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The Structure of Bryant's Empathy Index for Children: A Cross-Validation Study

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The present study examined the structure of Bryant's Empathy Index (BEI) using different samples for conducting exploratory and confirmatory analyses. The BEI was administered to a sample of 2,714 children (mean age 11.12, SD = 1.59). Exploratory and confirmatory factor analyses showed a three-factor structure: Feelings of Sadness, Understanding Feelings and Tearful Reaction. The results revealed both the multidimensionality of the instrument and appropriate fit indices for the model proposed. Although these results were very similar to those reported in other studies with a Spanish population, the analyses were conducted in a more robust way: with a larger sample and using polychoric correlations and cross validation estimation.
Keywords: empathy index, children, construct validity, Spanish language

El presente estudio examinó la estructura del Bryant's Empathy Index (BEI), empleando diferentes muestras para llevar a cabo análisis exploratorio y confirmatorio. El BEI se aplicó a una muestra de 2,714 niños (edad media 11,12; DT = 1,59). Análisis exploratorio y confirmatorio revelaron una estructura de tres factores: Sentimientos de Tristeza, Comprensión de Sentimientos y Reacción de Llanto. Los resultados revelaron la multidimensonalidad del instrumento e índices de bondad de ajuste adecuados para el modelo propuesto. Aunque estos resultados eran muy similares a los que aparecen en otros estudios con población española, los análisis se llevaron a cabo de una forma más robusta: con una muestra mayor y empleando correlaciones policóricas y estimación de la validación cruzada.
Palabras clave: índice de empatía, niños, validez de constructo, lengua española

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Empathy, the ability to feel for another person, is an aspect of human responding that is crucial for understanding positive development. It not only motivates us to help and desire justice for others, but also inhibits aggression toward them (Batson, 1991; Hoffman, 2000; Miller & Eisenberg, 1988); furthermore, it facilitates people's socially competent interactions and provides a sense of connection between them (Eisenberg et al., 1996; Saarni, 1990). From a developmental perspective, empathy begins during the first years of life (Dunn & Brown, 1994; Eisenberg, Spinrad, & Sadovsky, 2006; Sagi & Hoffman, 1976). In this regard, various authors highlight the importance of empathy with respect to the prosocial behavior and moral reasoning of children and adolescents (Eisenberg, 2005; Eisenberg & Miller, 1987; Eisenberg & Mussen, 1978; Hoffman, 2000). Indeed, many studies report that empathy is negatively correlated with aggression (Bryant, 1982; Kaukiainen et al., 1999; Mehrabian, 1997; Richardson, Hammock, Smith, & Gardner, 1994) and positively correlated with altruistic behavior (Batson & Coke, 1981; Ortiz et al., 1993; Zahn-Waxler & Radke-Yarrow, 1982).

However, there is a lack of consensus regarding the definition of empathy. Research has defined and conceptualized the construct in terms of both cognitive and affective mechanisms (Duan & Hill, 1996), although a number of unifying reports appear to have adopted both options, i.e. they regard it as a process involving cognitive (recognizing feelings of others) and affective (feeling and sympathizing with them) phenomena (Feshbach, 1982; Hoffman, 1984, 2000; Preston & de Waal, 2002). Mehrabian and Epstein (1972) defined empathy as a vicarious emotional response to the perceived emotional experiences of others. In the child and adolescent context, Bryant's conceptualization emphasizes emotional responsiveness rather than the accuracy of cognitive social insight. However, more recently empathy has been studied from a multidimensional perspective, which includes affective as well as cognitive components (Davis, 1983; Jolliffe & Farrington, 2004; Preston & de Waal, 2002; Hoffman, 2000). From this perspective empathy is a superordinate category that includes emotional contagion (emotional state in an observer as a direct result of perceiving the state in another), sympathy (state in which the subject feels "sorry for" the object as a result of perceiving its distress), cognitive empathy (situations when the subject arrives at an understanding of the object's state) and helping behavior, etc. The affective and cognitive components of empathy have different implications for human behavior. Jolliffe and Farrington (2004), in a meta-analysis of studies relating measures of cognitive and affective empathy to offending, showed that cognitive components are more associated with offenders than are affective components. Similarly, D'Antonio (1997) found a significant interaction between cognitive empathy and impulsivity when predicting delinquency. However, the interaction between affective empathy and impulsivity was not significant. Therefore, the difference between cognitive and affective dimensions of empathy is of considerable interest and there is some evidence for the validity of extracting a structure with both components (cognitive and affective).

