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Article

Fathering Children Aged from 2 to 10: Psychometric Properties of the IFI-BR-27

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Abstract: The Inventory of Father Involvement (IFI) was developed to examine paternal involvement among men with children from 5 to 10 years of age. However, father involvement affects child development starting in the child's infancy. In Brazil, a revised version of the instrument (called the IFI-BR-27) was developed to use with fathers of children in a wider age group (2 to 10 years). Thus, in this study we aimed to investigate evidence for validity of this revised version based on internal structure, measurement invariance, and evidence of convergent validity. For this purpose, 572 Brazilian fathers completed a sociodemographic questionnaire, the IFI-BR-27, and either the Father Engagement Questionnaire (FEQ; for fathers of children in early childhood education settings) or the Inventory of Parenting Practices (IPP; for fathers of children in elementary school). Results of confirmatory factor analyses indicated the plausibility of a second-order internal structure for the IFI-BR-27 (χ^2/df = 3.526; CFI = .937; TLI = .929; RMSEA = .066). Composite reliability for the nine factors varied from .65 to .84. Invariance analyses indicated that the structure is independent of the child's educational setting. Evidence of convergent validity was also found (r = .67 – FEQ; r = .58 – IPP). Therefore, the IFI-BR-27 is an adequate tool to assess the quality of father involvement for fathers of children in preschool or elementary school. The IFI-BR-27 can contribute to further scientific research, aiding in longitudinal studies, as well as helping professionals to evaluate and encourage specific dimensions of father involvement.

Keywords: Fathering, Psychological Assessment, Adult Development, Family.

Paternidade com Filhos entre 2 e 10 Anos de Idade: Propriedades Psicométricas do IFI-BR-27

Resumo: O *Inventory of Father Involvement* (IFI) foi desenvolvido para avaliar o envolvimento paterno de homens com filhos de 5 a 10 anos. No entanto, envolvimento paterno afeta o desenvolvimento de crianças desde a primeira infância. No Brasil, uma versão revisada dessa medida (chamada de IFI-BR-27) foi desenvolvida para uso com pais de crianças em uma faixa etária mais ampla (2 a 10 anos). O objetivo deste estudo foi, portanto, investigar evidências de validade dessa versão revisada com base na estrutura interna, invariância de medida e evidências de validade convergente. Para isso, 572 pais brasileiros preencheram um questionário sociodemográfico, o IFI-BR-27 e o Questionário de Engajamento Paterno (QEP; para pais com filhos no Ensino Infantil) e o Inventário de Práticas Parentais (IPP; para pais com filhos no Ensino Fundamental 1). Os resultados de análises fatoriais confirmatórias indicaram a plausibilidade de uma estrutura interna de segunda ordem para o IFI-BR-27 (χ^2/gl = 3,526;

CFI = 0,937; TLI = 0,929; RMSEA = 0,066). A confiabilidade composta para os nove fatores variou de 0,65 a 0,84. Análises de invariância indicaram que a estrutura é independente do ciclo escolar da criança. Também foram encontradas evidências de validade convergente (r = 0,67 – QEP; r = 0,58 – IPP). Assim, considera-se o IFI-BR-27 uma medida adequada para avaliar a qualidade do envolvimento paterno de pais de crianças do Ensino Infantil ao Fundamental 1. O IFI-BR-27 poderá contribuir para melhorias científicas, viabilizando estudos longitudinais e ajudando profissionais a avaliar e promover dimensões específicas do envolvimento paterno.

Palavras-chave: Paternidade, Avaliação Psicológica, Desenvolvimento Adulto, Família.

Paternidad con Hijos de entre 2 y 10 Años: Propiedades Psicométricas del IFI-BR-27

Resumen: El *Inventory of Father Involvement* (IFI) se desarrolló para evaluar la participación paterna en la crianza de hijos de entre 5 y 10 años de edad. Es sabido que la participación paterna contribuye al desarrollo infantil desde la primera infancia. En Brasil, una versión brasileña de este instrumento (la IFI-BR-27) se desarrolló para aplicarse a padres con hijos de un grupo de edad más amplio (de 2 a 10 años). Este estudio tuvo por objetivo comprobar evidencia de validez de esta versión revisada con base en la estructura interna, la invariancia del instrumento y la evidencia de validez convergente. Para ello, 572 padres brasileños completaron un cuestionario sociodemográfico, el IFI-BR-27 y el Cuestionario de Involucramiento Paterno (CIP; para padres de niños en el jardín de infantes) y el Inventario de Prácticas Parentales (IPP; para padres de niños en la primaria). Los resultados de los análisis factoriales confirmatorios indicaron la plausibilidad de una estructura interna de segundo orden para el IFI-BR-27 (χ^2/gl = 3,526; CFI = 0,937; TLI = 0,929; RMSEA =0,066). La confiabilidad compuesta para los nueve factores varió de 0,65 a 0,84. Los análisis de invariancia indicaron que la estructura es independiente del ciclo educativo del niño. También se encontró evidencia de validez convergente (r =0,67 – CIP; r = 0,58 – IPP). Por lo tanto, el IFI-BR-27 es un instrumento adecuado para evaluar la calidad de participación paterna de padres con hijos en edad preescolar o en la primaria. El IFI-BR-27 permitirá un mayor desarrollo científico, permitiendo estudios longitudinales y ayudando a los profesionales a evaluar y fomentar dimensiones específicas de participación paterna.

Palabras clave: Paternidad, Evaluación Psicológica, Desarrollo Adulto, Familia.

In the last few decades, researchers studying parenting have demonstrated the importance of fathering, showing that, in addition to mothering, father involvement also influences all family members (Volker, 2014; Santis & Barham, 2017). For example, father involvement is related to: (a) children's social behavior (Hosokawa, Katsura, & Shizawa, 2015; Santis, Barham, & Chuang, 2022), (b) fathers' own mental health (Shafer & Renick, 2020), and (c) fathers' and mothers' perceptions of their marital relationship (Varga, Gee, Rivera, & Reyes, 2017) as well as their coparenting relationship (Douglas et al., 2021; Varga et al., 2017).

