

# Persian Version of Parental Emotional Response to Children Index (P-PERCI) Among Parents of Children with Attention Deficit Hyperactivity Disorder: A Study on Psychometric Properties

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## Abstract

Determination of reliability and construct validity of the Persian version of Parental Emotional Response to Children Index (P-PERCI) in a sample of parents of children with ADHD was the aim of this study. A hundred and sixty parents who had at least a six to 15 years old ADHD child living in Tehran have participated in the study. The Persian version of the PERCI in addition to several socio-demographic items were used to collect the data. The results of the exploratory and confirmatory factor analyses showed that the five-factors model of P-PERCI was valid with an acceptable amount of explained variance. Also, the results of Cronbach's alpha and Guttman-s  $\lambda_2$  Coefficients showed that each of the five factors had acceptable reliabilities. Considering the factor structure and favorable psychometric properties of the PERCI, the scale can be useable in parents of ADHD children living in Tehran.

**Keywords:** Parental Emotional Response to Children Index, ADHD, Reliability, Validity.

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## 1. Introduction and preliminaries

Attention deficit hyperactivity disorder (ADHD) is one of the most common neurodevelopmental disorders characterized by hyperactivity, impulsivity, and damage at different levels of attention and planning [3]. There are lots of biological and psychological evidence for the etiology of ADHD, but the effects of factors such as child-parent relationships on the pathogenesis of this neurodevelopmental disorder are still unclear [25, 10]. Farone and Biederman proposed several factors in the context of ADHD suffering family which include severe marital discord, low social class, large family size, paternal criminality, mother's mental disorder, and foster placement [19].

Over the past decades, it has assumed that children's disruptive behavior and parent's negative responses are reciprocally influential. This assumption serves as a base for many developmental psychopathology models and clinical interventions [17]. Patterson and Reid believed that the interactions between parents and children are in a coercive form. The coercion process emerges in early childhood, identifies with the tendency of children with disruptive behaviors to elicit negative responses from their parents. In turn, it leads to more dysregulated behaviors from children themselves. This coercive interaction creates a loop of more negative responses from parents and more disruptive behaviors from children [21].

Patterson suggested some empirical evidence for coercive child-parent interaction. He claimed that children who are "stealers" presumably have parents who are less involved and less aware of the child's acts in the society and public situations, and it seems that parents of "social aggressive children" are likely to have emotionally negative and hostile behaviors with the child [26].

Behavioral models explaining the family-related factors of ADHD suggest that the coercive child-parent interaction serves as a risk factor for neurodevelopmental disorders [4, 8, 7]. The transactional model of development can explain child-parent interactions well. According to this approach, parents and children influence each other reciprocally, and this plays an important role in developmental consequences [20]. Early childhood problems can be a trigger to parent's future care or ignorance towards their children. As the child's problems get more chronic, it would be harder for parents to have positive responses against his/her disruptive behaviors [13]. The situation may serve as a major source for family future problems.

As one of the most important characteristics of child-parent interaction, the emotional responses of parents can be mentioned [12]. Although for decades, the parental emotional expression has been considered as an aspect of family functioning that predicts adulthood mental disabilities [26, 16], there is a vast body of empirical evidence supporting the role of parenting styles on children's future vulnerability [14]. Stormshak et al. [22] had found that punitive discipline by parents is a risk factor of future oppositional, aggressive, hyperactive, and internalizing behaviors of children. Moreover, the physically aggressive punishment was specifically linked with adulthood aggression, and low parental warmth or involvement was linked with future oppositionality [15].

We know that the child-parent interaction is a reciprocal process, and it is not just parental behaviors that affect the child's responses, but the child's responses also change the behavior of parents. We also assume that parents' emotional responses can affect children's future problems. Considering the specific characteristics of each childhood disability and the unique problems that they can cause for child-parent interaction, it was necessary to develop a specific instrument for studying the child-parent interaction in each of these disabilities. For this purpose, Lambek et al. developed an instrument for assessing the emotional responses of parents of children with ADHD [18]. In this study, psychometric properties of the instrument developed by Lambek et al. have been investigated.

Table 1: Parallel Analysis of 500 random samples to determine the number of extraction factors.

