

# Portuguese Validation of FACES-IV in Adult Children Caregivers Facing Parental Cancer

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**Abstract** The purpose of the present study was to examine the psychometric properties of the FACES-IV in Portuguese caregivers of cancer patients. In this cross-sectional study, a sample of 214 adult children caregivers of cancer patients receiving chemotherapy, completed FACES-IV, Family Communication Scale (FCS), Family Satisfaction Scale (FSS), and Satisfaction with Social Support Scale (SSSS). Internal consistencies above .70 were found for all FACES-IV scales, except for Enmeshed and Rigid scales, as well as for the FCS, FSS, and SSSS (except for Intimacy). Strong correlations between FACES-IV and the validation scales FCS and FSS were found except for the Enmeshed and Rigid scales. Confirmatory analysis yielded an acceptable model for the six theoretical subscales. The discriminant analysis between problematic and non-problematic family systems showed results similar to the original study. These findings suggest that FACES-IV is a valid measure of family functioning in oncological family caregiving's contexts.

**Keywords** FACES-IV · Validation · Caregivers · Parental cancer

## Introduction

Families of cancer patients face many issues related to cancer and its treatment, including caregiving and burden (Chen et al. 2004; Nijboer et al. 1999; Northouse et al. 1999); changes regarding family interactions (Harden 2005; Hilton 1993; Navon and Morag 2003; Sothill et al. 2003) and family roles (Harden 2005; Hilton 1993; Northouse et al. 1999; Sothill et al. 2003); communication difficulties (Nalbadian et al. 2001; Navon and Morag 2003; Porter et al. 2005); financial and psychological stressors (Edwards and Clarke 2004; Fleming et al. 2006; Matthews 2003; Northouse et al. 2002; Vickery et al. 2003).

Family (dys) functioning represents one of the most significant areas of stress for families dealing with cancer. Unfortunately, almost half of family members dealing with cancer, experience levels of distress similar to the patient (Schulz et al. 1996). Almost

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30 % of families facing cancer show high levels of distress, resulting in psychological symptoms, requiring professional intervention (Sales et al. 1992). Thus, research indicates that one of the most challenging tasks for many families is the ability to adapt to the system's demands of a family illness. In fact, the degree of family flexibility is regarded as an important predictor of how cancer will impact the family over time (Rait and Lederberg 1989).

For the past two decades, the focus in the family literature has moved from viewing family functioning through a deficit-based lens to a strength-based perspective (Hawley and DeHaan 1996; Walsh 2003). Family resilience and the ability to struggle with adversity has been mostly examined from the perspective of family stress and coping (Patterson 2002). Families can respond to adverse events, such as a cancer diagnosis, by strengthening their resources since adverse events have the potential to set off second-order change processes that lead to a higher level of functioning.

Family functioning appears to change over the course of illness and treatment, and the influence of family functioning on individual members' adjustment seems to depend on the illness/treatment' demands (Barakat and Kazak 1999). For example, a stronger association was found between family cohesion, adaptability and adjustment in adolescent cancer survivors who had recently gone off treatment or in those who were long-term survivors (greater than 5 years). The authors suggested that families may disengage in an attempt to regain "normality" (Rait et al. 1992).

Since the 1970s, there were several explanatory models of family functioning, with their respective assessment instruments, many of which are still in use today. One of the most important is the Circumplex model which, in the 1980s, was the basis for the development of the Family Adaptability and Cohesion Evaluation Scales (FACES). Since then, and after almost 30 years of research, four versions have been created. FACES was developed by Olson et al. (1979) and built around two primary dimensions, cohesion and flexibility, and a supplementary one, communication (Olson 1993). During the past few years, a great number of theories and studies around family have focused on the concepts of cohesion and flexibility. These concepts have been defined conceptually by academics and researchers in various ways (Barber and Buehler 1996; Doherty and Hovander 1990; Friedman et al. 1987; Green and Werner 1996; Werner et al. 2001) but the main hypothesis of the model is that cohesion and flexibility have a curvilinear relationship with family functioning and communication has a positive linear relationship with family functioning. Levels of Cohesion and Flexibility too low or too high are associated with problematic family functioning and moderate levels with healthy family functioning's (Gorall et al. 2004).