In the last decade, researchers have looked more closely at evidence of the father's role in child development (Schoppe-Sullivan & Fagan, 2020). For example, based on literature reviews, there is evidence indicating relationships between positive father involvement and more favorable results for children's: (a) social development (Liu, 2019), (b) cognitive development (Rollè et al., 2019), and (c) a reduced likelihood of problem behaviors (Zhang, Liu, & Hul, 2019). Despite advances in our understanding of the contributions of fathers to family relationships, measures of father involvement have developed more slowly, and this issue continues to pose a challenge (Schoppe-Sullivan & Fagan, 2020).

The development of instruments to measure father involvement is directly related to advances in theoretical models of fathering. A unified theoretical view of concepts related to fathering has not yet emerged (Cabrera, 2019; Rollè et al., 2019), although the conceptualization of father involvement has developed considerably over the years. Lamb, Pleck, Charnov, and Levine (1987) proposed a widely cited model of fathering, indicating three forms of father involvement: (a) *engagement* ("face-to-face" interactions between father and child), (b) *accessibility* (physical and psychological, or socioemotional availability of the father to assist his child, as needed), and (c) *responsibility* (the father helps with other tasks, to ensure his child's care and well-being). Moving forward, Pleck (2010) proposed a new model, which includes three fundamental interpersonal abilities: (a) *positive engagement in activities*, (b) *warmth and responsiveness*, and (c) *control* (being able to deal with the practical and interpersonal demands that arise during father-child interactions). Pleck further proposed that the opportunities that fathers have to use these abilities are affected by two auxiliary characteristics, which also influence their children's development: (d) indirectly, based on the fathers' *contributions to the material and interpersonal conditions* in their children's environment, and (e) directly, based on the fathers' ability to perceive and take measures to meet their children's needs, referred to as *process responsibility*.

Currently, father involvement is understood to be a multidimensional construct, and the quality of fathering reflects both the quantity and quality of this involvement (Barrocas, Vieira-Santos, Paixão, Roberto, & Pereira, 2017). In quantitative terms, the time fathers spend on parenting is examined in three contexts: (a) activities involving direct contact with the child, (b) amount of availability to the child, and (c) activities to guarantee resources for the child's survival and well-being. In terms of quality, the nature or type of interaction established by the father with his child is examined, as well as interactions with other people who are related to the fathering context, such as the mother or coworkers (D'Andrade & Sorkhabi, 2016).

Given its theoretical and psychometric characteristics, one instrument that has been gaining international interest is the Inventory of Father Involvement (IFI), developed in the United States by Hawkins et al. (2002). The original version of the IFI was designed to evaluate the quality of father involvement for fathers with children in elementary school settings (kindergarten to grade five, or children between 5 to 10 years of age). The IFI is a multidimensional tool composed of 26 items, evaluated using a score scale ranging from 0 (*very poor*) to 6 (*excellent*), or "*does not apply*" (Hawkins et al., 2002). The IFI is used to examine a variety of dimensions (including cognitive, affective, and behavioral components), capturing fathers' direct and indirect involvements. In addition to being in accordance with the current theoretical literature on fathering, the IFI also overcomes limitations of previous measures by adopting the father's perspective and by focusing on the quality of fathering, rather than an analysis of time spent on parenting tasks (Barrocas et al., 2017).

Testing a hierarchical model, Hawkins et al. (2002) found evidence for nine specific factors and one global second-order factor for the IFI. The first-order factors are: (a) Discipline and Teaching Responsibility, (b) School Encouragement, (c) Mother Support, (d) Providing, (e) Time and Talking Together, (f) Praise and Affection, (g) Developing Talents and Future Concerns, (h) Reading and Homework Support, and (i) Attentiveness. They also found adequate reliability estimates for the global score (α = .95). However, the measure has some limitations, such as the fact that one of the factors is comprised of only two items, which increases the chances of problems in confirmatory factor analyses (Kline, 2011). Nevertheless, in view of its various qualities, the IFI has been used by researchers in different countries (as commented by Barrocas et al., 2017, and by Santis, Barham, & Chuang, 2022).

The IFI has also been adapted for use in Brazil, resulting in an initial version of the *Inventário de Envolvimento Paterno* (or IFI-BR; Santis, Barham, Coimbra, Fontaine, 2017; Santis, Barham, & Chuang, 2022), with 26 items. This instrument was completed by 200 fathers of children aged from 5 to 10 years, matching the profile of fathers who participated in the study conducted by Hawkins et al. (2002). Analyses of the Brazilian data indicate adequate estimates of reliability for eight out of the nine factors, and evidence of validity based on the internal structure and its relationship with theoretically related constructs (Santis et al., 2017; Santis, Barham, & Chuang, 2022). However, several limitations were noted, such as: (a) a restricted scope of use (not usable with fathers of children under 5 years of age), (b) a slightly different and more limited internal structure, when compared to the IFI, as only

eight out of the nine factors were confirmed for the IFI-BR, and (c) several factors with less than three items, as only 23 items were retained in the final factor structure (Santis et al., 2017; Santis, et al., 2023).

In addition to these limitations, Authors (citation omitted) also noted that the initial version of the IFI-BR presented some cultural restrictions, considering the Brazilian context. For example, the most common ways that many Brazilian parents invest in their children's future, during their formative years (such as enrolling their children in private schools and in English classes) are different from the ways that many American parents approach this task (by developing their children's sporting or artistic talents). Furthermore, an important period in child development is the transition from early childhood to elementary school education. In Brazil, this transition occurs at age six, a year later than in the United States. Thus, it is important that these specificities are considered when developing a Brazilian instrument to assess the quality of father involvement.

