' school and one boys' school that had proper conditions for the study administration and data collection and had good cooperation with the researchers were selected. Third, all students of both schools were eligible to be included in this study. Both schools were public, and their enrollment requirements were the same as the other public elementary schools' enrollment requirements in Shiraz. Informed consent was attained from parents. Written information about the aim of the study and instructions for completing the questionnaires was sent to parents who filled out the questionnaires at home. The questionnaires were returned to the school by the children. The data were collected anonymously. The response rate was 75.8% (303 of 400 questionnaires were returned). Among the returned questionnaires, 23 were excluded because they were not fully completed by parents. This study was conducted in accordance with the ethical codes of the Psychology and Counseling Organization of Iran.

Measures

The strengths and weaknesses of ADHD symptom and normal behavior rating scale (SWAN)

The SWAN (Swanson et al. 2012) was developed with the aim of measuring differences in the population with regard to ADHD symptom strengths and weaknesses of individuals. The SWAN includes 18 items based on the DSM-IV ADHD symptoms (American Psychiatric Association 1994). The items cover two subscales that map on to DSM-5 ADHD symptoms: a 9-item inattention subscale (e.g., "Give close attention to detail and avoid careless mistakes") and a 9-item hyperactivity–impulsivity subscale [e.g., "Sit still (control movements of hands/feet or control squirming)"]. Response options to each item are based on a 7-point Likert scale; they are: 3 (far below average), 2 (below average), 1 (somewhat below average), 0 (average), − 1 (somewhat above average), − 2 (above average), and − 3 (far above average). Parents are asked to compare their child in comparison with other children of the same age during the past month. The two-factor structure of the SWAN (i.e., inattention

and hyperactivity–impulsivity) was confirmed by Swanson et al. (2012) using teacher report data from a school-based sample of 327 children. Since the SWAN has not been translated in Persian, after obtaining written permission from the developer of the SWAN, the scale was translated into Persian by a Ph.D. student in clinical psychology fluent in the English language. The Persian version was back-translated into English by a clinical psychologist who was fluent in English and Persian. Then, the back-translated version of the SWAN was compared with the original version of the scale in order to detect any possible inconsistencies.

Pediatric quality of life inventory version 4.0 generic core scales (PedsQL 4.0)

The PedsQL 4.0 (Varni et al. 2001) was designed to assess the quality of life in children and adolescents aged 2–18 years old and includes generic core scales and disease-specific modules for different chronic conditions (e.g., Iannaccone et al. 2009; Goldstein et al. 2008; Varni et al. 2008). The PedsQL 4.0 consists of 23 items on a 5-point response scale ranging from 0 (never a problem) to 4 (almost always a problem). The scores are reversed based on a 0 to 100 scale (0 = 100, 1 = 75, 2 = 50, 3 = 25, and 4 = 0), and higher scores show better quality of life. The PedsQL 4.0 includes four subdomains: Physical Functioning (8 items, e.g., "Walking more than one block"), Emotional Functioning (5 items, e.g., "Feeling afraid or scared"), Social Functioning (5 items, e.g., "Getting along with other children"), and School Functioning (5 items, e.g., "Paying attention in class"). The Psychosocial Health score is obtained by summing up the scores of Emotional, Social, and School Functioning subdomains. The PedsQL 4.0 Parent Proxy-Report has high internal consistency for each subdomain, Psychosocial Health Score, and the total score (≥ 0.75) and has demonstrated validity (Varni et al. 2001). In an Iranian sample of children, all subdomains of the Persian version of the PedsQL 4.0 Parent Proxy-Report form had good internal consistency with Cronbach's alpha ranging from 0.63 to 0.88 (Amiri et al. 2012). In the current study, reliability coefficients for the physical, Emotional, Social, and School subdomains, Psychosocial Health scale, and total scale were 0.78, 0.77, 0.72, 0.65, 0.85, and 0.88, respectively. The mean total score of the PedsQL 4.0 was 79.23 (SD = 16.59). Additionally, the mean score was 78.32 (SD = 19.41) for the Physical Functioning, 73.30 (SD = 21.24) for Emotional Functioning, 86.39 (SD = 18.36) for Social Functioning, 79.46 (SD = 19.06) for School Functioning, and 79.72 (SD = 16.96) for Psychosocial Health scale. The range of the scores was from 0 to 100 for all subdomains, Psychosocial Health scale, and total scale of the PedsQL 4.0.