A new version of FACES was considered necessary since previous versions (I, II and III) produced scores that were often linearly related to adjustment and outcomes. A linear relationship between cohesion, flexibility and positive outcomes is inconsistent with the Circumplex model since families extremely low and extremely high on each of these dimensions were supposed to have poorly functioning (Marsac and Alderfer 2011). According to Olson (2011), previous versions of FACES did not adequately assess the extremes of each dimension. Balanced and unbalanced scales of FACES-IV, on the other hand, proved to be positively and negatively related to adjustment, respectively (Olson 2011). FACES-IV subscales also correlate with the General Functioning subscale of the Family Assessment Device (FAD) (Epstein et al. 1983) i.e. positive correlations with the balanced scales, and small to strong negative correlations with the unbalanced scales (Gorall et al. 2004). Despite this inconsistency between the model and the scales, FACES-IV has been considered a 'promising' measure of family functioning (Alderfer et al. 2008).

To date, publications reporting psychometric properties of FACES-IV have been published in Spain (Rivero et al. 2010), Hungary (Mirnics et al. 2010), and Italy (Baiocco et al. 2012). Other empirical reports (Craddock 2001; Franklin et al. 2001; Laghi et al. 2012) provide some psychometric information as well. Although FACES-IV psychometric properties have been explored in families of pediatric oncological patients (Marsac and Alderfer 2011) have not been examined among families of adult patients. Thus, the general aim of the present study was to analyse the psychometric properties of FACES-IV in a sample of adult children caregivers of oncological patients, undergoing chemotherapy. More specifically, the purposes of the present study were: (1) the examination of reliability of the FACES-IV scales; (2) the assessment of intercorrelations of FACES-IV scales and its validity (correlations were compared to those reported in the original study to determine if the measure was behaving similarly across samples and according to the Circumplex model as well as through confirmatory factor analysis); (3) the comparison of ratings across participants with different sociodemographic backgrounds; (4) the examination of FACES-IV predictive validity, through a discriminant analysis in order to predict problematic family functioning.

## Method

### Procedures and Participants

This is a cross-sectional study, approved by the Ethics Committees of three general hospitals in Northern Portugal. Participants were adult children who, during the period of data collection, accompanied the parent diagnosed with cancer to chemotherapy. The convenience sample had voluntary participation. The inclusion criteria were: aged  $\geq 18$  years; having a parent (or both) in chemotherapy; accompany the parent to the hospital for treatment (minimum criterion for defining the adult children as “caregiver”); and not suffer from an oncological, psychiatric or neurological disease. The sample consisted of 214 adult children of patients undergoing chemotherapy. Of these, 74 % were women, with a mean age of 33.1 years ( $SD = 9.1$ ; range = 18–61 years) and 47 % had a partner. In terms of education, 63 % had less than a high school degree and 68 % had monthly household earnings of more than twice the minimum wage. The parent, in cancer treatment, was perceived as completely reliant on adult children’s caregiving by 21 % of the sample. Type of parental primary tumor was very heterogeneous.

## Measures

### Family Functioning

The Family Adaptability and Cohesion Evaluation Scales (FACES-IV) (Olson 2011) is a self-report measure that assesses family functioning according to the Circumplex model. The two primary dimensions measured are cohesion and flexibility. The scale comprises 42 items in a Likert-type format and is composed of six scales: two balanced scales (Cohesion and Flexibility) assessing central–moderate areas, and four unbalanced scales (Enmeshed and Disengaged; Rigid and Chaotic) assessing the lower and the upper ends of Cohesion and Flexibility (Olson et al. 2006b). While the two balanced scales are similar to previous FACES-III scales, the four unbalanced scales represent an original improvement (Olson

2011). The two balanced scales assess normal functioning and the unbalanced scales assess problematic functioning. The central hypothesis of the Circumplex model is that healthy families are more balanced, while problematic families are more unbalanced (Olson 2011). A further improvement of FACES-IV is the ratio scores (useful for research purposes), that the scales yielded, representing the level of functional versus dysfunctional behavior. Three ratio scores can be obtained: cohesion ratio, flexibility ratio, and total family functioning ratio. The higher the ratio scores (over 1), the more balanced or healthy the system is (Olson 2010).