Finally, and most importantly, there is strong evidence that the quality of children's relationship experiences during their first years of life have a long-term influence on their development (Arruabarrena & Paúl, 2012; Britto et al., 2017). Although there are ongoing changes in the specific ways that fathers help their children, over the course of their formative years, the areas in which fathers contribute to child development may be relatively constant during this period, as many abilities (such as language, socio-emotional, and relationship skills) develop gradually over many years. For example, two of the factors of the IFI are "School Encouragement" and "Reading and Homework Support," which involve fathers' efforts to help their children develop academic abilities. Fathers who participate in their children's language development during their toddler years encourage them to speak and may read age-appropriate books with them. As their children grow older, fathers can encourage reading and help their children with homework assignments. Thus, in addition to revising the IFI-BR so that it is culturally inclusive with respect to parenting and educational practices in the US and Brazil, it is also important to verify if adaptations of the items (so that they are relevant for fathers of children aged from 2 to 10 years) would mean that the revised version of this instrument could be used equally well with fathers during their children's preschool and elementary school years.

Considering these issues, the authors (Santis et al., 2023) made changes to 14 items of the IFI-BR that presented unsatisfactory results when evaluated with a sample of Brazilian fathers whose children were in early childhood education or elementary school (up to grade five). The objective was to adapt the IFI-BR for use with fathers of children in an extended age range (approximately 2 to 10 years of age), allowing evaluation of fathers of children in early childhood, as well as elementary school.

A further objective was to broaden the cultural scope of some items, aiming to maintain all the factors present in the original version of the IFI, which would be important for theoretical reasons and to facilitate intercultural comparisons. Finally, a new item was added to the factor "Providing" to ensure that all factors of the Brazilian version would have at least three items, following guidelines for the development of robust, psychometric instruments (Kline, 2011). These changes were empirically evaluated by analyzing the frequency of missing data and reliability estimates, and the items with the best results were selected to compose the revised version of the IFI-BR, called the IFI-BR-27 (Santis et al., 2023).

Although there is evidence indicating the potential for using the IFI-BR with Brazilian fathers whose children are in elementary school (Santis et al., 2017; Santis, Barham, & Chuang, 2022), the revised version developed by Santis et al. (2023) still needs to be evaluated. A further issue that is important in validity studies, beyond evidence based on the measure's internal structure, is to examine evidence for convergent validity. Other instruments that are used to evaluate similar, but somewhat different aspects of fathering include the Father Engagement Questionnaire (FEQ; Bolze, 2011), designed for using with fathers of children up to 6 years of age, and the Inventory of Parenting Practices ([IPP] Benetti & Balbinottil, 2003), fathers whose children are from 6 to 10 years of age. Neither of these other two instruments has been adapted for children in a wider age range (2 to 10, for example), but they can be helpful in evaluating convergent validity for the IFI-BR-27, especially when considering the global scores on each instrument.

According to Bolze (2011), Dubeau et al. (2009) defined father engagement as involving the father's participation and ongoing concern with respect to his child's development and physical and psychological well-being. Researchers who work

with parenting practices, on the other hand, focus on parents' behaviors related to setting limits, showing affection, and monitoring their children's academic, and social behavior (Bolsoni-Silva & Loureiro, 2010). Thus, there is theoretical overlap among the concepts of father involvement, father engagement, and parental practices; however, there are also specificities, which lead to differences in the instruments used to assess each construct.

The FEQ includes activities that are absent in the IFI-BR-27, and vice-versa. For example, the FEQ presents items about the father's evocation or memories of his child throughout the day and about the father's own participation in household chores (washing dishes, cleaning, etc.). On the other hand, the IFI-BR-27, different from the FEQ, investigates the father's involvement in providing financial support to his child and socioemotional support to the child's mother, among other differences. These and other dimensions of father involvement are also not measured by the IPP; however, the IPP directly addresses the accessibility dimension of father involvement (Lamb et al., 1987) which is only indirectly measured by the IFI-BR-27.

Another example of differences among these measures is that, although some dimensions of fathering appear in all three instruments, they are operationalized in different ways. For example, in the FEQ and in the IPP, the father's approach to discipline is represented by items about how the father reacts to his child's inappropriate behavior (using repression or punishment), among other forms of involvement in disciplining the child. In the IFI-BR-27, however, the concept of discipline is associated with teaching responsibility, and is investigated by asking fathers if they help their child develop appropriate behaviors. Considering differences in the presence or absence of some behavioral domains and the ways that some constructs are operationalized, we would not expect strong correlations among all the specific factors of the IFI-BR-27 and global scores on the FEQ and the IPP.

In sum, considering the importance of developing an instrument that could be used with fathers whose children are in preschool or in elementary school, and that has the same internal structure as the original instrument, evidence concerning the validity of the IFI-BR-27 is needed. To the extent that adequate evidence can be established, it would allow professionals to assess father involvement among Brazilian fathers of preschool children, so that this key relationship can be fostered earlier on and over the course of children's elementary school years. The IFI-BR-27 can also be an important tool for research on fathering, particularly for longitudinal studies and for developing and evaluating interventions that could increase the quality of father involvement, which can lead to positive consequences for all family members.

Therefore, the general objective of the present study was to evaluate evidence of the psychometric quality of the IFI-BR-27. Specifically, we examined: (a) evidence of validity based on the internal structure and reliability estimates for the factors of the IFI-BR-27, (b) invariance of this structure with respect to the child's educational setting, and (c) evidence of convergent validity, using measures of father engagement or parenting practices (very similar constructs).