Strengths and difficulties questionnaire (SDQ)

The SDQ (Goodman 1997) includes 25 items that assess psychosocial problems in children and adolescents aged 3–16 years old. The SDQ includes 5 subdomains: Emotional symptoms (5 items, e.g., "Often complains of headaches, stomach aches or sickness"), conduct problems (5 items, e.g., "Often loses temper"), Hyperactivity/Inattention (5 items, e.g., "Restless, overactive, cannot stay still for long"), Peer problems (5 items, e.g., "Rather solitary, prefers to play alone"), and Prosocial behavior (5 items, e.g., "Considerate of other people's feelings"). The items are scored based on a 0 (not true) to 3 (certainly true) rating scale, and reverse scoring is used for items 7, 11, 14, 21, and 25. In all subdomains, higher scores represent more psychopathology except for the Prosocial behavior subdomain. In a Persian-speaking sample of Iranian children aged 6–12 years, Cronbach's alpha coefficients were 0.73 and 0.69 for the parent SDQ and teacher SDQ total scores, respectively. In this study, the reliability coefficients for the Emotional symptoms, Conduct problems, Hyperactivity/Inattention, Peer problems, and Prosocial behavior subdomains, and total scale were 0.68, 0.60, 0.67, 0.45, 0.62, and 0.81, respectively. The mean score was 2.67 (SD = 2.28) for Emotional Symptoms, 2.25 (SD = 1.97) for Conduct Problems, 3.67 (SD = 2.43) for Hyperactivity/Inattention, 2.49 (SD = 1.95) for Peer Problems, and 8.11 (SD = 2.01) for Prosocial Behavior. The range of the scores was from 0 to 10 for Emotional Symptoms, Hyperactivity/Inattention, and Prosocial Behavior and from 0 to 9 for Conduct Problems and Peer Problems.

Weiss functional impairment rating scale-parent report form (WFIRS-P)

The WFIRS-P developed by Weiss et al. (2018) is a parent report scale that assesses functional impairment related to ADHD. The WFIRS-P includes 50 items based on a 0 (never or not at all) to 3 (very often or very much) rating scale. Additionally, items can be rated as "not applicable." The scale consists of 6 domains: Family (10 items, e.g., "Having problems with brothers and sisters"), School (10 items, e.g., "Makes it difficult to keep up with schoolwork"), Life skills (10 items, e.g., "Excessive use of TV, computer, or video games"), Self-Concept (3 items, e.g., "My child feels bad about himself/herself"), Social activities (7 items, e.g., " Being teased or bullied by other children"), Risky activities [10 items, e.g., "Easily led by other children (peer pressure)"]. A total score and a score for each domain can be calculated using the mean of all items excluding those rated not applicable, ranging from 0 to 3 (very much). This scoring method makes it possible to compare the domains and provides a score that is specific to the functional impairment related to that individual. In clinical assessment, any domain

is considered functionally impaired when two items within that subscale have a rating of 2 (much) or one item has a rating of 3 (very much). The WFIRS-P total scale is considered impaired when an individual shows impairment in two or more domains (Weiss 2000). A study on the Persian version of the WFIRS-P (Kiani et al. 2018) showed strong test–retest reliability ($r = 0.77$) for the total scale, good internal consistency for the family domain ($\alpha = 0.81$) and total scale ($\alpha = 0.88$), and acceptable internal consistency for the School, Self-Concept, and Social Activities domains (α's = 0.72–0.74). The mean total score of the WFIRS-P was 0.27 (SD = 0.20), and among the domains of the WFIRS-P, the Life Skills and Risky Activities showed the highest ($M = 0.50$, SD = 0.37) and lowest ($M = 0.07$, SD = 0.11) rated impairment, respectively (Kiani et al. 2018). In this study, the minimum score was 0 for all subdomains and the total scale of the WFIRS-P and the maximum score was 2.30 for the Family, 1.40 for the School, 1.90 for the Life Skills, 3.00 for the Self-Concept, 1.71 for the Social Activities, 0.60 for the Risky Activities, and 1.24 for the total scale of the WFIRS-P.