FACES-IV scales proved to be valid, reliable and discriminatory between both problematic and non-problematic families, and the reliability for the six scales ranged between .78 and .90, allowing its use in research and in family assessment (Olson 2011; Olson et al. 2006a). Test–retest correlations were not reported in the original study. Discriminate analysis demonstrated poor predictive validity for the Enmeshed and Rigid scales. Despite this limitation, FACES-IV demonstrated many strengths. In particular, total healthy family functioning, cohesion and flexibility ratio scores provide comprehensive measures of family functioning (Olson 2011). The present study used the Portuguese translation of FACES-IV (Rebello 2008).

### Family Communication

The Family Communication Scale (FCS) (Olson and Barnes 2004) is a 10-item Likert-type measure based on the 20-item Parent-Adolescent Communication Scale (PAC) (Barnes and Olson 1985). The FCS may be used in a variety of family structures, at various life stages related to the Circumplex model. Family communication is defined as the systemic capacity for positive communication within marital or family systems, and is perceived as a facilitator that can modify levels of cohesion and flexibility (Olson et al. 2006a). In the original study, the internal consistency was .90 (test–retest .86). The Portuguese translation of the FCS (Rebello 2008) was used in the present study.

### Family Satisfaction

The Family Satisfaction Scale (FSS) (Olson 2004) is a 10-item Likert-type scale based on the original 14-item, to evaluates the degree of satisfaction regarding family cohesion and flexibility. Family satisfaction is defined as the degree to which family members feel happy with and fulfilled by each other. Higher scores on this scale indicate that members are happy with their family (Olson et al. 2006a). In the original study, the internal consistency was .93 (test–retest .85). The Portuguese translation of the FSS (Rebello 2008) was used in the present study.

### Social Support

The Satisfaction with Social Support Scale (SSSS) (Pais-Ribeiro 1999) consists of 15 sentences that assess perceived social support based on the assumption that subjective social support is fundamental for the well-being and quality of life in both healthy and clinical populations (Santos et al. 2003). The possibilities for self-response are organized in a Likert-type scale that allows participants to indicate their degree of agreement to sentences. This measure produces total scores wherein higher values correspond to a perception of greater satisfaction with social support. The original study (Pais-Ribeiro 1999)

presents four dimensions organized in four subscales: Satisfaction with Friendships, Intimacy, Satisfaction with Family, and Social Activities. Alphas for the Portuguese adaptation (Pais-Ribeiro 1999) ranged from .64 to .85.

## Data Analysis

Bivariate and multivariate analyses relating to independent variables were conducted. Reliability analysis was performed using coefficients of internal consistency (Cronbach's alpha). Convergent validity, was assessed through Pearson correlations among FACES-IV, FCS, FSS, and SSSS. Correlations were also used to examine the associations between FACES-IV and relevant sociodemographic data. Sociodemographic differences were evaluated using MANOVA. A confirmatory factor analysis was also performed in order to test the fit between the Circumplex model and the present data. Finally, for predictive validity, a discriminant analysis was conducted to predict problematic family functioning. Results with  $p < .05$  were considered significant.

## Results

### Psychometric Characteristics of FACES-IV

Internal consistency for the six scales was assessed. The results found were consistent with the ones from the original version and, in general, alphas were good, except for the Enmeshed and Rigid scales, that showed alphas close to .70 but lower (see Table 1). Concerning the reliability of FCS and FSS (Table 1), results were in concordance with previous studies (Baiocco et al. 2012; Mirnic et al. 2010; Olson 2011).

Olson discourages validity studies of FACES-IV based on an exploratory factor analysis (Olson 2010) and, therefore, a confirmatory factor analysis was performed to test the six scales of FACES-IV. The result was acceptable [ $\chi^2(804) = 2088$ ;  $\chi^2/df = 2.6$ ; RMSEA = .08]. For some authors, a cutoff value close to .06 (Hu and Bentler 1999) or a stringent upper limit of .07 indicates fair fit as well as  $\chi^2/df$  below 3 (Steiger 2007). However, Kline (2011), in a recent publication, considers that a RMSEA less than .10 indicates good fit and a value less than .05, a very good fit.

Since two FACES-IV scales showed alphas below .70 (enmeshed and rigid), the model was also run without them and the RMSEA, in this case, was .09 indicating a bad fit between our data and the model. Therefore, it seems that the Circumplex model with the six scales works better and the results obtained indicate an acceptable fit (Kline 2011).