Thus, the central hypotheses for this study are that: H1 – an internal structure with nine specific factors (as previously described) and one general second-order factor, with adequate fit indices, will be found for the IFI-BR-27; H2 – considering that the items of the IFI-BR-27 were developed for assessing father involvement with children in preschool or elementary school, the factor structure will be invariant in relation to the child's educational setting; and H3 – a strong correlation is expected between the global score of the IFI-BR-27 and two other measures of fathering—father's engagement and parenting practices. Given the specific features of the measures used in this study, moderate to strong correlations are expected between the specific factors of the IFI-BR-27 and the two other measures of fathering.

Method

Participants

A total of 572 fathers living in the state of São Paulo, Brazil, participated in this study. In addition to being a father, the criteria for participating in the study included having at least one child in an early childhood education setting ($n = 285$) or in elementary school ($n = 278$), and having contact with this child at least once a week. Nine participants did not indicate their child's schooling level and were excluded from analyses involving school setting. Most of the fathers were married (87.9%) and many had completed secondary education (43.4%). Participants were aged

from 21 to 68 years (M = 36.6, SD = 7.51), and the target-child's[1] age varied from 2 to 17[2] years (M = 5.9, SD = 2.49). On average, fathers had 1.8 children (SD = 0.90) and their monthly family income (in Brazilian *reais*) was R$2,998.26 ($SD$ = 3,631.99).

Instruments

Sociodemographic Questionnaire. This questionnaire was developed to describe the sample, including the father's age, education, marital status, family income, and number of children.

Revised Version of the Brazilian Inventory of Father Involvement (IFI-BR-27; Citation omitted). The Inventory of Father Involvement (IFI) developed by Hawkins et al. (2002) consists of 26 items grouped in nine subscales: (a) Discipline and Teaching Responsibility (for example, "*Setting rules and limits for your children's behavior*"), (b) School Encouragement (e.g., "*Encouraging your children to succeed in school*"), (c) Mother Support (e.g., "*Cooperating with your children's mother in the rearing of your children*"), (d) Providing (e.g., "*Providing for your children's basic needs*"), (e) Time and Talking Together (e.g., "*Spending time with your children doing things they like to do*"), (f) Praise and Affection (e.g., "*Praising your children for being good or doing the right thing*"), (g) Developing Talents and Future Concerns (e.g., "*Encouraging your children to develop their talents*"), (h) Reading and Homework Support (e.g., "*Reading to your younger children*"), and (i) Attentiveness (e.g., "*Attending events your children participate in*"). For each item, the father self-evaluates the quality of his involvement with his child by using a scale ranging from 0 (*very poor*) to 6 (*excellent*), or "*does not apply*." The IFI was translated and adapted for use in Brazil (IFI-BR; Paschoalick, 2008). There is adequate evidence of validity for the initial version of the IFI-BR (26 items) for fathers of children aged from 5 to 10 years based on: (a) its internal structure (χ^2/df = 1.86; CFI = .90; $RMSEA$ = .06; $SRMR$ = .07), including eight out of the nine factors that comprise the IFI ($.65 \leq \alpha \geq .81$) (Santis et al., 2017), and (b) its relationship with theoretically related constructs (correlations varying from |.37| to |.46|) (Santis, Barham, & Chuang, 2022). In the present study, the revised version of the IFI-BR was used (comprised of 27 items, adapted for fathers with children in early childhood education or elementary school), as described by Santis et al. (2023). Reliability for all nine factors of the revised version (IFI-BR-27) was satisfactory, varying from ω =.61 to .78.

Father Engagement Questionnaire ([FEQ] Bolze, 2011). The FEQ (56 items) is used to evaluate the involvement of fathers when their children are aged from 0 to 6, using a rating scale ranging from 1 (*never*) to 6 (*everyday*), or "*does not apply*." An example of an item is: "*Listening to music with your child*." The Brazilian version of this Canadian measure was developed by involving translation, back-translation, and evaluation of the Brazilian version, with the involvement of a committee of specialists (Bolze, 2011). When used in Brazil, reliability for the global score of the FEQ was good (α =0.89) (Gomes, Crepaldi, & Bigras, 2013). Given that this instrument is used only with fathers of younger children, in the present study, this measure was completed by fathers whose children were in early childhood education settings (aged from 2 to 6 years) (n = 62), and the reliability of the global score was ω = 0.94.

Inventory of Parenting Practices ([IPP] Benetti & Balbinotti, 2003). Adapted for use in Brazil by Benetti and Balbinotti (2003), the IPP (29 items) is used to ask parents to evaluate their relationship with their children during the period when the children are between 6 to 10 years of age, using a rating scale ranging from 1 (*never*) to 5 (*very often*). An example of an item is: "*I participate in games/activities with my child.*" Benetti and Balbinotti found supportive evidence for construct validity and reliability (α = .87), also identifying a four-factor internal structure (explaining 56.2% of the variance) as adequate for the measure. In the present study, this measure was completed by fathers of children in elementary school (about 6 to 10

[1] When the father had more than one child who met the study criteria, he was asked to consider only one of them (called the *target-child*), to answer the questionnaire.

[2] One of the fathers had a child aged 17, but who, due to Down's Syndrome, had an academic performance equivalent to that of children aged 10. Because the child's school setting, and not the child's age, was the criterion used to define the sample, this father was maintained in the study. More than one father had a child with special needs, but only this child was over 10 years of age.

years of age) (n = 195), and the reliability of the global score was ω = .88.

Data Collection Procedure

The research proposal for this study was submitted to and approved by the Human Research Ethics Committee (1.473.472). After approval, contact was made with the principal of public and private schools from five different municipalities in the state of São Paulo. When the principal agreed, a letter was sent to the fathers of children in early childhood and elementary school settings, inviting them to participate in the study. Data collection took place at each school on a day and at a time that each school principal determined. Participants answered the questionnaires after reading and signing an informed consent form. All fathers answered the sociodemographic questionnaire and the IFI-BR-27. In addition, fathers of children in early childhood education settings answered the FEQ (n = 62) and fathers of children in elementary school completed the IPP (n = 195). Immediately after completing their questionnaire package, each father received an information pamphlet summarizing research findings on father involvement. A few months later, they received a document with the main findings of the study.