Statistical analysis

All statistical analyses were performed with a significance level of 0.05 in the IBM SPSS Statistics 22 program. In order to assess the internal consistency of the subscales and total scale of the SWAN, Cronbach's alpha coefficients were obtained from the full sample. An amount above 0.7, 0.8, and 0.9 was considered acceptable, good, and excellent internal consistency, respectively (George and Mallery 2003). In order to assess the construct validity of the SWAN, Confirmatory Factor Analysis (CFA) was conducted among the full sample. Based on the suggested structure for the SWAN (Swanson et al. 2012), a two-factor model was evaluated. The comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the Tucker–Lewis index (TLI) were considered to evaluate the model fit. A value of CFI ≥ 0.90, an RMSEA below 0.10, and a TLI over 0.90 (Hu and Bentler 1999; Browne and Cudeck 1993; Bentler 1990) indicate an acceptable model fit.

Three groups of children were determined according to their total mean score on the SWAN for between-group comparisons. The first group is with strengths in attention and behavioral control skills or the strong group (a total mean score on the SWAN ≤ − 1.5 SD, $n = 43$), the second group with moderate attention and behavioral control skills (a total mean score on the SWAN ranging from − 0.1 SD to + 0.1 SD, $n = 15$), and the third group with weaknesses in attention and behavioral control skills or the weak group (a total mean score on the SWAN ≥ + 1.5 SD, $n = 17$). The strong group ($n = 43$), the moderate group ($n = 15$), and the weak group ($n = 17$) were compared on the following scales: PedsQL 4.0, SDQ, and WFIRS-P. In order to conduct the analyses, one-way multivariate analysis of variance (one-way MANOVA), one-way analysis of variance (one-way ANOVA), and Scheffé's method were used. One-way MANOVA was conducted in order to examine the differences among the groups on subscales from the PedsQL 4.0, SDQ, and WFIRS-P followed up by one-way ANOVAs. Scheffé's method was used to perform pairwise comparisons. Partial eta-squared (partial η^2) values of 0.01, 0.04, and 0.1, respectively, were considered as low, moderate, and high effect sizes (Huberty 2002).

Results

Internal consistency

The internal consistency of the inattention and hyperactivity/impulsivity subscales and total scale of the SWAN was excellent. Cronbach's alpha coefficients were 0.90, 0.91, and 0.94 for the inattention subscale, hyperactivity/impulsivity subscale, and total scale of the SWAN, respectively.

Confirmatory factor analysis

The results of the CFA confirmed the two-factor model of the SWAN and showed acceptable model fit with the CFI = 0.914, RMSEA = 0.081, and TLI = 0.902. Factor loadings were good ranging from 0.58 to 0.86 for the inattention subscale and 0.63 to 0.81 for the hyperactivity/impulsivity subscale.

Between-group analysis based on SWAN scores

Groups based on SWAN scores were compared on the PedsQL 4.0, SDQ, and WFIRS-P. Significant main effects emerged among the strong group, the moderate group, and the weak group in PedsQL 4.0 subscales (Pillai's trace = 0.435, F (8,140) = 4.86, $p = 0.001$, partial $\eta^2 = 0.22$). Univariate F tests of the 4 PedsQL 4.0 subscales revealed that there were significant differences in Physical Functioning (F (2,72) = 6.30, $p = 0.003$, partial $\eta^2 = 0.15$), Emotional Functioning (F (2,72) = 8.62, $p = 0.001$, partial $\eta^2 = 0.19$), Social Functioning (F (2,72) = 9.19, $p = 0.001$, partial $\eta^2 = 0.20$), and School Functioning subscales (F (2,72) = 22.64, $p = 0.001$, partial $\eta^2 = 0.39$) among the three groups. There were also significant effects among the three groups on the Psychosocial Health scale (F (2,72) = 15.10, $p = 0.001$, partial $\eta^2 = 0.30$) and total scale (F (2,72) = 12.51, $p = 0.001$, partial $\eta^2 = 0.26$) of the PedsQL (Table 1). Pairwise comparisons of the strong group, the moderate group, and the weak group in the PedsQL indicated that the strong group is significantly higher than the weak group on all subscales, the Psychosocial Health scale, and the total scale of

Table 1 Comparison of the strong group ($n=43$), the moderate group ($n=15$), and the weak group ($n=17$) based on SWAN scores