Although empathy has been studied in different ways (natural observation, self-reports on picture stories and questionnaires, and in stimulated experimental situations) (Zhou, Valiente, & Eisenberg, 2003), self-report questionnaires are one of the most widely used techniques for assessing empathy in children. At present, one of the most popular among such tools is Bryant's Empathy Index for children and adolescents (BEI; Bryant, 1982), which is based on Mehrabian and Epstein's (1972) Measure of Emotional Empathy questionnaire for adults. The BEI has been used in different contexts and with a range of subjects, for example, child oncology (Labay & Walco, 2004), delinquency in youth offenders (Carr & Lutjemeier, 2005), adolescent firesetters (Walsh, Lambie, & Stewart, 2004), children with reactive attachment disorder (Hall & Geher, 2003), bullying (Sutton, Smith, & Swettentham, 1999), and exposure to violence in real-life, video games, television, movies and internet (Funk, Baldacci, & Pasold, 2004; Sams & Truscott, 2004). Such research has shown it to be a useful and versatile instrument when working with children and adolescents in different empathy-related responding contexts. As noted in the review by Rose and Rudolph (2006), the BEI has been used for a long time in studies of empathy, as well as in research on individual differences or various topics related to empathy. This review confirms that most studies show girls to be more empathic than boys.

As regards the structure of the empathy construct, few studies have specifically explored Bryant's Empathy Index. Although Bryant subsequently presented a series of exploratory factor analyses of the empathy scale, these suffered from a number of methodological limitations such as small sample size and the presence of some redundant items (Bryant, 1984). The adaptation of this measure to different languages (Koller, Camino, & Ribeiro, 2001) and further research into its psychometric properties with diverse samples are thus required (De Wied et al., 2007). Among the authors working in this field, Eisenberg and co-workers have extensively applied the BEI and use either a 22-item structure or a shorter structure composed of a selection of the 22 original items (Eisenberg, 2005; Eisenberg et al., 1996; Eisenberg, Guthrie, & Murphy, 1999; Eisenberg, Shell, & Pasternack, 1987). Recently, Del Barrio, Aluja and García (2004) conducted a preliminary study with the Spanish version of this instrument in order to determine its internal structure and detect any redundant or poorly-functioning items. This structure was investigated with 932 children (mean age 14.4, SD = .96). The exploratory analyses

(principal components with oblimin rotation) were examined using Pearson's correlations, and confirmatory analyses were then performed with the same sample. Among the four models estimated a three-factor structure (Feelings of Sadness, Understanding Feelings and Tearful Reaction) showed the best fit to the data (and accounted for 42% of the variance). However, there are two issues that need to be considered here. Firstly, if we take into account the metric characteristics of ordinal scales we find that Pearson correlations underestimate the degree of association between variables and, consequently, the factor loadings are biased (DiStefano, 2002; Guilley & Uhlig, 1993; Kampen & Swyngedouw, 2000). In this regard, Jöreskog and Sörbom (1996b) found that regardless of sample size and the true correlation value (ρ), polychoric correlations are the most consistent and robust estimator. Secondly, the use of cross-validation is also indicated in order to avoid the possibility of capitalization, which biases the statistical estimations. Thus, after introducing a modification index, a model that fits a given sample could be incorrect in another sample of the same population. Cross-validation seeks to optimize the generalisation using different samples to test the model (Cudeck & Brown, 1983). To our knowledge, no previous studies have been conducted with the Spanish version of the BEI using polychoric correlations and cross validation estimation.

In this regard, the purpose of the present study was to explore and compare the previous results of Del Barrio, Aluja, and García (2004), taking into account the aforementioned aspects, and therefore: 1) to explore the controversy about affective and cognitive components of the empathy construct in Bryant's Empathy Index; and 2) to reanalyze the BEI structure, including new methodological aspects in order to obtain a more robust instrument for measuring empathy in Spanish children. Thus, the specific aims were: a) to conduct an exploratory factor analysis (EFA) in order to examine the dimensionality of Bryant's Empathy Index using a matrix of polychoric correlations; and b) using a new and younger sample (mean 11.12 years) than previously, to test and compare, by means of confirmatory factor analysis (CFA), the solution obtained in both our EFA and the model presented by Del Barrio et al.