Intercorrelations of the six FACES-IV scales provide information concerning the relationship between the scales and may also be an indicator of the complexity of the measure. Looking at Table 1, in our sample, the two balanced scales (Cohesion and Flexibility) were highly correlated, thereby demonstrating the concordance between balanced family functioning (Olson 2011). Results showed a high negative correlation between balanced cohesion and disengaged (lower unbalance) scales, and a non-significant positive correlation between balanced cohesion and enmeshed (higher unbalance) scales. The two unbalanced cohesion scales were not significantly correlated (see Table 1). In turn, a high negative correlation between balanced flexibility and chaotic (higher unbalance) scales was found as well as a non-significant positive correlation between balanced flexibility and rigid (lower unbalance) scales. The two flexibility unbalanced scales were

**Table 1** Descriptive statistics, correlations, and internal consistencies among scales

Scales	M (SD)	Alpha	2	3	4	5	6	7	8	9	10	11	12	13
1. Cohesion <sup>a</sup>	51.99 (22.98)	0.83	.552***	-.547***	0.062	-0.02	-.355***	.541***	.542***	0.122	.233**	.346***	.142*	.267***
2. Flexibility <sup>a</sup>	55.96 (16.35)	0.7	1	-.471***	0.089	0.086	-.441***	.549***	.504***	.177**	.182**	.344***	0.095	.256***
3. Disengaged <sup>a</sup>	29.14 (13.06)	0.73		1	0.072	.221**	.544***	-.590***	-.510***	-0.121	-.247***	-.345***	-.152*	-.274***
4. Enmeshed <sup>a</sup>	34.20 (13.19)	0.67			1	.363***	.214**	-0.049	0.011	-0.098	-.200**	0.025	-.188**	-.161*
5. Rigid <sup>a</sup>	35.92 (13.06)	0.67				1	0.118	-0.086	-0.072	-0.131	-.231**	-.151*	-.214**	-.240***
6. Chaotic <sup>c</sup>	27.49 (11.72)	0.75					1	-.468***	-.392***	-.160*	-.217**	-.260***	-.175**	-.264***
7. Family communication <sup>b</sup>	56.22 (22.21)	0.89						1	.671***	.208**	.253***	.433***	0.114	.323***
8. Family satisfaction <sup>c</sup>	37.36 (23.07)	0.93							1	.206**	.325***	.404***	.156*	.352***
9. Satisfaction with friendships <sup>d</sup>	19.46 (4.02)	0.81								1	.518***	.507***	.450***	.865***
10. Intimacy <sup>d</sup>	15.35 (3.36)	0.63									1	.289***	.490***	.787***
11. Satisfaction with family <sup>d</sup>	12.63 (2.59)	0.87										1	0.088	.602***
12. Social activities <sup>d</sup>	9.07 (2.59)	0.7											1	.687***
13. Total social support <sup>d</sup>	56.52 (9.76)	0.85												1

N = 214

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

<sup>a</sup> FACES-IV = Family Adaptability and Cohesion Evaluation Scales

<sup>b</sup> FCS = Family Communication Scale

<sup>c</sup> FSS = Family Satisfaction Scale

<sup>d</sup> SSSS = Satisfaction with Social Support Scale

not significantly correlated (see Table 1). The two unbalanced scales, disengaged and chaotic, were highly correlated, indicating that family systems that are disengaged can also be chaotic, and vice versa. The enmeshed and rigid scales seem to be ‘independent’ from other scales, although they were correlated (.36). Cohesion had a moderate negative relationship with the chaotic scale, but a non-significant negative relationship with the rigid scale. In addition, flexibility showed a high negative correlation with disengaged, but a non-significant correlation with the enmeshed scale (Table 1).