Data Analysis

To verify the internal structure of the revised version of the IFI-BR-27, confirmatory factor analyses (CFA) were performed using the MPlus software package (version 7.11) and the Weighted Least Squares Mean and Variance (WLSMV) estimation method, based on polychoric correlation matrices (Green & Yang, 2009; Muthén & Muthén, 2008). Since the existence of specific (related) factors and a general factor was plausible, three models for the internal structure of the IFI were evaluated: (a) a second-order structure, (b) a correlated factors model, and (c) a bifactor model.

To assess the fit for each of the three models, item loadings and global adjustment were verified using the following indices and criteria: item loadings > .40; χ^2/df < 5; Bentler Comparative Fit Index (CFI) > .90; Tucker-Lewis Fit Index (TLI) > .90; and the Root Mean Square Error of Approximation (RMSEA) < .08 (Brown, 2015). Theoretical concepts were also considered to help define the most appropriate structure for the IFI-BR-27.

After defining the internal structure of the IFI-BR-27, the invariance of this structure was tested, comparing results for two groups of fathers, based on their child's educational setting (an early childhood or elementary school setting). These analyses were conducted considering: (a) configural invariance, by examining the number of factors and the specific items that are related to each factor for each group of fathers, (b) metric invariance, based on the magnitude of item loadings in each of the two groups, and (c) scalar invariance, based on the levels of the second-order latent trait that were associated with endorsement of each of the item-rating categories (thresholds) (Cheung & Rensvold, 2002) for each group of fathers.

The same adjustment indexes and reference values that were used in the CFA were also used to evaluate models with different levels of restrictions (configural, metric, and scalar models). Differences in the CFI values were also calculated (Cheung & Rensvold, 2002). Differences of up to .01 between two models (configural and metric, or metric and scalar) indicate the invariance of the model with the most constrained parameters, among those compared (Milfont & Fisher, 2010).

The reliability of each of the IFI-BR-27 factors was assessed using McDonald's omega (Reise, Moore, & Haviland, 2010; Wiethaeuper, Oliveira, Peixoto, Balbinotti, & Castilho, 2017) and a measure of composite reliability (Valentini & Damásio, 2016; Peterson & Kim, 2013). Reliability values greater than .70 were considered adequate (Tabachnick & Fidell, 2019).

To examine evidence of validity based on the relationship with other constructs, correlations were tested between scores on the IFI-BR-27 and other study variables. Once a multidimensional structure was identified for the measure, the external variables were correlated with the global and factorial scores of the IFI-BR-27. Pearson's correlation index (r) was used to estimate the correlation between variables with a normal data distribution, and Spearman's rho (ρ) was adopted for variables with a non-normal distribution. Evidence of convergent validity is established when there are strong correlations (greater than .50; Cohen, 1988) between the measure and constructs that are very similar (American

Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 2014).

Results

Confirmatory Factor Analyses

The results for the three factor-structure models tested (correlated factors, second-order factor, and bifactor models) are displayed in Table 1. Item-factor loadings below the criterion were observed only for the bifactor model, although the adjustment indices were adequate for this model. Adequate item loadings and adjustment indices were found for the correlated factors and second-order factor models, but the correlated factors model was the one with the best adjustment indices.

In analyzing the quality and suitability of the correlated factors model, however, we also examined the magnitude of the correlations between all the first order factors. These correlations were moderate to high (ranging from .53 to .92), indicating the possible existence of a common influence on all the factors of the IFI-BR-27— which could be explained by a "higher" level (second order) factor. There is additional evidence for the existence of a common factor considering the results for the bifactor model, as most items loadings were higher on the global factor (ranging from .45 to .80) when compared with loadings on the specific factors (ranging from .07 to .83).

Table 1

Results of the Confirmatory Factor Analysis for Three Models of Internal Structure (N = 572)

	Number of items	Item loadings	Adjustment index			
			χ^2/df	CFI[1]	TLI[2]	RMSEA[3]
Reference values	--	> .40	< 5	> .900	> .900	< .080
Model						
Correlated factors	27	≥ .55	3.44	.944	.931	.065
2nd order	27	≥ .55	3.52	.937	.929	.066
Bifactor	24*	≥ .07	3.12	.958	.949	.061

*To test the bifactor model, the MPlus program indicated the exclusion of the Factor "Attentiveness," so that it was possible to complete the analyses and generate the results for the adjustment indexes.

