Empirical Research

Assessing psychological inflexibility in infertility: The development and validation study of the Psychological Inflexibility Scale – Infertility (PIS-I)

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ABSTRACT

Facing an infertility diagnosis and the demands of infertility medical treatment has been widely recognized as a psychologically distressing condition and psychological inflexibility may be a relevant construct to better understand mental health in this population. In this context, the current study aimed to develop a new self-report measure, the Psychological Inflexibility Scale – Infertility (PIS–I), and examine its factor structure and psychometric properties. Based on the Acceptance and Commitment Therapy (ACT) conceptual framework, literature review and clinical expertise in the infertility domain, an initial pool of 18 items was developed. An online survey was conducted with 287 women presenting an infertility diagnosis. Exploratory Factor Analysis revealed that a refined version of the PIS-I, encompassing 16 items, presented a single-component structure accounting for 58.92% of the variance. Psychometric analyses showed an excellent internal consistency and support for the PIS-I convergent, concurrent, and incremental validities was found. Overall, the PIS-I showed to be a context-specific reliable and valid measure of psychological inflexibility for people dealing with infertility, being useful for clinical and research purposes.

1. Introduction

The International Glossary on Infertility and Fertility Care defines infertility as "A disease characterized by the failure to establish a clinical pregnancy after 12 months of regular, unprotected sexual intercourse or due to an impairment of a person's capacity to reproduce either as an individual or with his/her partner." (Zegers-Hochschild et al., 2017, p. 401). This is a medical condition with an estimated prevalence of 9% (Boivin et al., 2007). More recent data suggest that one in eight women and one in ten men may present fertility problems (Datta et al., 2016).

Being confronted with difficulties in conceiving can be seen as a stressful condition, not only because it impends the accomplishment of a typically valued life goal, but also because people tend to experience a sense of loss of control (Cousineau & Domar, 2007). People seeking medical care for infertility face additional challenges, such as daily self-injections, medical exams, oocyte retrieval, and embryo transfer. Moreover, dealing with an infertility diagnosis and the demands associated with medical treatment may induce psychological difficulties that may vary from transitory negative emotional reactions to more severe forms of psychopathological symptoms (Verhaak et al., 2010). The

literature addressing the topic of psychopathology associated with infertility has provided mixed results. Some studies suggest the existence of higher prevalence of psychiatric disorders in people with an infertility diagnosis (e.g., Fallahzadeh et al., 2019; Haimovici et al., 2018; Joelsson et al., 2017; Pásztor et al., 2019; Volgsten et al., 2010). However, Greil (1997) and Eugster and Vingerhoets (1999) do not report such differences in psychopathological symptoms when comparing people facing infertility and comparison groups and Verhaak et al. (2007) mention only minor distinctions regarding emotional difficulties between women starting *in vitro* fertilization (IVF) and a control group. Nevertheless, and according to Verhaak et al. (2010), about 30% of people with infertility are at risk of developing clinically relevant symptoms of depression or anxiety.

Within the theoretical framework of contextual behavioral therapies, specifically in Acceptance and Commitment Therapy (ACT; Hayes et al., 1999) psychological inflexibility is at the core of psychological suffering. Psychological inflexibility can be conceptualized as a transdiagnostic mechanism (Levin et al., 2014) characterized by rigid efforts to control psychological reactions to unpleasant, unwanted or painful private experiences (e.g., thoughts, emotions, memories, bodily sensations,

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behavioral predispositions) (Harris, 2009). This mechanism comprises the unwillingness to stay in contact with aversive or unpleasant internal experiences, and actions to modify these experiences or what triggers them (Hayes & Smith, 2005). Thus, according to Tavakoli et al. (2019), engaging in psychological inflexibility corresponds to the tendency to avoid, control or minimize the experience of distressing private events and act in ways that are not in accordance to one's values. In the short term, psychological inflexibility may offer relief and act as a somewhat nonthreatening strategy for regulating emotional manifestation (Hayes et al., 1996; Kashdan et al., 2006). Nevertheless, when it becomes a rigid and inflexible pattern it may be seen as a maladaptive process, being associated with psychopathology and poor quality of life (e.g., Chawla & Ostafin, 2007; Lilly & Allen, 2015).

