



Psychological Assessment

# Development and validity evidence of the Children–Dog Interaction Scale


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### Abstract

Animal-assisted interventions (AAI) have been showing significant results in human health promotion. This study aimed to develop and present validity evidence of the Children-Dog Interaction Scale (CDIS) for the Brazilian population. Items were developed and evaluated by experts. Parents of children between 2 and 12 years old ( $n = 118$ ) completed the CDIS and the Strengths and Difficulties Questionnaire (SDQ). Exploratory Factor Analysis generated two dimensions: Affective Interactions (23 items,  $\alpha = .89$ ) and Educational and Punitive Interactions (8 items,  $\alpha = .65$ ) between children and dogs. The significant correlations between CDIS and SDQ dimensions indicated that the interaction between children and dogs could be a significant variable for assessing children's behavioral problems. We concluded that CDIS is a valid and reliable instrument to assess children-dog interactions and screen children for IAA participation.

**Keywords:** psychometric measure; human-animal interaction; child behavior; Animal-Assisted Intervention; domestic dogs.

## CONSTRUÇÃO E EVIDÊNCIAS DE VALIDADE ESCALA DE INTERAÇÃO ENTRE CRIANÇAS E CÃES

### Resumo

As Intervenções Assistidas por Animais (IAAs) apresentam resultados expressivos para a promoção da saúde humana. O objetivo deste artigo foi construir e apresentar evidências de validade da Escala de Interação entre Crianças e Cães (EICC) para a população brasileira. O instrumento foi desenvolvido a partir da literatura e submetido a análise de juízes, o qual respondido por 118 pais de crianças entre 2 e 12 anos de idade, juntamente com o Questionário de Capacidades e Dificuldades (SDQ). A partir da análise fatorial exploratória, foram extraídos os fatores Interação Afetiva ( $\alpha = .89$ ), 23 itens e Interação Educativa e Punitiva ( $\alpha = .65$ ), 8 itens. As correlações significativas entre dimensões da EICC e do SDQ indicam que a interação entre crianças e cães domésticos pode ser uma variável importante para a avaliação de problemas comportamentais. Conclui-se que a EICC apresenta bons índices de validade e confiabilidade e pode ser usada para a triagem de crianças.

**Palavras-chave:** medida psicométrica; interação homem animal; comportamento infantil; Intervenções Assistidas por Animais; cães domésticos.

# CONSTRUCCIÓN Y EVIDENCIA DE VALIDEZ DE LA ESCALA INTERACCIÓN NIÑOS Y PERROS

## Resumen

Las intervenciones asistidas por animales (IAA) han mostrado resultados significativos para la promoción de la salud humana. El objetivo fue construir y presentar evidencia de validez de la Escala de Interacción entre Niños y Perros (EICC) para la población brasileña. El instrumento desarrollado a partir de la literatura y sometido al análisis de jueces, fue respondido por 118 padres de niños de entre 2 y 12 años, junto con el Cuestionario de Capacidades y Dificultades (SDQ). Del análisis factorial exploratorio, se extrajeron los factores interacción afectiva (23 elementos,  $\alpha = ,89$ ) e interacción educativa y punitiva (ocho elementos,  $\alpha = ,65$ ). Correlaciones significativas entre las dimensiones del EICC y el SDQ indican que la interacción entre los niños y los perros domésticos puede ser una variable importante para evaluar los problemas de comportamiento. Se concluye que el instrumento tiene buenos índices de validez y confiabilidad, y se puede utilizar para la detección de niños.

**Palabras clave:** medida psicométrica; interacción entre hombre y animal; comportamiento del niño; intervenciones asistidas por animales; perros domesticos.

## 1. Introduction

The use of dogs and other animals in human health treatment and promotion was pioneered in England by William Tuke in 1792. This practice was first adopted and developed in Brazil by Nise da Silveira in the 1950s (Santos & Silva, 2016). At that time, this therapeutic tool still lacked standardized terminology and definitions. However, given its increasing use by health professionals and to avoid misunderstandings due to divergent definitions, in 1996, the Delta Society described it as Animal–Assisted Interventions (AAI). These were divided into two different modalities, namely, Animal–Assisted Activity (AAA) and Animal–Assisted Therapy (AAT) (Ferreira et al., 2016). Later, Pet Partners, the leading Non–Governmental Organization in AAI, launched an international initiative aimed at establishing standardized terms and definitions, classifying the various animal–assisted approaches according to the methodology employed: AAA, AAT, and Animal–Assisted Education (AAE). AAA is characterized by free and more informal interventions, in which interactions are spontaneous; AAT involves structured goal–oriented therapeutic activities; and AAE comprises interventions that use these activities with a focus on academic and learning environments.