Factors	Real data percentage of	Mean of random percentage of variance	95th percentile of random percentage of variance
1	16.6*	8.1	8.8
2	12.3*	7.5	8.1
3	10.7*	7	7.4
4	6.8*	6.5	6.9
5	5.9*	5.8	6.5
6	5.2	5.6	6.2

## 2. Participants and procedure

The present study is a descriptive correlational study. The statistical population includes the parents of children with ADHD (aged 6 to 15 years old) living in Tehran. Through a nonprobability sampling, 160 parents participated in the study. Because of the rarity of cases, the data were collected by both paper and pencil, and online methods (53 parents at Roozbeh Hospital and 107 via telegram messenger). After the translation of items, to review the content validity both the original version of the instrument and the Persian version had given to a psychologist, a psychometrist, and an English-Persian translator. After the experts' opinions have been applied, some socio-demographic items and questions containing brief explanations for respondents have been attached to the instrument. finally, the Persian version of PERCI (P-PERCI) has been performed.

In order to verify the reliability, the Cronbach's alpha coefficient, the Guttman's lambda-2 [5], and the split-halves method were used. To investigate the construct validity, the exploratory factor analysis (EFA; using principal component analysis and the Varimax rotation method) and confirmatory factor analysis (CFA) were used. Finally, data were analyzed via SPSS-23, Amos, and FACTOR Software programs.

## 3. Materials

**Parental Emotional Response to Children Index (PERCI):** PERCI is a 27 items questionnaire which has been developed by Lambek and colleagues [15]. The instrument was designed in a five-point Likert scale (1= strongly agree, 2= agree, 3= neither agree nor disagree, 4= disagree & 5= strongly disagree) aiming to evaluate the emotional responses of parents of children with ADHD [14]. The scores below 3 indicate the negative emotional response of parents. It has determined that the questionnaire concludes of five subscales: impulsivity (3 items), inattention (9 items), delay aversion (3 items), hyperactivity; (6 items), and delay discounting (6 items). In terms of internal consistency, all subscales of the questionnaire were acceptable (inattention,  $\alpha = .86$ ; hyperactivity,  $\alpha = .86$ ; impulsivity;  $\alpha = .71$ ; delay discounting,  $\alpha = .82$ ; delay aversion,  $\alpha = .80$ ). Test-retest reliability results were significant and acceptable for all sub-scales except delay discounting (inattention,  $r = .82$ ,  $n = 20$ ,  $p < .001$ ; hyperactivity,  $r = .53$ ,  $n = 16$ ,  $p < .05$ ; impulsivity,  $r = .70$ ,  $n = 17$ ,  $p < .01$ ; delay aversion,  $r = .51$ ,  $n = 14$ ,  $p = .06$ ; delay discounting,  $r = .20$ ,  $n = 18$ ,  $p = .43$ ).

## 4. Results

After the initial screening, 10 participants were excluded from the analysis due to the lack of data. The final analysis was performed on 150 complete questionnaires. Among these, 107 participants

Table 2: factor model matrix after 50 times Varimax rotations.

Items	DD	IN	IM	HY	DA
16	.840				
8	.422				
2	.749				
10	.673				
14	.528				
3		.704			
6		.688			
5		.651			
13		.522			
25		.440			
9		.407			
20		.365			
1			.758		
12			.742		
11			.415		
27					
21					
7				.661	
24				.550	
17				.495	
22				.436	
15				.392	
4					.685
23					.509
18					.509
19					
26					

Table 3: Fitting indices of 5-factor model.

Fitting indices	Chi-square	RMSEA	Chi-square/df	GFI	CFI	IFI
Desirable amount		≤ .8	3 ≤	.90 ≥	.90 ≥	.90 ≥
Available amount	286.56	.06	1.36	.87	.93	.93

Figure 1: Five-factor confirmatory factor model.