In an attempt to capture this construct within infertility, some examples will be specified. People facing fertility problems may experience negative self-referential thoughts related to their involuntarily childlessness, as well as feelings of sadness or anxiety. These thoughts and feelings may lead them to avoid situations with children, such as family or friends meetings. Subjects may also try to escape to these thoughts/feelings by attempting to suppress them. Using these strategies repeatedly will contribute to negatively reinforce the original thoughts and feelings and create a series of snowballing of negative affect and avoidance (Kanter et al., 2008). In fact, Cunha et al. (2016) found that when compared to fertile couples and couples pursuing adoption, people dealing with infertility showed higher scores in psychological inflexibility/experiential avoidance. Although this study provided data with the couple as the unit of analysis, a previous study also indicated that people with an infertility diagnosis presented lower levels of psychological flexibility when compared to people applying for adoption and people presumably fertile (with children) (Galhardo et al., 2011).

Several studies have addressed psychological inflexibility and its relationship with other mental health constructs (e.g., depression, anxiety, health quality, self-efficacy), either as a predictor, a mediator, or moderator in a varied range of health conditions such as chronic pain, inflammatory bowel disease, breast cancer, weight related problems (Costa & Pinto-Gouveia, 2011; Ferreira et al., 2016; González-Fernández et al., 2017; Lilly & Allen, 2015) and populations, for example, teachers, adolescents (Hinds et al., 2015; Mellick et al., 2017). Furthermore, Woodruff et al. (2014) found that psychological inflexibility was a stronger predictor of negative indicators of psychological health when compare to self-compassion and mindfulness. Specifically in people with infertility, (Galhardo et al., 2019a) found an indirect effect of the impact of infertility on several life areas on depressive symptoms that was mediated by experiential avoidance, suggesting that this construct should be considered in the assessment and psychological interventions targeting infertility.

The Acceptance and Action Questionnaire (AAQ-II; Bond et al., 2011) is the most commonly used self-report measure of psychological inflexibility, with numerous studies supporting its use (e.g., Fledderus et al., 2012; Gloster et al., 2017; Pennato et al., 2013). Nevertheless, the AAQ-II is a general measure and there has been a dissemination of several other domain-specific measures developed to assess psychological inflexibility associated with health conditions, such as chronic pain (McCracken et al., 2004), pain (Wicksell et al., 2008), smoking (Gifford et al., 2004), diabetes (Gregg et al., 2007), epilepsy (Lundgren et al., 2008), tinnitus (Westin et al., 2008), weight related problems (Lillis and Hayes, 2008), substance abuse (Luoma et al., 2010), and body image (Callaghan et al., 2015). Also, the assessment of psychological inflexibility has also been extended to other settings, such as work (Bond et al., 2012), teaching (Hinds et al., 2015) and university students (Levin et al., 2019). Overall, these context-specific measures have shown to be advantageous allowing to capture more detailed aspects of psychological inflexibility.

Given that psychological inflexibility is a regulatory strategy (Machell et al., 2015), with well-established adverse effects on mental health, the current study aimed to develop and test the factor structure and psychometric properties of a self-report instrument examining infertility-related psychological inflexibility, the Psychological Inflexibility Scale – Infertility (PIS–I). Additionally, the associations between the PIS-I scores and age, years of education, and infertility diagnosis duration were addressed. Differences in the PIS-I scores considering participants' marital status, infertility diagnosis (factor), and previous infertility medical treatment were explored.