The notion that animals can have multiple effects on people's lives and behavior is investigated in a field of research known as Human-Animal Interaction (HAI). It is used to describe and understand the different qualitative and quantitative results of such interactions. As a relatively new and interdisciplinary field, HAI is often criticized for its lack of methodological rigor (Herzog, 2015). Common criticisms of HAI research point out issues related to weak study design, small sample sizes, and inadequate use of evaluation instruments, which limit its ability to develop an evidence base for AAA.

Relationships between human and non-human animals involve adaptive demands that created new conditions for domesticated species selection and, thus, resulted in a wide genetic differentiation (Frantz et al., 2016). Domestic dogs (*Canis familiaris*) are social animals whose cognitive abilities allow them to interact with other dogs and with people. The variability in the social behavior of domestic dogs, that is, the ability to adjust their behavior to different contexts, facilitated their connection with humans (Udell & Brubaker, 2016). For thousands of years, dogs have shared the environment with humans, and this relationship is becoming even closer, with some human societies considering them a central part of family life and as family members.

Canine abilities such as making eye contact with humans, understanding communicative gestures, establishing bonds and perceiving emotions, face expressions, and human vocal signals made dogs one of the animals most used as a therapeutic tool. Moreover, the human ability to distinguish between different canine barks and expressions and to form an attachment relationship with dogs facilitated the development of this kind of intervention (Chelini & Otta, 2015).

Health interventions and programs assisted by animals, used in this context as co-therapists, can be used heterogeneously in methodologies developed to meet various therapeutic goals. Because they promote interaction and social support, communication development, and motor development playfully and dynamically, these interventions are widely used with children. In this context, it is essential to follow the recommendations for selecting the animal, as well as the child, to avoid allergic reactions, bites, and diseases transmitted by the animal, as well as any aggressive behavior on the part of the child or any form of abuse that could make this type of treatment impracticable. Planning a possible animal-assisted intervention could benefit from the development of psychological assessment

instruments to evaluate the interaction between children and domestic animals, enhancing the chances of successful interventions.

Several studies have been attempting to develop valid and reliable scales to assess the interaction between children and animals, as well as measuring the propensity for abusive behaviors towards animals in children. Thompson and Gullone (2003) assessed childhood behavior towards animals using the *Children's Treatment of Animals Questionnaire* (CTAQ) scale. The research involved the participation of children aged from 8 to 10 years old. The scale showed adequate internal consistency and good test–retest reliability in identifying various types of children's behaviors towards domestic animals, such as playing, talking, taking for a walk, and feeding. However, the authors point out that it is necessary to assess the predictive validity of the instrument in the identification of children who are cruel to animals. Guymier, Mellor, Luk, and Pearse (2001) developed an instrument to measure the levels of children's cruelty towards different animals, the *Children's Attitudes and Behaviors Towards Animals* (CABTA). The CABTA questionnaire was completed by parents of children aged 4 to 13, attending elementary education and of children who have been diagnosed with either a disruptive behavioral disorder or attention deficit hyperactivity disorder (ADHD). The results showed that the CABTA is a valid and reliable instrument for detecting children's cruelty towards animals based on two factors: typical cruelty and malicious cruelty. The authors advocate using CABTA as a screening instrument to assess and detect early aggressive behaviors of children towards animals in clinical and community samples. CABTA has also been validated in Malaysia and China (Wong, Mellor, Xu, & Richardson, 2013).

The researchers who developed these instruments understand that non-empathic and aggressive behaviors towards animals can predict such behavior in interactions with humans. Thus, instruments to assess children–animals interaction can help plan interventions aimed at developing empathic and prosocial behaviors in children. Moreover, these behaviors may be predictors of disorders, such as oppositional defiant disorder (ODD) and ADHD (Vaughn et al., 2009). Instruments to assess the children's interaction with animals, thus, can also be used to help make diagnoses.