### Convergent Validity of FACES-IV

Pearson correlations were performed to determine the validity of FACES-IV. The relationship between FACES-IV, FSS, FCS, and SSSS were analyzed (see Table 1). Strong correlations were found between most of FACES-IV scales and the validation scales FSS and FCS ( $p < .001$ ). The exceptions were the Enmeshed and Rigid scales, which showed non-significant correlations with the validation scales. Considering the SSSS, the subscale Satisfaction with Friendships showed only a significant positive correlation with Flexibility, and a negative correlation with the Chaotic scale. Intimacy showed significant positive correlations with the balanced scales and negative correlations with the unbalanced scales. Satisfaction with Family and Social Activities scales showed a similar trend, except the Enmeshed and Flexibility scales (n.s.). Finally, total Satisfaction with Social Support (SSSS) showed significant positive correlations with the balanced scales and negative correlations with the unbalanced scales. One last note on the correlations: although somehow the validation scales assess similar constructs (e.g. Satisfaction with Family from SSSS and Family Satisfaction Scale from FSS), the Social Activities scale of SSSS showed a low positive correlation with Family Satisfaction and a non-significant correlation with Family Communication Scale (FCS).

### Sociodemographic Differences

To study sociodemographic differences, a preliminary correlational analysis between these variables and FACES-IV scales and ratios were conducted. Contrary to Baiocco et al. (2012), a significant association with gender or age was not found. However, for marital status, a significant association with Family Communication, was found. In turn, interesting associations between FACES-IV scales (and ratios), education and income have been found. The multivariate analysis revealed significant effects for education (Wilks's Lambda = .906;  $F_{9,204} = 2.358$ ;  $p < .05$ ) and income (Wilks's Lambda = .876;  $F_{9,196} = 3.073$ ;  $p < .01$ ). Participants with less education showed significantly higher scores on Enmeshed and Chaotic scales, as well as a trend on the Rigid scale ( $p = .061$ ). On the other hand, family caregivers with more education reported significantly higher ratios (cohesion, flexibility and total). In turn, income differences showed that caregivers with lower income reported higher scores on Disengaged and Enmeshed scales, and a trend on the Chaotic scale ( $p = .085$ ). Conversely, caregivers with higher income showed significantly elevated ratios (cohesion, flexibility and total) (see Table 2).

### Discriminant Analysis of FACES-IV

A discriminant analysis (Burns and Burns 2008) was conducted to test the ability of FACES-IV scales to distinguish problematic and non-problematic families, considering the results of

**Table 2** Education and income differences (mean and SD reported) for FACES-IV scales and ratios

Scales	Education				Income			
	< High school [n = 134]	> High school [n = 80]	$F_{(1,212)}$	$p$	< 2 MW <sup>a</sup> [n = 60]	> 2 MW <sup>a</sup> [n = 146]	$F_{(1,204)}$	$p$
Cohesion	50.59 (23.33)	54.33 (22.35)	1.328	0.25	49.05 (21.91)	53.41 (23.20)	1.556	0.214
Flexibility	55.02 (16.04)	57.53 (16.83)	1.186	0.277	53.68 (17.49)	57.19 (15.76)	1.974	0.161
Disengaged	30.11 (12.63)	27.51 (13.68)	2.003	0.158	32.78 (14.34)	27.74 (11.83)	6.778	0.01
Enmeshed	36.01 (13.09)	31.16 (12.87)	6.961	0.009	39.16 (15.58)	32.31 (11.40)	12.262	0.001
Rigid	37.21 (12.62)	33.76 (13.58)	3.541	0.061	38.28 (11.21)	34.96 (13.56)	2.8	0.096
Chaotic	29.33 (12.89)	24.41 (8.68)	9.176	0.003	29.73 (13.89)	26.61 (10.76)	2.988	0.085
Cohesion Ratio	1.53 (.40)	1.68 (.43)	7.215	0.008	1.44 (.39)	1.64 (.41)	9.346	0.003
Flexibility Ratio	1.27 (.25)	1.41 (.31)	13.183	0	1.21 (.23)	1.37 (.28)	13.688	0
Total Ratio	1.40 (.29)	1.55 (.34)	11.176	0.001	1.33 (.28)	1.50 (.31)	13.179	0

N = 214

<sup>a</sup> Minimum Wages (around 950 Euros/month)