Method

Participants

Participants were 2,714 children (boys = 1,252, girls = 1,462) with a mean age of 11.12 years (*SD* = 1.59, range 8-14). They were all drawn randomly from different primary and secondary state schools in Madrid and Valencia. For the purposes of the study the sample was divided into two equivalent samples of similar characteristics: sample A was used for the EFA and sample B for the CFA.

Instruments

The instrument used was the Spanish version of Bryant's Empathy Index (Bryant, 1982). This measure, which uses a 3-point scale, consists of 22 items related to emotional empathy (e.g., "People who kiss and hug in public are silly"; "It's hard for me to see why someone else gets upset"), previously adapted to Spanish children (Del Barrio et al., 2004). The instrument used had a 3-point scale of *agreement* versus *disagreement* (1 = *very strong disagreement* to 3 = *very strong agreement*). Items were very short and of low meaning complexity, which facilitated children's understanding. All the subjects had reached the required reading level for this instrument.

The scale used for the sample had a Cronbach's α coefficient of .72 and a mean discrimination index of .31 (the extent to which an item differentiates between subjects with a different degree of the trait measured). However, Items 7, 15 and 22 showed a very low discrimination indexes (.088, .0032, and .13, respectively). When omitting these items the Cronbach's α coefficient was .75 and the mean discrimination index .33. The heterogeneous content of these items makes it difficult to include them in the overall meaning of the scale; however, the loadings of these items (7, 15, and 22) are not relevant in the matrix structure (see Table 1).

The software packages used for data analysis and processing were PRELIS 2.30 and LISREL 8.54 (Jöreskog & Sörbom, 1996a, 1996b).

Procedure

The questionnaire was administered in the classroom in the presence of a trained psychologist. First, the total sample was randomly divided into two equal sub-samples (sub-samples A and B). Sub-sample A was used for the exploratory factor analysis and sub-sample B for the confirmatory analysis.

Once the matrix of polychoric correlations had been estimated, the assumption of bivariate normality was tested by calculating the percentage of tests that rejected the null hypothesis of bivariate normality for each pair of correlations, assuming a nominal level of 5% and using the Bonferroni correction. In addition, the percentage of correlations whose RMSEA was less than .1 was reported (Jöreskog, 2001).

EFAs were then carried out with sub-sample A, using the minimum residuals (MINRES) method of estimation and a Promax oblique rotation.

Two different CFAs were then conducted to test goodness-of-fit in sub-sample B. We tested both the model proposed by Del Barrio et al. (2004) and the model obtained in the previous EFA with sub-sample A. In both cases, the asymptotic variance-covariance matrix was used as the weighting element in the weighted least squares (WLS) procedure.

Results

In 20 of the 210 polychoric correlations obtained the assumption of bivariate normality was rejected at the significance level of $\alpha = .05$. None of them gave a RMSEA greater than .1. These results confirm the suitability of the polychoric correlations matrix for testing the scale's construct validity by means of FA.

Exploratory Factor Analysis

Table 1 shows the factor loadings of the rotated solution for each of the items with respect to the three factors. The first factor explained 29.58% of the variance, the second 8.15%, and the third 3.25%. The Cronbach's α coefficients for each sub-scale are .56, .72, and .71, respectively.

In the first factor, labeled Understanding Feelings, the items with the highest loadings refer to comprehension of other people's feelings, Item 9 ("Girls who cry because they are happy are silly") having the highest loading (.858). The second factor (Feelings of Sadness) mainly consisted of those items referring to emotions of sadness, and here it was Item 12 ("It makes me sad to see a boy who cannot find anyone to play with") which had the highest loading (.95). Finally, the third factor (Tearful Reaction) included those items concerning sympathetic attitudes and the reaction to requests and the emotions of other people, Item 19 ("Seeing a girl who is crying makes me feel like crying") being the one with the highest factor loading here (.894). The correlation between Factors 1 and 2 was higher (–.493) than the correlations between Factors 1-3 (.269) and 2-3 (.059). In this regard, the independence of the last factor should be noted. Although the explained variance of this factor is very low, the independence and internal consistency (high loadings) shown provide empirical support for its continued inclusion in the model.