Other instruments to assess children's interaction with animals are mentioned in the literature. Different aspects of this interaction were addressed, such as

attachment to and friendship with pets – *Pet Bonding Scale*, *Pet Attachment Scale – Revised/Parent Report* and *Pet Friendship Scale* – PFS (Anderson, 2007). However, no validation studies of these instruments were found, making it difficult to evaluate their validity, structure, and applicability.

The instruments mentioned above enabled a more specialized screening of children participating in animal-assisted intervention programs. Thus, professionals working in the field became able to assess the suitability of children for this type of intervention and achieve a greater predictability of potential complications during the procedures (Guymer et al., 2001; Thompson & Gullone, 2003). Furthermore, these studies demonstrated a relationship between abusive behaviors in children towards animals and the manifestation of these behaviors in interactions with humans. It was also possible to demonstrate the relationship between abusive behavior in children towards animals and diagnoses such as ADHD and ODD in childhood. However, we believe that the focus of these instruments on aggressive and cruel behaviors might have possibly caused a bias in the responses given by children and their parents, since items in the instruments addressing these behaviors can arouse unpleasant and conflicting feelings in respondents. We believe, therefore, that such questions should be avoided or reformulated in the development of assessment instruments to measure the interaction between children and animals.

Despite the potential for using instruments to assess the interaction between children and animals, we did not find any such instrument available in the Brazilian literature. Thus, our aim in this study was to develop an instrument and gather evidence regarding its validity to assess the interaction between children and dogs in the Brazilian context, with the potential to be used in the planning of AAI and to guide the selection of children for this therapeutic modality.

## 2. Method

### 2.1 Participants

The inclusion criteria for selecting the study participants were to have at least one son/daughter aged 2 to 12 and provide the information requested during the research. A total of 118 parents of children aged 2 to 12 who owned a dog as a pet met the inclusion criteria. Most participants identified themselves as the children's mothers, lived in various regions of Brazil, but mainly in the states of

Espírito Santo and São Paulo, and had their purchasing power assessed by the Brazilian Economic Classification Criterium (*Critério de Classificação Econômica Brasil –CCEB*) corresponding to the B economic class (Figure 2.1.1). The children’s averaged seven years of age, and just over half were female. Most had no special needs and had never been harmed by an animal. Figure 2.1.1 summarizes the respondents’ and their children’s characteristics.

Figure 2.1.1. Descriptive statistics of the participants and their children.

Characteristic	Description	<i>M (SD) or n (%)</i>
Relation with the child	Mother	99 (83.9)
	Father	6 (5.2)
	Aunt	4 (3.4)
	Sister	1 (0.8)
	Other	8 (6.7)
State of residence	ES	42 (35.6)
	SP	35 (29.7)
	MG	10 (8.5)
	RJ	7 (5.9)
	BA	6 (5.1)
	Other	18 (15.2)
CCEB		41.8 (10.9)
Gender of the child	Male	50 (42.4)
	Female	68 (57.6)
Age of the child		6.9 (3.5)
Does the child have special needs?	Yes	16 (13.6)
	No	102 (86.4)
Has the child ever been harmed by a pet?	Yes	30 (25.4)
	No	88 (74.6)

Note: ES = Espírito Santo; SP = São Paulo; MG = Minas Gerais; RJ = Rio de Janeiro; BA = Bahia.

## 2.2 Instruments

- Brazilian Economic Classification Criterium (CCEB), developed by the Brazilian Research Companies Association (*Associação Brasileira de Empresas de*

*Pesquisa* – ABEP, 2016): the instrument comprises questions about ownership of consumer goods, education level, and access to public services to obtain an economic classification of respondents. The sum of the scores is used to classify respondents into economic classes ranging from A (45–100 points) to D–E (0–16 points).

- Socio-demographic questionnaire: participants answered questions about themselves (city and state of residence and the relationship with the child) and about the children, such as age, gender, number of siblings, whether the child has special needs, and whether a pet had already hurt the child.
- Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997), version for parents: this instrument was selected due to its suitability for the age group focused by the study and because it is validated for the Brazilian population. It assesses the mental health and behavior of children and adolescents. We used in this study the version for children aged 2 to 4 and the version for children/adolescents aged 5 to 17. Parents answered the age-appropriate version for their child. The instrument consists of 25 items divided into five subscales: prosocial behavior, hyperactivity, conduct problems, emotional symptoms, and peer relationships. Respondents marked each statement as false, more or less true, or true. Versions translated and validated for Brazil were used (Woerner et al., 2004). Cronbach's alphas for the subscales ranged from .48 (emotional problems) to .80 (hyperactivity), both on the scale for children aged 2–4.