[1] Bentler Comparative Fit Index

[2] Tucker-Lewis Fit Index

[3] Root Mean Square Error of Approximation

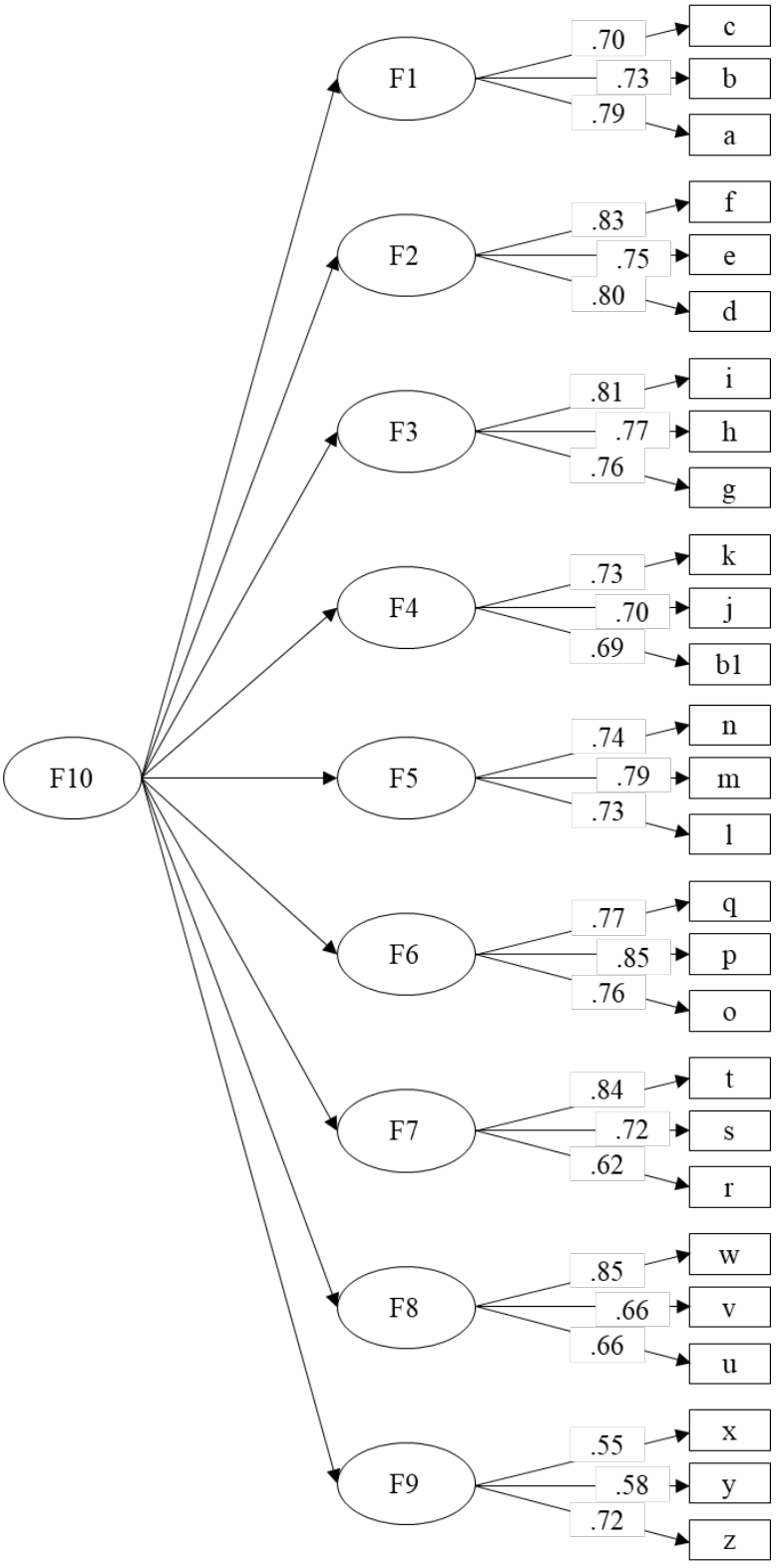
To complete an analysis of information that should be considered when deciding which of the three factor-structure models is the most suitable one, it is important to interpret the statistical results in light of theoretical considerations. Father involvement is known to be a multidimensional construct. Furthermore, several or all the dimensions of father involvement may be influenced by other variables that could favor or enable father involvement. In this sense, the second-order model (see Figure 1) was selected as the one that seemed to best represent the quality of father involvement and the responses of Brazilian fathers to the IFI-BR-27.

Invariance of the IFI-BR-27 Structure Considering the Child's Educational Setting

Adjustment indices were adequate for the three models of invariance that were evaluated (configural, metric, and scalar) (see Table 2). Variations in CFI values showed a difference of.001 for the configural and metric model, and no variation for the metric and scalar model. Thus, we found invariance in the internal structure of the IFI-BR-27 concerning the educational setting of the participant's child, for all levels of invariance that were evaluated.

Figure 1

The Factor Structure for the IFI-BR-27 (N = 572)



Note. F1 = Discipline and Teaching Responsibility, F2 = School Encouragement, F3 = Mother Support, F4 = Providing, F5 = Time and Talking Together, F6 = Praise and Affection, F7 = Developing Talents and Future Concerns, F8 = Reading and Homework Support, F9 = Attentiveness, F10 = General Father Involvement.

Table 2

Invariance Analysis of the IFI-BR-27 Structure Considering Child's Educational Setting (N = 572).

	X^2/df	CFI[1]	TLI[2]	RMSEA[3]
Reference values	< 5	> .90	> .90	< .08
Model				
Configural	1.361	.971	.964	.036
Metric	1.332	.972	.967	.034
Scalar	1.323	.972	.968	.034

[1] Bentler Comparative Fit Index

[2] Tucker-Lewis Fit Index

[3] Root Mean Square Error of Approximation

Reliability

Reliability was adequate for seven of the factors of the IFI-BR-27, being inadequate only for "Providing" and "Attentiveness." Values for McDonald's omega and for composite reliability were, respectively: "Discipline and Teaching Responsibility" =.71 and.78; "School Encouragement" =.77 and.84; "Mother Support" =.78 and.82; "Providing" =.58 and.75; "Time and Talking Together" = .74 and .80; "Praise and Affection" = .73 and .84; "Developing Talents and Future Concerns" = .70 and .77; "Reading and Homework Support" = .73 and .77; and "Attentiveness" = .61 and .65.

Evidence of Convergent Validity

The number of participants in each correlation analysis varies since fathers received a questionnaire package based on the age of his child (early childhood or elementary school students). As shown in Table 3, regarding convergent validity (relationships with very similar constructs), the correlations between scores on the IFI-BR-27 and father engagement (for fathers of children in early childhood education settings) or with parental practices (elementary school settings) were above the minimum value established by Cohen (1988) when considering the global factor score (general father involvement).

When considering the individual factor scores of the IFI-BR-27, as expected, not all correlations reached the criteria for strong correlations (see Table 3). However, all results were in the expected direction, that is, all correlations were positive. The strength of these relationships varied but these differences were in line with the theoretical meaning of each factor. For example, since the IPP (used to evaluate parenting practices) was designed to measure the socialization practices employed by parents (Benetti & Balbinotti, 2003), we expected that the correlation between the factor "Time and Talking Together" and the IPP would be one of the highest since this factor directly reflects socialization practices.