	(1) Strong group Mean (SD)	(2) Moderate group Mean (SD)	(3) Weak group Mean (SD)	F	Partial η^2	Pairwise comparisons
PedsQL 4.0						
Physical functioning	83.94 (14.13)	75.63 (24.75)	62.68 (30.47)	6.30**	0.15	1 > 3**
Emotional functioning	81.51 (20.57)	66.33 (22.08)	56.18 (26.55)	8.62**	0.19	1 > 3**
Social functioning	93.49 (11.31)	85.00 (27.52)	67.94 (30.88)	9.19**	0.20	1 > 3**
School functioning	91.74 (9.19)	75.67 (24.70)	58.24 (25.61)	22.64**	0.39	1 > 3** 1 > 2* 2 > 3*
Psychosocial health	88.91 (11.13)	75.67 (23.71)	60.78 (25.86)	15.10**	0.30	1 > 3**
Total score	87.18 (10.69)	75.65 (23.78)	61.45 (26.39)	12.51**	0.26	1 > 3**

Pairwise comparisons were conducted only for main effects that were statistically significant with p values < 0.05

All other pairwise comparisons yielded p values > 0.05

SD standard deviation, *SWAN* the strengths and weaknesses of ADHD symptom and normal behavior rating scale, *PedsQL 4.0* pediatric quality of life inventory version 4.0 generic core scales

*$p < 0.05$, **$p < 0.01$

the PedsQL 4.0 and the strong group is significantly higher than the moderate group and the moderate group is significantly higher than the weak group on School Functioning (Table 1).

Significant differences were found between the impaired group, the normal group, and the skilled group in SDQ subscales (Pillai's trace = 0.673, F (10,138) = 7.00, $p = 0.001$, partial $\eta^2 = 0.34$). Univariate F tests of the 5 SDQ subscales revealed that there were significant differences in Conduct Problems (F (2,72) = 20.78, $p = 0.001$, partial $\eta^2 = 0.37$), Hyperactivity/Inattention (F (2,72) = 25.22, $p = 0.001$, partial $\eta^2 = 0.41$), Peer problems (F (2,72) = 3.27, $p = 0.044$, partial $\eta^2 = 0.08$), and Prosocial Behavior subscales (F (2,72) = 11.72, $p = 0.001$, partial $\eta^2 = 0.25$) among the three groups (Table 2). Pairwise comparisons of the strong group, the moderate group, and the weak group in the SDQ indicated that the weak group is significantly higher than the moderate group and the strong group on the Conduct Problems and the Hyperactivity/Inattention subscales of the SDQ. The moderate group was significantly higher than the strong group on the Hyperactivity/Inattention subscale. The strong group and the moderate group were significantly higher than the weak group on the Prosocial Behavior subscale of the SDQ (Table 2).

Significant main effects emerged on the WFIRS-P subscales (Pillai's trace = 0.639, F (12,136) = 5.32, $p = 0.001$, partial $\eta^2 = 0.32$). Univariate F tests of the 6 WFIRS-P domains revealed that there were significant effects in Family (F (2,72) = 22.36, $p = 0.001$, partial $\eta^2 = 0.38$), School (F (2,72) = 15.37, $p = 0.001$, partial $\eta^2 = 0.30$), Life Skills

Table 2 Comparison of the strong group ($n=43$), the moderate group ($n=15$), and the weak group ($n=17$) based on SWAN scores

	(1) Strong group Mean (SD)	(2) Moderate group Mean (SD)	(3) Weak group Mean (SD)	F	Partial η^2	Pairwise comparisons
SDQ						
Emotional symptoms	2.21 (2.39)	2.53 (2.29)	3.59 (2.43)	2.05	0.05	
Conduct problems	1.30 (1.37)	1.27 (1.28)	4.12 (2.23)	20.78**	0.37	3 > 1, 2**
Hyperactivity/inattention	1.98 (1.88)	3.93 (2.09)	6.53 (3.14)	25.22**	0.41	3 > 1, 2** 2 > 1*
Peer problems	1.98 (1.95)	2.07 (1.62)	3.35 (2.09)	3.27*	0.08	
Prosocial behavior	8.67 (1.82)	9.13 (1.30)	6.18 (2.74)	11.72**	0.25	1, 2 > 3**

Pairwise comparisons were conducted only for main effects that were statistically significant with p values < 0.05