In addition to these instruments, we also used the Children–Dog Interaction Scale (CDIS), whose development and analysis are described below in Study 1 (2.3) and Study 2 (2.4) sections.

### **2.3 Study 1: development of the Children–Dog Interaction Scale (CDIS)**

CDIS is a scale for assessing children's interaction with dogs, which was developed according to the following steps:

- 1) *Creating 42 items related to the children–dog interaction:* To create the items, the authors adapted scales found in the international literature that directly or indirectly assess human interactions with pets (Anderson,



2007; Cromer & Barlow, 2013; Winefield, Black, & Chur–Hansen, 2008; Zilcha–Mano, Mikulincer, & Shaver, 2011). Although some of these scales have a multifactor structure, the items selected for CDIS development were not restricted to any specific dimension. Our goal was to develop a scale encompassing all possible forms of children’s interaction with dogs. Thus, after collecting a series of items regarding different dimensions of the children’s interaction with dogs (obtained from the scales found in the literature), we initially predicted that the CDIS would have a multidimensional structure, but without predicting any specific factor structure.

- 2) *Face validity*: In this step, the items developed in step 1 were analyzed by three experts who evaluated their adequacy for describing children interaction with dogs defined as “Any attitude on the part of the child that involves direct contact between the child and the dog, positive and negative feelings during and/or after contact with the dog and the maintenance of a physical and emotional relationship with the dog”. The experts also evaluated the items for concreteness, simplicity, and clarity. Three experts participated in the analysis, two with PhDs and one with a master’s degree, with experience in psychological assessment and work with children and/or animals.

## 2.4 Study 2: construct validity and reliability

In this study, the CDIS developed during Study 1 was presented to the parents participating in the research, along with the other instruments. Answers to CDIS questions range from 1 = Never to 5 = Always. Participants were instructed as follows: “Think about your child’s relationship with dogs. Indicate on the response scale below how often the listed behaviors and situations occur”.

Participants were recruited through the researchers’ social media networks. Invitations to participate in the study were sent along with a link to the questionnaire and a request to share the invitation with other parents in the participant’s social media network. Upon clicking on the link, participants were led to the free and informed consent form (*Termo de Consentimento Livre e Esclarecido* – TCLE); at the end of which they chose to participate in the research or close the page. Participants obtained access to the online form, which contained all the instruments described

above and was made available on the Google platform by accepting to participate. Missing data were avoided by leaving active the mandatory answer option to access the next page of the form. Participants could withdraw from the study at any time, as they could close the form at any point without submitting their responses. The study was approved by the responsible institution's Ethics Committee (no. 64232416.3.0000.5542) following the guidelines of the National Health Council's (2016) Resolution no. 510, dated April 7<sup>th</sup>, 2016.

Collected data had their dimensionality assessed using the FACTOR software (Lorenzo-Seva & Ferrando, 2006). A parallel analysis with a random permutation of the observed data and Robust Promin rotation was run to investigate the number of factors to be extracted. Subsequently, an exploratory factor analysis (EFA) was run to test the factor structure suggested by the parallel analysis results. The EFA was carried out by generating a polychoric matrix and using the Robust Unweighted Least Squares (RULS) extraction method. Factor stability was assessed using the H index (Ferrando & Lorenzo-Seva, 2018). The H index assesses how well a set of items represents a common factor (Ferrando & Lorenzo-Seva, 2018). H values range from 0 to 1. High H values ( $> 0.80$ ) suggest a well-defined latent variable, which is more likely to be stable across different studies. Low H values suggest an ill-defined latent variable, probably unstable across different studies (Ferrando & Lorenzo-Seva, 2018). Total scale reliability was also evaluated using the alpha (Cronbach) and Omega (McDonald's) coefficients using the jamovi software.

For obtaining evidence of convergent validity, Pearson's  $r$  correlation analysis was performed between the CDIS and the SDQ using the IBM SPSS software (version 21).

### 3. Results

Results for the development and analysis procedures are described in sections 3.1 and 3.2.