The results obtained suggest, with certain qualifications, that the structure obtained in the present study is very similar to the model presented by Del Barrio et al. (2004). We obtained the same three theoretical dimensions included in the construct of empathy: cognitive content in terms of understanding the emotions of other people (Understanding Feelings), as well as affective content in the form of feeling on the same wavelength as other people (Feelings of

Table 1
Matrix Structure with Factor Loadings

Item	F 1	F 2	F 3	M1	M2
UNDERSTANDING FEELINGS (F1)					
9 Girls who cry because they are happy are silly.	.858	–.124	–.028	1	1
3 Boys who cry because they are happy are silly	.854	–.067	–.065	1	1
20 I think it is funny that some people cry during a sad movie or while reading a sad book	.830	–.010	–.165	1	1
2 People who kiss and hug in public are silly	.795	–.190	.121	1	1
21 I am able to eat all my cookies even when I see someone looking at me wanting one	.790	–.134	.099	1	1
16 It's silly to treat dogs and cats as though they have feelings like people	.738	–.124	.070	1	1
18 Kids who have no friends probably don't want any	.605	–.053	.049	1	1
10 It's hard for me to see why someone else gets upset	.453	.196	–.012	1	2
17 I get mad when I see a classmate pretending to need help from the teacher all the time	.300	.120	–.051	1	1
FEELINGS OF SADNESS (F2)					
12 It makes me sad to see a boy who can't find anyone to play with	.108	.950	–.003	2	2
1 It makes me sad to see a girl who can't find anyone to play with	–.010	.899	.008	2	2
6 I get upset when I see a girl being hurt	–.066	.878	–.021	2	2
14 I get upset when I see a boy being hurt	–.224	.784	.088	2	2
11 I get upset when I see an animal being hurt	–.273	.769	–.103	2	2
4 I really like to watch people open presents, even when I don't get a present myself	–.262	.714	–.032	2	2
TEARFUL REACTION (F3)					
19 Seeing a girl who is crying makes me feel like crying	.038	–.038	.894	3	3
5 Seeing a boy who is crying makes me feel like crying	.070	.015	.770	3	3
13 Some songs make me so sad I feel like crying	–.022	–.076	.762	3	3
8 Sometimes I cry when I watch TV	–.135	.054	.650	3	3
7 Even when I don't know why someone is laughing, I laugh too	.063	.144	.133		
15 Grown-ups sometimes cry even when they have nothing to be sad about	.061	.221	.139		
22 I don't feel upset when I see a classmate being punished by a teacher for not obeying school rules	.251	.210	.130		2

Note. M1 and M2 refer to Model 1 and 2 in CFA. The dimensions assigned to each item are indicated in the cells.

sadness) and sympathetic reactions (Tearful Reaction). Likewise, Items 7 ("Even when I do not know why someone is laughing, I laugh too") and 15 ("Grown-ups sometimes cry even when they have nothing to be sad about") have low factor loadings. However, two differences were found with regard to the findings of Del Barrio, Aluja, and García: a) in our study, Item 22 ("I do not feel upset when I see a classmate being punished by a teacher for not obeying school rules") has a low factor loading. The low factor loadings of Items 7, 15 and 22 were consistent with the low discrimination of these items found in the present research; and b) in our study, Item 10 ("It's hard for me to see why someone else gets upset") was included in the factor Understanding Feelings, while in that of Del Barrio et al., it appears in the Feelings of Sadness dimension. One explanation for this could be related to the meaning attributed to the item. The expression "It's hard for me to see why someone else gets upset" can be understood in either a cognitive way, as something that is difficult to understand or believe (e.g., it's hard to understand or to believe something), or in an affective way, as a situation that is severe or tough (e.g., in the sense of "times are very hard for me"). Therefore, Item 10 could, theoretically, be included in both dimensions, Understanding Feelings and Feelings of Sadness; however, in the Spanish translation the meaning of this item is more consistent with the cognitive interpretation.

Confirmatory Factor Analysis

The criteria used to define the measurement model were theoretical coherence and the loadings obtained in the previous EFA. We defined Model 1 based on this three-factor structure obtained in the previous EFA, and also tested the model proposed by Del Barrio et al. (2004) in sub-sample B (Model 2). The completely standardized solution for both models is shown in Table 2.