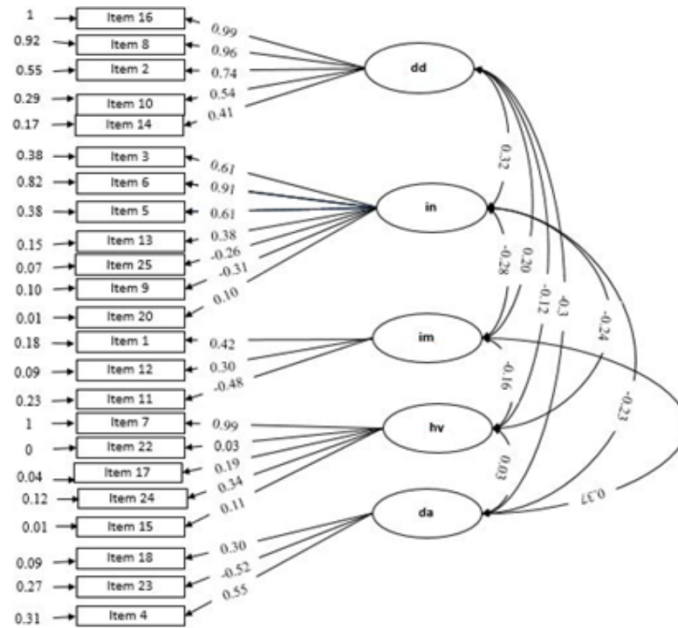


Table 4: Cronbach's Alpha Index and Guttman's lambda-2 to evaluate the Reliability of P-PERCI.

Factor	Number of Items	Mean	Standard Deviation	Cronbach's Alpha	Guttman's lambda-2
DD	5	3.62	.93	.79	.82
IN	7	3.35	.53	.77	.79
IM	3	3.04	.64	.70	.72
HY	5	3.54	.61	.68	.71
DA	3	3.18	.60	.61	.63
<b>Total</b>	<b>23</b>	<b>77.99</b>	<b>8.048</b>	<b>.89</b>	<b>.91</b>

were mothers ( $M = 37.4$  &  $SD = 4.72$ ) and 43 of them were fathers ( $M = 42.63$  &  $SD = 5.72$ ). All of whom had at least a child with ADHD between 6 to 15 years of age.

For determination of structural validity, EFA (using main component analysis and varimax rotation) and CFA were used. Also, in the analysis of the number of extracted factors, the parallel analysis method was used [6]. The Kaiser-Meyer-Olkin index for the sample size was equal to 0.67 and the Chi-square statistic of Bartlett's test of sphericity was significant ( $= 1442.56$ ,  $p < 0.001$ ,  $df = 351$ ) which indicates the assumptions are confirmed. Due to the parallel analysis method, the number of extracted factors by comparing the mean and 95th percentile of the eigenvalue of random data with the eigenvalue of the real data has determined.

According to the comparison of the percentage of random data variances with real data mentioned in Table 1, five factors can be extracted. These factors account for 46% of the total variances. Table 2, shows the factor model matrix after 50 times Varimax rotations.

According to Table 2, the first factor consists of 5 items (16,8,2,10,14), the second factor consists of 7 items (3,6,5,13,25,9,20), the third factor of consists 3 items (1, 12,11), the fourth factor consists of 5 items (7, 24,17,22,15), and the fifth factor consists of 3 items (4,23,18). Also, items number 27,

21, 19, and 26 were excluded from the final form because they did not have any acceptable factor weight ( $> 0.3$ ). Therefore, the final form of the scale consists of 23 items and five independent factors.

To measure the fitting of the five-factors model, confirmatory factor analysis was used. The findings are reported in Figure 4 and Table 3. To evaluate the model, the chi-square index, Goodness of Fit Index (GFI), Incremental Fit Index (IFI), Comparative Fit Index, and the Root Mean Square Error of Approximation (RMSEA) were used. According to Table 3, most of the time, the fitness indices are within the acceptance range of the model and it can be concluded that the model has a favorable fit.

To verify the reliability of the Persian version of PERCI (P-PERCI), internal consistency and Split-halves reliability methods were used. Cronbach's alpha for the 23-points P-PERCI questionnaire was equal to 0.89. Guttman's lambda-2 index was also equal to 0.91. In order to evaluate the split-halves reliability, items were divided into two 11 and 12 items groups.

Based on the results, Cronbach's alpha for the 23-items PERCI questionnaire was equal to 0.89 and the Guttman's lambda-2 index was also equal to 0.91. In order to verify the split-halves reliability, items were divided into two 11 and 12 items groups; and it was significant and equal to 0.78. The indices of reliability and the name of each factor with means and standard deviations have indicated in Table 4.

The index of Cronbach's alpha for the total score of the questionnaire was equal to 0.89 and for the subscales was between 0.61 and 0.79 and the Guttman's lambda-2 for the total score of the instrument was 0.91 and for the subscales was between 0.63 and 0.82. According to the findings above, the Persian version of PERCI (P-PERCI), in terms of reliability and validity was strongly acceptable.