#### 3.1 Study 1: development of the Children-Dog Interaction Scale (CDIS)

Of the 42 items submitted to the experts' evaluation, two were excluded because at least two experts evaluated that they did not meet the criteria of concreteness, simplicity, and clarity ("The child likes to brush the dog"; "The child

pays attention to the dog”). Other six items did not meet the criteria of concreteness, simplicity, and clarity for only one of the experts; and these were adjusted according to the suggestions made. Thus, the item “Your child talks to the dog as if they were friends” was altered to “Your child talks to the dog”; “When the dog misbehaves, your child hits the dog” to “Your child hits the dog when the dog does something he/she doesn’t like”; “Your child avoids the dog” to “Your child avoids contact with dogs”; “Your child loves the dog” to “Your child says he/she loves the dog”; “Your child shares his/her food with the dog” to “Your child shows concern for feeding the dog”; “Your child hugs or shows affection for the dog” was broken down into two items, namely, “Your child hugs the dog” and “Your child shows affection for the dog”. At the end of Study 1, the CDIS included 41 items.

### 3.2 Study 2: construct validity and reliability

The parallel analysis of the CDIS, with 41 items, resulted in a non-positive correlation matrix, preventing the extraction of factors by the polychoric method. Analysis results indicated the pair of items with the highest correlation and suggested excluding the item with the smaller variance (Lorenzo–Seva & Ferrando, 2006). The item was excluded, and the procedure was repeated until a positive correlation matrix was obtained. The items excluded during the analyzes were: “Your child shows affection for the dog”; “Your child shows fondness for the dog”; “Your child likes to pet the dog”; “Your child gets excited when interacting with the dog”; “Your child gets annoyed when sniffed by the dog”; “Your child doesn’t like the dog”; “Your child appears to be happy when he/she is with the dog”; “Your child has fun with the dog”. After excluding the highly correlated items, the CDIS was reduced to 33 items, allowing the extraction of factors by the polychoric method. Bartlett’s tests of sphericity (1226.1,  $gl = 496$ ,  $p < 0.001$ ) and Kaiser–Meyer–Olkin (KMO) (0.90) suggested interpretability of the items’ correlation matrix. Parallel analysis suggested the extraction of two factors. The percentage of data variance explained by Factor 1 was 41.46% and by Factor 2 was 9.01%.

A factor loading level of .30 was adopted as an exclusion criterion for the items, resulting in the exclusion of only 1 item: “Your child feels uncomfortable when hearing a dog barking”. Figure 3.2.1 shows the factor loadings for the remaining 31 items, the composite reliability indices, and estimates of replicability of the factor scores – H index (Ferrando & Lorenzo–Seva, 2018).

**Figure 3.2.1. Factor structure of the Dog-Children Interaction Scale.**

Item	Factor 1	Factor 2
8. Your child tries to teach the dog new things.	1.121	
7. Your child tries to make the dog behave.	0.929	
11. Your child trains the dog.	0.855	
28. Your child accompanies you when you go for a walk with the dog.	0.720	
4. Your child hits the dog when the dog does something he/she doesn't like.	0.677	
5. Your child is jealous of the dog.	0.393	
37. Your child imitates the dog.	0.388	
40. Your child barks at the dog during play.	0.334	
41. Being around the dog is pleasant for your child.		0.987
33. The dog makes your child laugh.		0.907
34. The dog helps your child feel less sad.		0.882
26. Your child enjoys spending time with the dog.		0.814
2. Your child talks to the dog.		0.810
19. Your child is calmer when he/she is with the dog.		0.774
18. Your child avoids contact with dogs.		-0.772
23. Your child asks to sleep with the dog.		0.756
32. Your child likes when the dog eats from his/her hand.		0.751
16. Your child smiles when he/she sees the dog.		0.727
1. Your child spends part of the day playing or exercising with the dog.		0.627
14. Your child says he/she loves the dog.		0.618
39. Your child gets annoyed when he/she is licked by the dog.		-0.596
35. Your child shows concern for feeding the dog.		0.571
3. When your child is upset, he/she looks to the dog for solace.		0.562
24. Your child talks about the dog with other people.		0.494
27. Your child takes care of the dog.		0.487
31. Your child understands what the dog is trying to express.		0.476
6. Your child is sad when he/she is away from the dog.		0.469
12. Your child hugs the dog.		0.435
9. Your child spends time watching the dog.		0.368
15. Your child is afraid of the dog.		-0.364
29. Your child communicates with the dog.		0.358
Composite reliability	0.821	0.942
H-latent	0.944	0.968
H-observed	1.480	1.640