FCS and FSS. Following the methodology described by Olson (2011), the grouping for the discriminant analysis was performed based on the scores of each participant in the FCS and FSS (top vs. bottom 50 and 40 %, in each scale), two family assessment tools that were established above as valid measures. In both scales, highest scores correspond to a healthier family functioning and the percentage with better discriminant capacity for problematic versus non-problematic grouping, was tested. For example, if the results of a caregiver were in the top 50 % on the FCS and FSS (median values used for reference), they would be included in the ‘non-problematic’ group. Conversely, if a participant scored in the bottom 50 % on FCS and FSS, he/she would be included in the ‘problematic’ group. For the analysis considering the top (healthiest) and the bottom (most problematic) 40 %, regarding the validation scales, percentile 40 and 60 were used. The results of the discriminating model for the problematic and non-problematic clusters (Olson 2011) are presented for each of the six FACES-IV scales, for the six scales together as independent variables, for each of the Circumplex ratios, and finally for the validation scales. Table 3 demonstrates the predictive validity of the FACES-IV scales. The grouping methods that resulted in the highest ability of the scales to discriminate were the top versus bottom 40 % on FCS and FSS validation scales. However, comparing these two methods, the greatest percent accuracy in discriminating groups was found to be the top versus bottom 40 % on the FSS. With this method, the average percent accuracy for the FACES-IV scales was 65 % (range = 52–74 %), and when all six scales were used in the analysis, the correct placement was 78 % (average = 74 %; range = 70–78 %). Using the total ratio score with this method, the predictive accuracy was also higher than the other methods, i.e., 71 % (average = 68 %; range = 65–71 %). Finally, using the FCS validation scale, the correct placement was the highest as well, i.e., 85 %.

## Discussion

The purpose of this study was to analyse the psychometric properties of the Portuguese translated FACES-IV, in a sample of adult children caregivers with parental cancer.



**Table 3** Discriminant analysis of problematic and non-problematic families, according to the family communication scale and the family satisfaction scale (percent accuracy in discriminating groups reported)

Scale	Top versus Bottom 50 % on FCS <sup>c</sup>	Top versus Bottom 40 % on FCS <sup>c</sup>	Top versus Bottom 50 % on FSS <sup>b</sup>	Top versus Bottom 40 % on FSS <sup>b</sup>
N for each group	Top = 99 Bottom = 115	Top = 99 Bottom = 95	Top = 101 Bottom = 113	Top = 88 Bottom = 86
Unbalanced scales <sup>a</sup>				
Disengaged	66	69	66	74
Chaotic	65	62	65	69
Enmeshed	54	52	53	52
Rigid	57	53	53	54
Balanced scales <sup>a</sup>				
Cohesion	69	71	68	68
Flexibility	66	66	69	74
Six scales together <sup>a</sup>	70	74	75	78
Ratio scores <sup>a</sup>				
Cohesion ratio	69	66	70	70
Flexibility ratio	57	57	55	58
Total ratio	66	68	65	71
Validation scales				
FSS <sup>b</sup>	72	77	#	#
FCS <sup>c</sup>	#	#	75	85

N = 214

<sup>a</sup> FACES-IV = Family Adaptability and Cohesion Evaluation Scales<sup>b</sup> FSS = Family Satisfaction Scale<sup>c</sup> FCS = Family Communication Scale

Internal consistency was examined using Cronbach's alpha. For all of the scales, alpha coefficients were in the acceptable range (Nunnally 1978), above .70, except for the Enmeshed and Rigid scales. However, these scales showed lower alphas like in the original study (Enmeshed = .77, Rigid = .82), (Olson 2011) as well as in the Hungarian study (Enmeshed = .71, Rigid = .70) (Mirnics et al. 2010). In the Italian version, these two scales showed also low alphas (Enmeshed = .67, Rigid = .68) (Baiocco et al. 2012). In one study with parents of children with cancer (Marsac and Alderfer 2011), the Enmeshed scale showed a lower alpha in parents (.65 in both fathers and mothers), and the Rigid scale a low alpha of .70, in the mothers' sample. Thus, the present results suggest that, overall, internal consistency of FACES-IV is adequate to assess Portuguese families taking also in consideration the confirmatory factor analysis of Olson's theoretical model (six subscales).

Concerning the relationships among FACES-IV scales, the results of the present study confirm the balanced family functioning's construct, since Cohesion and Flexibility were highly correlated. These results are consistent with the original study of the scale (Olson 2011). As expected, cohesion (Disengaged and Enmeshed) and flexibility (Rigid and Chaotic) were not significantly correlated and a similar result was found for flexibility (Rigid and Chotic). These results seem to provide evidence for the construct validity of these unbalanced scales. As in previous reports (Baiocco et al. 2012; Mirnics et al. 2010), the Enmeshed and Rigid scales, in the present sample, seem to be the most problematic scales.