## 5. Conclusion

This study was accomplished to translate and review the factor structure of P-PERCI within the parents of children with ADHD. After the data was collected, the exploratory and confirmatory factor analyses have been used to study the construct validity and to answer the questions "how many factors do P-PERCI have?" And "if the recommended exploratory factor analysis model has an appropriate fitting value?" Due to the results of the parallel analysis and comparison the variance percentage of random data with real data, five factors were retractable which together account for 46% of the total variances. Also, the factors matrix has represented that the first factor has the most contribution load than the other factors.

The first factor, impulsivity, was correlated with the five items. In the original version of PERCI. In the current study, item 21 was excluded from the final version because it did not have an acceptable factor loading. Except for item 21, this factor was completely consistent with the original version proposed by Lambek et al. [15]. The second factor, inattention, was correlated with seven items. Children's inattention can lead to impulsive responses in parents regardless of the child's diagnostic status. According to Lambek's findings, inattention along with the factor delay aversion causes negative emotional reactions even among parents who have typically developed children. As a result, a child's inattention can be the biggest challenge for parents. Difficulties related to ADHD such as neuropsychological dysfunctions, poor educational status, and adjustment disorders are mainly related to inattention [15, 11]. This factor included 9 items in the original version. Items 26 and 27 were excluded from the P-PERCI because of lack of acceptable loading. Rest of the items in this factor have remained (factor loading  $\geq 0.4$ ).

The third factor, impulsivity, has included items 1, 11, and 12. All of which had an acceptable factor loading. Torres et al. [24] suggest that the impulsive behavior of adolescents causes more severe emotional responses (relative to other symptoms) in parents. The higher mean of this factor in the present study can confirm this opinion.

The fourth factor included five items. This factor had 6 items in the original version. The difference was in item 19. This item was excluded from the analysis due to the lack of proper factor loading. Given the high consistency with the original version [15] and the concept of items, this factor was called hyperactive. The fifth factor, delay aversion, included items 4, 23, and 18. This factor was also completely consistent with the original version and was called.

To study the reliability of P-PERCI, internal consistency and split-half reliability were tested. An acceptable internal consistency was observed. This measure indicates a high correlation between the P-PERCI items [9] The internal consistency was also acceptable for each of the five factors ( $\alpha = 0.61 - 0.79$ ). The results of reliability were similar to Lambek et al findings [15]. To ensure the results of Cronbach's alpha, the Guttman's lambda-2 index has been tested. The reliability of P-PERCI was estimated to be higher ( $\lambda_2 = 0.91$ ) [2]. In the current study, since the research project was one-way, the split-half method was used to verify the reliability. Split-half is the most common method to prevent repeating test problems [1]. For this purpose, the test was divided into two sub-test and the items were divided into two sets of items using the Even and odd method. The results have shown that the test is appropriately reliable (stratified  $\alpha = 0.89$ ). The reduction of alpha in the ballot is likely to be due to the incomparability of the two halves of the test [23]. Accordingly, it can be said that the P-PERCI has is statistically valid and reliable either. It is recommended to researchers and clinicians to use this instrument in their theoretical and practical applications.