The value obtained in Model 1 with 149 degrees of freedom was $\chi^2 = 712.61$ with $p < .0001$. Model 2 yielded $\chi^2 = 1188.7$ ($df = 168$; $p < .0001$). Although the chi-squared values indicate a poor fit in both models this is because type I error is extremely sensitive to sample size, which can increase artificially the chi-squared values. Therefore, we used other fit indices such as root mean square error of approximation ($RMSEA_{model\ 1} = .048$; $RMSEA_{model\ 2} = .065$), goodness of fit index ($GFI_{model\ 1} = .98$; $GFI_{model\ 2} = .97$), and adjusted goodness of fit index ($AGFI_{model\ 1} = .98$; $AGFI_{model\ 2} = .97$). In order to compare alternative models

Table 2
Completely Standardized Solution for Model 1 and 2

Item	F 1	F 2	F 3			
	M1	M2	M1	M2	M1	M2
UNDERSTANDING FEELINGS (F1)						
9 Girls who cry because they are happy are silly	.99	.99	—	—	—	—
3 Boys who cry because they are happy are silly	.98	.98	—	—	—	—
20 I think it is funny that some people cry during a sad movie or while reading a sad book	.86	.86	—	—	—	—
2 People who kiss and hug in public are silly	.98	.99	—	—	—	—
21 I am able to eat all my cookies even when I see someone looking at me wanting one	.96	.96	—	—	—	—
16 It's silly to treat dogs and cats as though they have feelings like people	.89	.90	—	—	—	—
18 Kids who have no friends probably don't want any	.75	.75	—	—	—	—
10 It's hard for me to see why someone else gets upset	.34	—	—	.32	—	—
17 I get mad when I see a classmate pretending to need help from the teacher all the time	.14	.14	—	—	—	—
FEELINGS OF SADNESS (F2)						
12 It makes me sad to see a boy who can't find anyone to play with	—	—	.99	.99	—	—
1 It makes me sad to see a girl who can't find anyone to play with	—	—	.98	.99	—	—
6 I get upset when I see a girl being hurt	—	—	.95	.96	—	—
14 I get upset when I see a boy being hurt	—	—	.96	.97	—	—
11 I get upset when I see an animal being hurt	—	—	.98	.99	—	—
4 I really like to watch people open presents, even when I don't get a present myself	—	—	.90	.90	—	—
TEARFUL REACTION (F3)						
19 Seeing a girl who is crying makes me feel like crying	—	—	—	—	.97	.97
5 Seeing a boy who is crying makes me feel like crying	—	—	—	—	.94	.94
13 Some songs make me so sad I feel like crying	—	—	—	—	.77	.77
8 Sometimes I cry when I watch TV	—	—	—	—	.56	.58
22 I don't feel upset when I see a classmate being punished by a teacher for not obeying school rules	—	—	—	—	—	.18

Table 3
Fit Indices of Models 1 and 2

Model	RMSEA	GFI	AGFI	ECVI	CAIC	IFI	χ^2	df	$\Delta\ \chi^2$	$\Delta\ df$
1	.048	.98	.98	.50	12563.3	.98	712.61	149	—	—
2	.065	.97	.97	.80	12817.9	.98	1188.7	168	476.09*	19

*$p < .0001$.

we also calculated the expected cross validation index ($ECVI_{model\ 1} = .50$; $ECVI_{model\ 2} = .80$), the consistent Akaike information criterion ($CAIC_{model\ 1} = 125663.3$; $CAIC_{model\ 2} = 12817.9$), and the incremental fit index ($IFI_{model\ 1} = .98$; $IFI_{model\ 2} = .98$). The latter three are used to measure the comparative fit between two or more models, and the smaller the values are the better the fit obtained (Bandalos, 1993) (see Table 3).

It can be concluded from these results that, in both models, the fit indicators are adequate for GFI and AGFI (Bollen & Long, 1993; Hopko, 2003). The RMSEA value is regarded as adequate when it is below .05, although values of up to .08 are considered to represent reasonable errors of approximation (Browne & Cudeck, 1993).

It can be seen that the GFI, AGFI, ECVI, CAIC, and RMSEA indices are better for Model 1. Similarly, the significant increase ($p < .001$) in the chi-squared value between the two models suggests a decrease in the goodness of fit for Model 2. In sum, although both models represent the structure of the data, Model 1 shows a slightly better fit.