All other pairwise comparisons yielded p values > 0.05

SD, standard deviation, *SWAN*, the strengths and weaknesses of ADHD symptom and normal behavior rating scale, *SDQ* strengths and difficulties questionnaire

*$p < 0.05$, **$p < 0.01$

(F (2,72) = 12.53, p = 0.001, partial η^2 = 0.26), Self-Concept (F (2,72) = 15.42, p = 0.001, partial η^2 = 0.30), Social Activities (F (2,72) = 16.01, p = 0.001, partial η^2 = 0.31), and Risky Activities subscales (F (2,72) = 21.62, p = 0.001, partial η^2 = 0.38) among the three groups. Significant difference was also found between the mentioned groups in the total scale of the WFIRS-P (F (2,72) = 34.79, p = 0.001, partial η^2 = 0.49) (Table 3). Pairwise comparisons of the strong group, the moderate group, and the weak group in the WFIRS-P indicated that the weak group is significantly higher than the moderate group and the strong group on all subscales and the total scale of the WFIRS-P (Table 3).

Discussion

The factor structure and internal consistency of the Persian version of the SWAN were evaluated. Our findings suggested that the Persian version of the SWAN is a valid and reliable measure for assessing attention and behavioral control skills. The present study which was done in a Middle Eastern sample of children assessed this question whether children with strengths in attention and behavioral control skills differed from those with moderate and weak attention and behavioral control skills in quality of life, emotional and behavioral problems, prosocial behavior, and functional impairment. This study confirmed that in a normal population, the range of attention and behavioral control skills is associated with expected differences in quality of life, general psychopathology, and function.

These findings are relevant because no studies have yet to consider a Persian translation of the SWAN and this is the first study of the full range of strengths and weaknesses of attention and behavior in a Middle Eastern sample. This study is a necessary "first step" to utilize the SWAN as a clinical assessment and treatment outcome tool in the care of children and adolescents living in the Middle East. Further, these findings demonstrate replication across cultural settings and provide additional support that ADHD is a cross-cultural construct.

Internal consistency of the subscales and total scale of the SWAN was excellent. These results are consistent with previous studies on the SWAN (Lakes et al. 2011; Lai et al. 2011). In Lakes et al. (2011), Cronbach's alphas were, respectively, 0.91, 0.93, and 0.95 for the inattention subscale, hyperactivity/impulsivity subscale, and total scale of the English version of the SWAN and the alphas were 0.92, 0.95, and 0.96 for the respective subscales and total scale of the Spanish version of the SWAN. In Lai et al.'s (2011) study, the alpha coefficients were, respectively, 0.90, 0.93, and 0.95 for the inattention subscale, hyperactivity/impulsivity subscale, and total scale of the parent report form of the SWAN and the alphas were 0.97, 0.97, and 0.98 for the respective subscales and total scale of the teacher report form of the SWAN. In this study, the test–retest reliability of the SWAN was not assessed. Future studies should consider measuring test–retest reliability of the Persian version of the SWAN.

The two-factor (i.e., attention and motor/impulse control) structure of the Persian version of the SWAN was confirmed in this study, and the items had good factor loadings that show the SWAN is a valid measure in assessing two major symptom clusters in ADHD including inattention and hyperactivity/impulsivity. These findings replicate findings in other samples using the SWAN from other cultural backgrounds (Swanson et al. 2012; Arnett et al. 2013; Lai et al.

Table 3 Comparison of the strong group (n = 43), the moderate group (n = 15), and the weak group (n = 17) based on SWAN scores

	(1) Strong group Mean (SD)	(2) Moderate group Mean (SD)	(3) Weak group Mean (SD)	F	Partial η^2	Pairwise comparisons
WFIRS-P						
Family	0.15 (0.220)	0.17 (0.25)	0.76 (0.55)	22.36**	0.38	3 > 1, 2**
School	0.08 (0.130)	0.15 (0.21)	0.45 (0.42)	15.37**	0.30	3 > 1, 2**
Life skills	0.36 (0.33)	0.50 (0.31)	0.91 (0.56)	12.53**	0.26	3 > 1** 3 > 2*
Self-concept	0.05 (0.16)	0.20 (0.35)	0.88 (1.04)	15.42**	0.30	3 > 1, 2**
Social activities	0.06 (0.11)	0.13 (0.23)	0.47 (0.46)	16.01**	0.31	3 > 1, 2**
Risky activities	0.03 (0.08)	0.07 (0.10)	0.25 (0.19)	21.62**	0.38	3 > 1, 2**
Total	0.16 (0.12)	0.23 (0.15)	0.59 (0.31)	34.79**	0.49	3 > 1, 2**