## References

- [1] M. Allen and W. Yen. *Introduction to measurement theory*. In Waveland Press, 2001.
- [2] LA. Van Der Ark, DM. Bolt, WC. Wang, JA. Douglas, and SM. Chow. Quantitative psychology research. *The 79th Annual Meeting of the Psychometric Society, Madison, Wisconsin*, 140:1–387, 2014.
- [3] American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders (DSM-5®)*. American Psychiatric Pub, 2013.
- [4] RA. Barkley, AD. Anastopoulos, DC. Guevremont, and KE. Fletcher. Adolescents with adhd: Patterns of behavioral adjustment, academic functioning, and treatment utilization. *J. Am. Acad. Child. Adolesc. Psychiatry.*, 30(5):752–761, 1991.
- [5] T. Benton. An empirical assessment of guttman's lambda 4 reliability coefficient. *In: Springer Proceedings in Mathematics and Statistics. Springer New York LLC*, page 301–310, 2015.
- [6] O. Cokluk and D. Koçak. Using horn's parallel analysis method in exploratory factor analysis for determining the number of factors. *Educ Sci Theory Pract.*, 16(2):537–551, 2016.
- [7] A. Chronis-Tuscano, KA. O'Brien, C. Johnston, HA. Jones, TL. Clarke, VL. Raggi, and et al. The relation between maternal adhd symptoms & improvement in child behavior following brief behavioral parent training is mediated by change in negative parenting. *J. Abnorm. Child. Psychol.*, 39(7):1047–1057, 2011.
- [8] A. Chronis-Tuscano, VL. Raggi, TL. Clarke, ME. Rooney, Y. Diaz, and J. Pian. Associations between maternal attention-deficit/hyperactivity disorder symptoms and parenting. *J. Abnorm. Child. Psychol.*, 36(8):1237–1250, 2008.
- [9] LJ. Cronbach. Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3):297–334, 1951.
- [10] LC. Deault. A systematic review of parenting in relation to the development of comorbidities and functional impairments in children with attention-deficit/ hyperactivity disorder (adhd). *Child Psychiatry and Human Development*, 41:168–192, 2010.
- [11] S. Graham. Attention-deficit/hyperactivity disorder (adhd), learning disabilities (ld), and executive functioning: Recommendations for future research. *Contemporary Educational Psychology*, 50:97–101, 2017.
- [12] YR. Hong and JS. Park. Impact of attachment, temperament and parenting on human development. *Korean Journal of Pediatrics*, 55:449–454, 2012.

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- [13] C. Johnston and JS. Jassy and. Attention-deficit/hyperactivity disorder and oppositional/conduct problems: Links to parent-child interactions. *J. Can. Acad. Child. Adolesc. Psychiatry.*, 16(2):74–79, 2007.
- [14] TL. Jones and RJ. Prinz. Potential roles of parental self-efficacy in parent and child adjustment: A review. *Clin. Psychol. Rev.*, 25(3):341–363, 2005.
- [15] R. Lambek, E. Sonuga-Barke, L. Psychogiou, M. Thompson, R. Tannock, D. Daley, and et al. The parental emotional response to children index: A questionnaire measure of parents' reactions to adhd. *J. Atten. Disord.*, 21(6):494–507, 2017.
- [16] C. O'Driscoll, SB. Sener, A. Angmark, and M. Shaikh. Caregiving processes and expressed emotion in psychosis, a cross-cultural, meta-analytic review. *Schizophr. Res.*, 208:8–15, 2019.
- [17] G. Patterson. *Reciprocity and coercion: Two facets of social system*. 1970.
- [18] L. Psychogiou, R. Lambek, M. Thompson, and E. Sonuga-Barke. Parental emotional response to children index. *SAGE Publications Inc.*, 21, 2011.
- [19] JO. Biederman S. V. Faraone. Pathophysiology of attention deficit/hyperactivity disorder. *Child Psychiatry and Human Development*. *Lippincott Williams & Wilkins*, pages 577–596, 2002.
- [20] A. Sameroff. The transactional model. *The transactional model of development: How children and contexts shape each other*, pages 3–21, 2009.
- [21] LV. Scaramella and LD. Leve. Clarifying parent-child reciprocities during early childhood: The early childhood coercion model. *Clin. Child. Fam. Psychol. Rev.*, 7:89–107, 2004.
- [22] EA. Stormshak, KL. Bierman, RJ. McMahon, LJ. Lengua, JD. Coie, KA. Dodge, and et al. Parenting practices and child disruptive behavior problems in early elementary school. *J. Clin. Child. Adolesc. Psychol.*, 29(1):17–29, 2000.
- [23] B. Thompson. *Score reliability: Contemporary thinking on reliability issues*. Sage publications, 2002.
- [24] A. Torres, A. Catena, A. Megías, A. Maldonado, A. Verdejo-García, and et al. Emotional and non-emotional pathways to impulsive behavior and addiction. *Front Hum Neurosci*, 2013.
- [25] A. Vélez van Meerbeke, C. Talero-Gutiérrez, I. Zamora-Miramón, and GM. Guzmán-Ramírez. Attention deficit hyperactivity disorder: From parents to children. *Neurol (English Ed.)*, 32(3):158–165, 2017.
- [26] C. Vaughn and J. Leff. The measurement of expressed emotion in the families of psychiatric patients. *Br. J. Soc. Clin. Psychol.*, 15(2):157–165, 1976.