The three-factor structure found by Del Barrio et al. (2004) has adequate fit indices and thus cannot be rejected in this study. Furthermore, we have used a different type of correlation that is more suited to ordinal measurement, and have not correlated any error term. The convergence of the results is a good indicator of the coherence between the theory and the data, this being one of the cornerstones of construct validity (Chacon, Perez, & Holgado, 2001; Messick, 1994).

Discussion and Conclusions

The possibility of replication is the key to the accumulation of scientific knowledge and is the basis on which research findings can be generalized to more people and settings than those represented in a single study (Cronbach & Shapiro, 1982; Schneider, 2004). In line with the main objective of this paper we studied the factor structure replication of Bryant's Empathy Index in Spanish children. The research was conducted with younger subjects in a large sample and comparable conditions except for two statistical aspects that help improve the efficacy of results: use of a matrix of polychoric correlations and a different sample from the previous one in order to test the model through CFA. Thus, after the initial exploratory factor analysis we tested the factor solution obtained and the model reported by Del Barrio, Aluja, and García (2004) via confirmatory factor analysis. The results of the EFA revealed a three-factor model quite similar to that described by Del Barrio et al., particularly when Items 7 and 15 were excluded. However, an important difference is that Item 10 ("It's hard for me to see why someone else gets upset") loaded on a cognitive factor (Understanding Feelings) rather than an affective one (Feelings of Sadness), depending on how the meaning of the item was interpreted by children, that is, in a cognitive or an affective way. In both situations the results are coherent with the structure obtained.

As regard the CFA, there is no statistical basis for rejecting the hypothesis that Model 2 represents the data. Furthermore, we have not correlated any error term. However, Model 1 presents better fit indices, despite the fact that there are no substantial theoretical differences between the two models. Therefore, from a statistical perspective, Model 1 shows a better fit, but from a theoretical perspective Models 1 and 2 are interchangeable.

This study illustrates the multidimensionality of empathy as evaluated by Bryant's Empathy Index. The three-factor structure appears to be appropriate for children and adolescents and reinforces the validity of the cognitive and affective components of the scale, as well as that of the construct of empathy (Bryant, 1982; Hogan, 1969; Jolliffe & Farrington, 2004). This structure supports an integrative concept of empathy (Hoffman, 1984; Eisenberg & Strayer, 1987; Hoffman, 2000; Preston & de Waal, 2002), which includes a cognitive factor (Understanding Feelings) and two affective factors (Feelings of Sadness and Tearful Reaction). The cognitive factor refers to situations in which the child arrives at an understanding of other children. As regards the affective factors two different affective components can be distinguished: one factor related to emotions or feelings of empathy (Feelings of Sadness), which refers to situations in which the subject has a similar emotional state to an object as a result of perceiving the object's situations, and another factor (Tearful Reaction) related to emotional contagion (i.e., an emotional state in an observer as a direct result of perceiving the state in another) and sympathy (a state in which the subject feels "sorry for" the object as a result of perceiving the distress of the object). All these components are empirically based and help to categorize this behavior (Hoffman, 2000; Preston & de Waal, 2002). Finally, although the explained variance of Factor 3 (Tearful Reactions) is very low, its independence

and internal consistency (high loadings) provide empirical support for its continued inclusion in the model. Furthermore, this factor is theoretically coherent in the sense that it represents a specific affective dimension of empathy related to the dimensions of emotional contagion and sympathy. Many authors (Eisenberg, 2000; Eisenberg & Strayer, 1987; Hardee, 2003; Wilmer, 1968) have argued that sympathy implies sharing feelings with the sufferer, as if the pain or happiness belonged to both persons; in other words, we sympathize with other human beings when we share feelings with them. In contrast, empathy is concerned with a much higher order of human relationship and understanding and involves engaged detachment: we empathize with other human beings when we borrow their feelings to observe, feel and understand them, but without taking these feelings into ourselves (Hardee, 2003; Wilmer, 1968). Both components (empathy and sympathy) are conceptually different from overall emotional empathy, and taken together all these factors constitute an integrative structure.

In conclusion, this structure is theoretically and empirically suitable for a wide age range and is consistent with the literature reviewed. Therefore, the instrument would appear to be a useful tool for studying this population.

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