2. Material and methods

2.1. Participants

The sample comprised 287 Portuguese women. Participants' age ranged from 25 to 50 years old with a mean age of 35.75 ($SD = 4.52$) years. The majority of participants were married or living with a partner ($n = 230$; 80.1%), followed by single ($n = 57$; 19.9%). Regarding years of education, participants presented a mean of 15.11 years ($SD = 3.04$). Participants had been diagnosed with infertility for approximately five years ($M = 4.97$; $SD = 4.25$). One hundred and twelve participants (39%) mentioned a female factor infertility, 64 (22.3%) a male factor, 51 (17.8%) both female and male factors and 60 (20.9%) stated that their infertility etiology was unknown. There was a higher number of participants who had previously undergone infertility treatments ($n = 235$; 81.9%) and 52 (18.1%) were pursuing medical treatment for the first time. One hundred and twenty-one (42.2%) women were waiting for medical treatment schedule, 75 (26.1%) were waiting for test or exams results, 41 (14.3%) were performing *in vitro* fertilization IVF, 34 (11.8%) were pursuing Intracytoplasmic Sperm Injection (ICSI), 12 (4.2%) were taking hormonal stimulation (not included in a IVF or ICSI protocol), and 4 (1.4%) were performing Intrauterine Insemination (IUI).

A sub-sample of 51 women participated in the second part of the study (6-weeks later to the first data collection). The mean age of these participants was 37.20 ($SD = 5.08$) years old. They were mainly married or living with a partner ($n = 32$; 62.7%), followed by single ($n = 19$; 37.3%). Concerning years of education, a mean of 16.18 years ($SD = 3.45$) was found. Participants had an infertility diagnosis for 6.16 ($SD = 4.47$) years. Twenty-three participants (45.1%) mentioned a female factor infertility, 9 (17.6%) a male factor, 9 (17.6%) both female and male factors and 10 (19.6%) mentioned unknown infertility. Forty-three women (84.3%) had previously undergone infertility treatments and 8 (15.7%) were pursuing medical treatment for the first time. Eighteen participants (35.3%) were waiting for test or exams results, 17 (33.3%) were waiting for medical treatment schedule, 8 (15.7%), were in an IVF protocol, and 6 (11.8%) were in an ICSI protocol.

2.2. Instruments

2.2.1. Acceptance and Action Questionnaire II (AAQ-II)

The AAQ-II (Bond et al., 2011; Portuguese version by Pinto-Gouveia et al., 2012) is a 7-item self-report instrument aimed to assess psychological inflexibility (e.g., "My painful experiences and memories make it difficult for me to live a life that I would value"). Respondents are asked to state the extent to which each statement is true to them using a 7-point Likert scale ranging from 1 "Never true" to 7 "Always true". Higher scores are indicative of greater psychological inflexibility. A Cronbach's alpha mean of .84 (distinct samples) was found in the original version. The Portuguese version of the AAQ-II showed a Cronbach's alpha value of .90. In this study the AAQ-II showed a Cronbach's alpha of .94 .

2.2.2. Fertility Problem Inventory (FPI)

The FPI (Newton et al., 1999; Portuguese version by (Moura-Ramos et al., 2012) is a 46-item self-report instrument assessing infertility-related stress (e.g. "I can't help comparing myself with friends who have children"). Participants are asked the extent to which they

agree or disagree with fertility-related concerns or beliefs, using a Likert-type scale, ranging from 0 "Strongly disagree" to 6 "Strongly agree". The FPI encompasses 5 subscales: "social concern", "sexual concern", "relationship concern", "rejection of childfree lifestyle" and "need for parenthood". The FPI and subscales showed good psychometric properties (Newton et al., 1999). Cronbach alpha value of the FPI total score in the current study was .91.