The items presented adequate factor loadings on their respective factors. The composite factor reliability was adequate (above 0.70) for both factors. The measure of the factor structure replicability (H index, Ferrando & Lorenzo-Seva, 2018) pointed out that the two factors could be replicated in subsequent studies ( $H > 0.80$ ). The reliability indicators of Cronbach's alpha and McDonald's omega presented total scale values of  $\alpha = .94$  and  $\omega = .94$ ; factor 1  $\alpha = .65$  and  $\omega = .66$ ; and factor 2  $\alpha = .89$  and  $\omega = .91$ . The factor structure showed adequate fit indices ( $\chi^2 = 368.795$ ;  $gl = 433$ ;  $p < .001$ ; RMSEA = 0.000; CFI = 0.970; TLI = 1.008).<sup>2</sup>

Factor 1, called educational and punitive interaction, was composed of 8 items for assessing the display of educational and punitive behavior in the child's interaction with the dog. Factor 2, called affective interaction, was composed of 23 items for assessing the display of affection, concern, and care in the child's interaction with the dog. The two-scale factors correlated positively and significantly with each other ( $r = .55$ ,  $p = .0001$ ) and both factors correlated with the total score (Educational and Punitive Interaction  $r = .76$ ,  $p = .0001$ ; and affective interaction  $r = .96$ ,  $p = .0001$ ).

The children's average score was 2.88 for the educational and punitive interaction factor and 3.52 for the affective interaction factor. The CDIS average total score was 3.36. There was no significant difference between scores of boys and girls in any of the dimensions (Mann–Whitney: factor 1  $U = 1527.0$ ,  $p = .34$ ,  $\eta^2 = .007$ ; factor 2  $U = 1517.0$ ,  $p = .32$ ,  $\eta^2 = .008$ ; total  $U = 1488.0$ ,  $p = .25$ ,  $\eta^2 = .01$ ). There was a positive correlation between the affective interaction score and the children's age ( $r = .22$ ,  $p = .02$ ).

Of the sample's 118 children, 37 were aged between 2 and 4 and 81 between 5 and 12. Parents completed the appropriate version of the SDQ for their children's age group. Figures 3.2.2 and 3.2.3 show the average scores for the SDQ dimensions for each age group. The correlation between the CDIS and SDQ scores was evaluated. For children aged 2 to 4, there was a significant negative correlation between the total scores obtained in the CDIS and SDQ hyperactivity subscale and the total score. The CDIS affective interaction factor also negatively correlated with the hyperactivity and behavior subscales and with SDQ total scores (Figure 3.2.2). For

2 RMSEA: root mean square error of approximation; CFI: comparative fit index; TLI: Tucker–Lewis index.

children aged 5 to 12, only the CDIS total scores showed a significant positive correlation with the SDQ prosocial behavior subscale (Figure 3.2.3).

**Figure 3.2.2. Correlations between CDIS and SDQ factors for children aged 2 to 4 (n = 37).**

	<b>M (SD)</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
1. CDIS Educational/ Punitive Interaction	2.86 (0.7)	--							
2. CDIS Affective Interaction	3.28 (0.6)	.55**	--						
3. CDIS Total	3.17 (0.5)	.76**	.96**	--					
4. SDQ emotional	1.51 (1.5)	-.20	-.09	-.14	--				
5. SDQ conduct	2.76 (1.9)	.14	-.37*	-.25	.006	--			
6. SDQ hyperactivity	3.27 (2.5)	-.30	-.33*	-.36*	.30	.16	--		
7. SDQ peer	1.67 (1.8)	.02	-.24	-.19	-.09	.52**	.13	--	
8. SDQ prosocial	8.24 (1.7)	.22	.19	.22	-.17	-.14	-.45**	-.32	--
9. SDQ Total	9.22 (4.9)	-.16	-.43**	-.39*	.44**	.67**	.72**	.62**	-.46**