The convergent validity of the FACES-IV scales were examined by correlating them with other conceptually related measures, namely the Family Communication Scale, the Family Satisfaction Scale, and the Satisfaction with Social Support Scale. In fact, FACES scales designed to measure the balance ('healthy' areas) of cohesion and flexibility showed moderate to high positive correlations with the FCS and FSS; while scales designed to measure the low extreme of cohesion (Disengaged) and the high extreme of flexibility (Chaotic) had moderate to high negative correlations with the FCS and FSS. However, unlike the results with the FCS and FSS, some of the SSSS scales showed significant negative correlations with the higher extreme of cohesion (Enmeshed) and with the low extreme of flexibility (Rigid), namely the Intimacy and the Social Activities scales. In summary, the validity of the balanced Cohesion and Flexibility scales was highly supported, as well as the Disengaged and Chaotic unbalanced scales; but the two weaker scales were the Rigid and Enmeshed unbalances scales, such as in previous studies (Baiocco et al. 2012; Mirnics et al. 2010; Olson 2011).

Some reports with caregivers describe that higher income and education (Nijboer et al. 1998) are related to satisfaction with social support, and a relatively low socioeconomic status is related to a higher burden (Montgomery et al. 1985). Family provide support, hence is influenced by these two sociodemographic variables. The present results showed significant differences in FACES-IV considering education and income of caregivers. Generally, the results showed that in a parental cancer situation, adult children caregivers with lower educational levels, seem to have more problems in enmeshed and chaotic family systems. The opposite also appears to be true, since caregivers with greater education scored higher in all FACES-IV ratios. As described previously, this is representative of a higher balance in the system. Somehow, this results are in line with those of Mirnics et al. (2010), who also found that people with low education perceive less cohesion. The same trend was obtained regarding income, since adult children caregivers with lower income also showed more problematic family functioning in higher disengagement and higher enmeshment systems and showed lower FACES-IV ratios.

The last aim of the present study was to confirm data about the capacity of FACES-IV scales to discriminate problematic and non-problematic families. Similar to Olson (2011), no specific criteria to distinguish groups of families was available, so caregiver's scores on FCS and FSS were used. Discriminant analysis showed that the scales of the Portuguese version of FACES-IV, in a sample of adult children experiencing parental cancer, had predictive validity. These results are consistent with Olson's (2011), since the method of grouping problematic and non-problematic families, that resulted in a better discriminative capacity of scales, was the top versus bottom 40 % on the validation scales, particularly when using the FSS. Similar to Olson's data (Olson 2011), the scales that showed a poorer discriminative capacity were the Enmeshed and the Rigid (see Table 3). For this reason, they may not be so important for comparing groups in terms of Family Communication and Family Satisfaction. Thus, the results of the present study should be interpreted with caution, given the restrictive nature of the problematic and non-problematic grouping.

The present study shows, like previous ones (Baiocco et al. 2012; Mirnics et al. 2010), that the Olson's model has a cross-cultural applicability, and that FACES-IV may be a useful measure, in the Portuguese cultural context. However, it is important to stress some of the limitations and strengths of the results. The current study was cross-sectional and performed on a convenience sample of non-clinical participants, despite the clinical family context of oncology. Even though, generalization of the results to more diverse families is not advisable. Future cross-cultural comparisons should be performed on larger samples with inclusion of clinical groups, although the present sample size of adult children

caregivers was acceptable ( $N = 214$ ). Relating caregivers' scores on FACES-IV to the parental tumor site was not a concern of the present study. Albeit some studies examined the effects on family functioning of specific types of cancer or multiple types of cancer, the results across different types of cancer were similar regarding family interaction, roles, communication, and emotional support (Harden 2005; Hilton 1993; Navon and Morag 2003; Nijboer et al. 1999; Porter et al. 2005; Segrin et al. 2005).

As Olson (2011), and Marsac and Alderfer (2011) found, the present findings also suggest that the Enmeshed and Rigid scales of the FACES-IV were empirically weaker, needing further development and improvement. Finally, without a clearly identified clinical criterion, the groups created regarding problematic versus non-problematic family functioning were based on FCS and FSS. Further validation studies with other samples should be done in order to strengthen the predictive ability of FACES-IV and improve its application in future clinical work.

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