Table 3

Correlations for the IFI-BR-27 Global and Factorial Scores with Father Engagement and Parental Practices.

	Convergent validity (*criteria* > *.50*)	
IFI-BR-27	Father engagement (n = 62)	Parental practices (n = 195)
Global factor score	.67 (p < .001)	.58 (p < .001)
Discipline and Teaching Responsibility	.54 (p < .001)	.25 (p < .001)

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IFI-BR-27	Convergent validity (*criteria* > *.50*)	
	Father engagement (n = 62)	Parental practices (n = 195)
School Encouragement	.66 (p < .001)	.43 (p < .001)
Mother Support	.53 (p < .001)	.46 (p < .001)
Providing	.30 (p = .021)	.32 (p < .001)
Time and Talking Together	.56 (p < .001)	.41 (p < .001)
Praise and Affection	.42 (p = .001)	.37 (p < .001)
Developing Talents and Future Concerns	.58 (p < .001)	.42 (p < .001)
Reading and Homework Support	.46 (p < .001)	.46 (p < .001)
Attentiveness	.56 (p < .001)	.44 (p < .001)

Discussion

In this study, we found adequate evidence of validity, from different sources, for the revised version of IFI-BR, with 27 rather than 26 items (Santis et al., 2023), when completed by Brazilian fathers of children in either early childhood or elementary school settings. Thus, all initial hypotheses were confirmed.

Regarding the first hypothesis, the nine-factor model of the IFI, with a second-order general factor (Hawkins et al., 2022) was confirmed for the IFI-BR-27. After comparing three models for the internal factor-structure of the IFI-BR-27, the second-order structure was the one that best suited (statistically and theoretically) the Brazilian data, presenting the same structure that Hawkins et al. (2002) proposed for the IFI. Thus, father involvement in the Brazilian context can also be broken down into nine distinct components. Involvement in each of these components, however, is "connected" or "guided" by a global structure that regulates, in part, the quality of father involvement in each of the specific (first order) factors.

For example, this second-order latent construct may involve social-emotional skills that are important for the father-child relationship, considering that the father interacts with his child, or with other people regarding his child, in all areas of father involvement. This hypothesis can be partially supported based on other results reported in the present study, considering the correlation found between father involvement and fathers' social skills. Cardozo and Soares (2010) also reported that parents' social skills (in particular, the dimension "self-affirmation in the expression of positive feelings") were positively correlated with caring for a child. It could also be the case that the specific components of father involvement are regulated by guiding principles defined by cultural elements. For example, contemporary cultural values in occidental countries may be leading fathers to follow an emerging norm for intensive parenting (César, Oliveira, & Fontaine, 2020).

In this sense, Glass and Owen (2010) evaluated the relationship between father involvement and cultural norms of Latino fathers who lived in the US. They found significant relationships between IFI scores and cultural characteristics of these fathers, considering: (a) their level of acculturation (process of "articulation" between characteristics of their original culture and the culture that prevails in the place where they live) and (b) their attitudes towards gender-based cultural norms within the family (referred to as *machismo*, in Spanish).

In another study with Latino fathers, the association between fathers' values and cultural practices and father involvement was also evaluated (Cruz et al., 2011). Cruz et al. also found a relationship between components of father involvement (such as parental monitoring and efforts to shape the child's behavior) and the fathers' adherence to *machismo*, confirming the results of Glass and Owen (2010) and providing additional evidence of the relationship between cultural practices and the quality of father involvement. However, to better understand the nature of the second-order factor found in the internal factor-structure of the IFI-BR-27, further studies are needed to verify whether the variables we suggested (interpersonal skills used in the fathering context and cultural beliefs about fathering) are, individually or in

combination, influencing the more specific aspects of father involvement, and to determine how this influence occurs. Since other evidence is not yet available, in this study, this factor was called "general father involvement."

Based on the invariance analysis of the internal structure of the IFI-BR-27, we consider that these results supported our second hypothesis. The same internal structure was suitable for fathers of children from early childhood education to elementary school settings (up to grade five), satisfying one of the objectives we had for the revised version of this instrument. Thus, the IFI-BR-27 can be used in longitudinal studies on assessing father involvement, starting early on and continuing throughout children's formative years, in addition to enabling the measurement of father involvement with children of different ages. Based on Milfont and Fischer (2010), the invariance of the internal structure of the IFI-BR-27 regarding educational setting can be understood to mean that, although fathers help their children in different ways as they grow older, they have the same nine areas of involvement across this period of their children's lives. Thus, differences or similarities in father involvement in these two contexts are due to surrounding conditions that affect the fathers, and not due to differences in the capacity of the IFI-BR-27 to measure the involvement of fathers whose children are in early childhood or elementary school education settings.

To strengthen this evidence, however, the invariance of responses on the IFI-BR-27 should be verified with another sample of fathers whose children are in early childhood or elementary school education settings. Moreover, longitudinal studies aiming to examine patterns of father involvement over time should be conducted, so that the invariance of father involvement, as a construct, can be evaluated. Our results cannot be generalized to other cultural contexts since the IFI-BR-27 requires adaptation for use in other languages and cultures. We highlight that cross-cultural invariance should be evaluated in future studies, so that these revised versions of the IFI can be used in other countries. A preliminary translation of the IFI-BR-27 into English (called the IFI-27) has been included as supplementary material.