**Figure 3.2.3. Correlations between CDIS and SDQ factors for children aged 5 to 12 (n = 81).**

	<b>M (SD)</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
1. CDIS Educational/ Punitive Interaction	2.89 (0.8)	--							
2. CDIS Affective Interaction	3.63 (0.6)	.55**	--						
3. CDIS Total	3.44 (0.6)	.76**	.96**	--					
4. SDQ emotional	2.95 (2.3)	.07	.02	.04	--				
5. SDQ conduct	1.51 (1.4)	.12	.00004	.04	.49**	--			
6. SDQ hyperactivity	3.58 (2.6)	.12	.08	.10	.32**	.47**	--		
7. SDQ peer	1.60 (1.8)	.10	-.02	.02	.47**	.50**	.36**	--	
8. SDQ prosocial	8.53 (1.7)	.13	.36	.32**	-.18	-.45**	-.18	-.42**	--
9. SDQ Total	9.64 (6.1)	.14	.35	.07	.76**	.77**	.75**	.74**	-.38**

#### 4. Discussion

This study aimed to develop and validate an assessment scale for the interaction between children aged 2 to 12 and pet dogs. Based on the results obtained, we consider that the study's goal has been achieved. EFA indicated the presence of two factors in the scale, educational and punitive interaction, and affective interaction. The first factor showed acceptable internal consistency, and the second excellent internal consistency (George & Mallery, 2003). The internal consistency differed between the two factors probably due to the low number of items in the first factor. Another aspect that might have influenced responses to the first factor items is that we selected participants based on pet dog ownership. Thus, parents' responses were based on their children's interaction with their own dogs, which might have influenced the reporting of training and punishment behaviors compared to reports of affective behaviors towards the dog. Moreover, the studies on which the scale development was based might have favored the appearance of certain dimensions (Anderson, 2007; Cromer & Barlow, 2013; Winefield et al., 2008; Zilcha–Mano et al., 2011). Most scales found in the literature assess behaviors in interactions with animals in general and are focused on affective aspects of this interaction, with less emphasis on training and punishment behaviors.

As few studies presenting instruments developed to assess the interaction between children and animals were found in the literature, the development of this study's scale was also based on instruments for assessing the interaction between humans and non–human animals in general, whose items were adapted for use with children (Anderson, 2007). As observed in this study, the scales for measuring the bonds, interactions, and attitudes involving humans and domestic animals found in the literature also include affective dimensions and, some of them, discipline dimensions as the main aspects of HAI.

CDIS factors correlated significantly and positively, suggesting that the display of affection, concern, and care and pedagogical and punitive behaviors are two relevant and correlated aspects of the interaction between children and pet dogs. However, other factors included in the scales found in the literature were not present in the CDIS. For example, factors related to cost and responsibilities/care for the animal. This absence can be explained by the target audience of this study's scale, children up to 12 years old, who mostly rely on the help of their parents in these matters.

No difference was observed in parents' responses regarding the interaction of boys and girls with dogs. We found in the literature reports of differences between men and women in their interactions with dogs. Women tended to talk more to dogs, use a baby talk speech register more than men, and speak in a manner more suggestive of friendliness and having a conversation (Mitchell, 2004). Women tended to value their role as caregivers in interactions with their dogs, while men valued their role as trainers and as play and exercise companions (Ramirez, 2006). However, we did not find reports of differences between boys and girls in their interaction with dogs. The absence of differences may be related to the fact that we interviewed the parents and not the children themselves, or may be due to the children's age, which might have prevented the appearance of differences that possibly only emerge after sexual maturity. It may also be due to methodological differences between this study and those found in the literature. We point out, therefore, that more data are needed to confirm our results.

Analysis of the convergence between the CDIS and the SDQ showed, in general, the results expected considering the literature on the topic (Boat et al., 2011). The higher the scores on behavioral problems, hyperactivity, and difficulties (total SDQ) of children aged 2 to 4, the lower were the scores on affective interaction with the dog. Also, the higher the scores on hyperactivity and difficulties (total SDQ), the lower the scores on total interaction with dogs. Studies in the literature indicate that deficits in empathy and aggressive behaviors towards animals are related to ADHD, conduct disorder (CD), and antisocial behavior (Vaughn et al., 2009). ADHD and associated psychiatric conditions such as ODD and CD are the three most common disorders in childhood and adolescence (Althoff, Rettew, & Hudziak, 2003) and include clinical conditions that cover behaviors ranging from impulsiveness, restlessness, intimidation, need for control, and low tolerance for frustration, to more severe hostile behaviors such as aggressiveness and cruelty (Serra-Pinheiro, Schmitz, Mattos, & Souza, 2004). The relationships between the CDIS and SDQ dimensions observed in this study strengthen the hypothesis that aspects of the interaction between humans can also be generalized to relationships between humans and non-human animals.