Pairwise comparisons were conducted only for main effects that were statistically significant with p values < 0.05

All other pairwise comparisons yielded p values > 0.05

SD standard deviation, *SWAN* the strengths and weaknesses of ADHD symptom and normal behavior rating scale, *WFIRS-P* Weiss functional impairment rating scale-parent report form

*p < 0.05, **p < 0.01

2011). Our findings are also consistent with factor analytic findings of ADHD rating scales that do not assess symptomatic strengths in a Middle Eastern sample. In a validation study on the Persian self-report form of the Swanson, Nolan, and Pelham Rating Scale—fourth edition (SNAP-IV; Swanson et al. 2012) in a sample of Iranian adolescents, two factors of inattention and hyperactivity/impulsivity were revealed that directly map onto the items for each factor indicated in the current study (Kiani and Hadianfard 2016).

Children in the strong group had better quality of life specifically better physical functioning, emotional functioning, school functioning, and social functioning than the weak group. The strong group was better than the moderate group, who in turn was better than the weak group on school functioning. The strong group showed less conduct problems and more prosocial behavior than the weak group and less hyperactivity/inattention than the moderate group and the weak group. The moderate group had more prosocial behavior and less hyperactivity/inattention and conduct problems than the weak group. The strong group and the moderate group had less functional impairment in all domains including family, school, life skills, self-concept, social activities, and risky activities than the weak group. These findings suggest that the ADHD symptoms are not a construct in which individuals are either symptomatic or not, but symptom severity can range from a deficit to a strength (Greven et al. 2018; Arnett et al. 2013; Hay et al. 2007). Our findings support the use of SWAN in clinical samples in Persian-speaking populations and could have utility for clinicians to identify behavioral strengths among these pediatric patients.

Limitations

This was a preliminary investigation, and our findings should be considered in light of study limitations. The data analysis in this study was exploratory, and future studies should address this limitation. The sample of this study included Iranian children studied in two elementary schools in Shiraz and is not necessarily generalizable to children in other cities of Iran. Future studies should consider a larger and representative sample of Middle Eastern children to compare children in different points of the spectrum of attention and behavioral control skills in different outcome measures and provide the normative values on the Persian version of the SWAN. In addition, future studies should consider an ADHD sample of Middle Eastern children to establish clinical cutoff points on the subscales and total scale of the Persian version of SWAN. Further, future studies are needed to assess whether our findings are replicated with self-reported symptoms in children and adolescents. Future studies should also consider adult samples to assess the ability of the SWAN to assess attention and behavioral control skills in adults. Future studies are recommended to consider the full spectrum from strong skill to significant impairment on the WFIRS-P and PedsQL. Future studies with larger samples could consider using the T scores to define a better than normal, normal, and abnormal population in PedsQL, SDQ, and WFIRS-P measures.

Summary

The results of our study indicated that the SWAN in a Middle Eastern sample of children is internally reliable and has a factor structure. In addition, in a normal population, the spectrum of attention and behavioral control skills from most abnormal to unusually strong was found to be reflected in similar strengths and weaknesses in function, quality of life and functional impairment. Individuals with strengths in attention and behavioral control skills show improved quality of life and have less behavioral and functional impairment. Those with moderate attention and behavioral control skills have better school functioning, less conduct problems, hyperactivity/inattention, and functional impairment than individuals with weaknesses in attention and behavioral control skills. In addition, individuals with strengths in attention and behavioral control skills had better school functioning and attention and motor control than those with moderate attention and behavioral control skills. Therefore, these behaviors are not merely ADHD symptoms that are either present or not present. Instead, some individuals have strengths in these domains even when compared to those that are not endorsing a high severity of symptom (i.e., a middle symptom severity group). Future studies are needed to build on these findings to identify cross-cultural differences and similarities when considering ADHD symptom severity and related characteristics.

Compliance with ethical standards The study was performed in accordance with the ethical standards.

Conflict of interest The authors declare that they have no conflict of interest.

Informed consent The parents of the children approved and signed the informed consent form.

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