Although the CFA results and the reliability estimates of most of the IFI-BR-27 factors were adequate, reliability was not adequate for the "Provision" and "Attentiveness" factors. Under some conditions, reliability values lower than .70 can be accepted (Kline, 2011), such as when factors are composed of few items, as is the case of the IFI- BR-27 (three items each). However, reliability estimates provide important information about the consistency of scores in samples with different profiles and are directly related to measurement error (Peixoto & Ferreira-Rodrigues, 2019). Thus, in future studies, the items should be reviewed by other researchers. In addition, given that further evidence is needed, caution should be exercised when interpreting the results of these factors in the present version of the measure (the IFI-BR-27).

Finally, based on our analysis of convergent validity, the results we obtained supported our third hypothesis. Evidence was found for relationships between the global score on the IFI-BR-27 and measures of very similar constructs: (a) father engagement (for fathers of children in early childhood education settings) and (b) parenting practices (for fathers of children in elementary school settings).

Other researchers have also assessed the convergent validity of different versions of the IFI. In Barrocas et al. (2017), the correlation between scores on the Portuguese version of the IFI and the Father Involvement Scale (*Escala de Envolvimento Paterno* – EEP; Simões, Leal, & Marôco, 2010) was .49 ($p < .001$) for the global scales and .57 ($p < .001$) and .39 ($p < .001$) for the "Care" and "Presence" subscales, respectively. These correlations were slightly lower than those found in the present study, with the revised 27-item version of the IFI. In two other studies, convergent validity for two versions of the IFI was evaluated but these researchers examined correlations between fathers' and mothers' assessments of father involvement (Chui, Lee, & Tsang, 2016; Trahan & Cheung, 2016), which is important for investigating the possibility of using multiple informants to evaluate father involvement.

Regarding the correlations involving each of the specific IFI-BR-27 factors and other constructs, the variability observed can add to the evidence previously presented since the direction and strength of these relationships corroborated theoretically-based similarities between the instruments. For example, a strong correlation was found for the factor "Mother support" and scores on the father engagement questionnaire (FEQ) since the FEQ includes, among others, items related to the father's participation in household chores (washing dishes, cleaning, etc.). Given that these tasks have been historically attributed to mothers

(Koivunen, Rothaupt, & Wolfgram, 2009), the performance of these activities by fathers can be understood as representing a way that fathers show their support for mothers. On the other hand, lower correlations were found between the "Providing" factor of the IFI-BR-27 and scores on the FEQ and the IPP, which may reflect that the IFI-BR-27 is the only instrument, out of the three included in this study, to include items about the father's involvement in providing financial support for his child.

A lower correlation was also found for the relationship between the IFI-BR-27 factor "Discipline and Teaching Responsibility" and global scores on the FEQ and IPP. In the IFI-BR-27, this factor is operationalized by items that reflect positive discipline, such as: "*Discipline your child (e.g., correct inappropriate behavior)*" and "*Establish rules and limits for your child's behavior.*" Although the FEQ and IPP also present items that refer to discipline, both measures focus on the use of coercive behaviors. In the FEQ, items concerning disciplinary behaviors include: "*Reprehend your child when he/she disobeys*" or "*Punish your child when he/she does something wrong.*" In the IPP, the coercive behaviors of the father explicitly refer to the use of physical or verbal violence and include: "*When just talking is not enough I spank my child*" or "*I yell at my child when she/he does something wrong.*" Differences in the ways that discipline is evaluated in each instrument would contribute to the degree of specificity or overlap for this factor, resulting in differences in the correlations between this factor of the IFI-BR-27 and scores on the other two measures of fathering, being higher for the FEQ and lower for the IPP.

A final example that may explain why correlations between each of the factorial scores of the IFI-BR-27 and the global scores for the FEQ and IPP did not always reach the 0.50 criteria involves the factor "Praise and Affection." In the IFI-BR-27, this factor is represented by two items that refer to fathers praising their child (e.g., "*Praising your child for something he/she did well*") and one item about affection ("*Telling your child that you love him/her*"). When this dimension of the father-child relationship is investigated in the FEQ and in the IPP, a greater diversity in the content of the items can be observed. In the FEQ, for example, there is a more practical operationalization of paternal affection (e.g., "*Giving first aid when your child is injured*" or "*Consoling your child when he/she cries*"). The same can be observed in the IPP (e.g., "*I talk to my child about what happens at school*"). Both the FEQ and the IPP also have a significantly smaller number of items about praise for the child when compared to items about affection— another difference with the IFI-BR-27. These examples help understand variations in the strength of the correlations for the specific factors of the IFI-BR-27 with global scores on each of the other two measures of fathering, which were also consistently lower when compared with the correlations for the global score of the IFI-BR-27 with the FEQ and IPP.

In conclusion, in this study, we found evidence for the validity of the IFI-BR-27. This revised version of the IFI-BR allows a more appropriate assessment of the quality of father involvement in Brazil, for fathers of children between 2 and 10 years of age. Despite these advances, we highlight some limitations of this study. Among them, the respondents were all from the state of São Paulo, Brazil, and only the fathers' perspective on the variables of interest was obtained.

Finally, further information is needed so that the IFI-BR-27 can be made available to professionals in Brazil. In addition to expanding data collection to include fathers from all regions of the country, additional information is needed about the characteristics and psychometric properties of the items, as well as testing the influence of social desirability on responses to this measure. A system for scoring and interpreting the scores obtained using the IFI-BR-27 is also needed (AERA, APA & NCME, 2014). Using this instrument, it will also be possible to identify factors that influence father involvement, such as socioeconomic status, number, and age of children, among others. With this evidence, it will be possible to understand more about the multiple factors that determine the quality of father involvement.

In addition to contributing to the scientific rigor of future studies on father involvement, results of the present study will also be important for professional practice, enabling, for example, more effective psychological interventions to promote good-quality father involvement. Finally, the IFI-BR-27 can be used as a tool to encourage parental involvement among fathers who experienced poor quality fathering during their own childhood. By working on the nine dimensions of positive father involvement, fathers who have difficulties interacting positively with their children can improve the quality of their involvement, reducing perceptions of maternal burden and male privileges in the family context.

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