In children aged 4 to 12, the higher the levels of prosocial behavior, the greater the total interaction with dogs. The literature indicates that interaction



with animals can be used as a resource to facilitate children's integration with their environment, thus, promoting the development of their social behavior and interactions (Mendonça, Silva, Feitosa, & Peixoto, 2014).

In general, studies of AAI in Brazil fail to accurately report how the selection of participants is performed (Pereira, Nobre, Capella, & Vieira, 2017). When they do report, the selection is aimed at evaluating the clinical condition for which the intervention is planned and do not focus on the child–animal interaction. More emphasis is also given to selecting the therapy dog, evaluating its behavior and training than to selecting the child (Muñoz, 2014). Some studies used the quality of the child–dog interaction as an inclusion or exclusion criterion for the intervention. However, they do not specify how this evaluation was carried out, or they do so unsystematically in a preliminary interview with the parents (Zago, Finger, & Kintschner, 2011; Ichitani & Cunha, 2016). We consider, therefore, that the validation of the CDIS for the Brazilian context can be useful in screening children for this therapeutic modality. Children who showed a positive interaction with the dog (affective and approaching behavior towards the animal) can benefit from AAI with dogs. On the other hand, children who show avoidance and fearful behaviors towards the animal may feel uncomfortable when subjected to this type of intervention. However, once fear and avoidance are detected in the child–dog interaction, CDIS can still be used to help plan the intervention and, thus, make any adjustments that might be needed. It is possible, for example, to prioritize certain activities conducted in the presence of the dog, but without physical contact between the child and the dog, in cases in which the child is afraid. It is also possible to select therapy dogs suited to the types of interaction displayed by the child. In this way, the risks inherent to the procedure can be reduced, and the safety and effectiveness of the intervention enhanced. However, to ensure that the scale can be used as a screening instrument, further studies are needed to perform a confirmatory factor analysis of the data obtained, in addition to experimental studies that use the instrument to select participants.

Despite the results obtained, which indicate the validity and reliability of CDIS, this study has some limitations. Data were collected through an online platform, which excludes those who do not have easy access to the internet from participating. Study participants belong mainly to the B economic class (upper–middle class), and the majority reside in the Brazilian Southeast region. Further

studies are necessary to expand the scope of the sample and overcome the data collection limitations mentioned here.

Questions and items describing possible inappropriate behavior by the children (“Your child trains the dog”; “Your child hits the dog when the dog does something he/she doesn’t like”; “Your child is jealous of the dog”) might have influenced some parents in their answers due to considerations related to the concept of social desirability. The use of contradictory items (such as “Your child never hit the dog”; “Your child lets the dog act freely according to its own will” or “Your child always wants to be close to the dog”) and, if possible, of external confirmation of the information provided through home visits and direct observation could be added in future studies to reduce bias in participants’ responses.

Our study also has a conceptual limitation. The investigation of the CDIS’ dimensionality was not based on an a priori theoretical assumption, as explained in the methods section. According to Borsboom, Mellenbergh, & van Heerden (2004), this approach could lead to a validity problem. The authors criticize the absence of a theoretical assumption in the investigation of construct validity, arguing that analyzes focus on the empirical relations observed to the detriment of theoretically predicted causal relationships between the attributes. We consider that our approach is justified by the absence of instruments developed in Brazil for assessing the interaction between children and dogs, which made it difficult to theoretically predict the scale’s dimensionality. On the other hand, we consider that this study contributes to an initial investigation of the construct and to a theoretical framework to support the development of other scales or to the adjustment of the CDIS.

Despite the study’s limitations, the process of developing and subsequently validating the scale of interactions between children and pet dogs proved to be satisfactory. The instrument showed good reliability, face, construct, and convergent validity indices for its application to the Brazilian population. Professionals working in animal-assisted therapies and activities should be able to use this instrument in the screening of children for dog-assisted therapeutic interventions, as it can provide indications of the quality of future interactions between the child and the dog. The instrument can also help plan these interventions to adapt them to the child’s needs, thus, reducing the risk of possible complications during the intervention.

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