2.2.3. Infertility Self-efficacy Scale (ISE)

The ISE (Cousineau et al., 2006; Portuguese version by Galhardo et al., 2013a) is a 16-item self-report instrument assessing the perception of self-efficacy to deal with the demands of an infertility diagnosis and medical treatment. Participants are asked to indicate the degree to which they feel confident concerning tasks such as "Make meaning out of my infertility experience", and "Keep active with my usual life routine", rating their answers on a 9-point scale. The scale presented good internal reliability in the original (Cronbach's alpha of .94; Cousineau et al., 2006) and in the Portuguese version (Cronbach's alpha of .96; Galhardo et al., 2013a). In this study the ISE Cronbach alpha value was .95.

2.2.4. Depression, Anxiety and Stress Scales - 21 (DASS 21)

The DASS-21 (Lovibond & Lovibond, 1995; Portuguese version by Pais-Ribeiro, Honrado, & Leal, 2004) is a 21-item well-established measure addressing depression (e.g., "I felt I wasn't worth much"), anxiety (e.g., "I felt I was close to panic"), and stress (e.g., "I found myself agitated") symptoms. Items are answered on a 4-point scale ranging from 0 "Did not apply to me at all" to 3 "Applied to me very much, or most of the time" reporting the frequency of symptoms during the preceding week. The DASS-21 original version and the Portuguese version were indicative of good psychometric properties. The depression, anxiety, and stress subscales showed Cronbach alpha values of .94, .87, and .91 in the original version (Lovibond & Lovibond, 1995) and of .84, .80, and .87 in the Portuguese validation study (Pais-Ribeiro et al., 2004). In the current study, the Cronbach alpha values were .90 for the depression subscale, .87 for the anxiety subscale and .91 for the stress subscale.

2.3. Procedures

The study was previously approved by the Portuguese Fertility Association board (patients' association). All procedures were in accordance with the ethical standards of this institution and with the 1964 Helsinki declaration and its later amendments.

Participants were recruited through a post disseminated on the Portuguese Fertility Association social media and website. All participants were informed about the study aims and procedures and the anonymity and confidentiality of the data were assured. The study e-mail contact was provided for doubts or additional information. Informed consent was mandatory before completing online the set of self-report measures. Data collection took place from June to December 2018. Participants were asked whether they would be willing to complete one of the self-report measures (the PIS-I) 6-weeks after the first assessment and the ones who agreed to do so provided their email address.

2.4. Scale development

The PIS-I was developed aiming to assess psychological inflexibility in people facing fertility problems. A set of 18 items (Portuguese language) based on the Acceptance and Action Questionnaire (AAQ-II), several other specific versions of this self-report instrument (literature review) and clinical experience (ACT model and the infertility area) was developed. These items' content was related to the core problem processes derived from an ACT/RFT perspective and specifically linked to the experience of infertility: a) Cognitive fusion (e.g., When I start thinking about my infertility it is difficult to do anything else); b)

Experiential avoidance (e.g., I need to control my negative thoughts and feelings about infertility); c) Conceptualized self (e.g., Not being able to have children defines me as a person); d) Conceptualized past and future [e.g., I am invaded by thoughts and fantasies about the future (e.g., results of medical tests and treatments, whether or not I will be able to become a parent)]; e) Lack of values, confusion of goals with values (e. g., The infertility experience prevents me from getting involved with other important things in my life); f) Inability to commit with values driven actions [e.g., I often do not persist in doing things that could be important (e.g., being with friends, invest in the relationship with my partner)]. The response rate ranging from 1 "Never true" to 7 "Always true" was maintained and there were no reverse coded items.

This 18-items version was administered to a group of people with an infertility diagnosis who volunteered to complete the scale (people participating in the patients' association activities). It was asked them to comment on the items comprehensibility and on whether the items reflected their experience. These subjects agreed that the items' content was congruent with their infertility experience and only suggested minor changes of wording. The 18-items preliminary scale was then completed by the study participants and submitted to an exploratory factor analysis.

2.5. Statistical analyses

Data analyses were conducted using IBM SPSS Statistics 24 (IBM Corp, 2016). Items' descriptive statistics (means and standard deviations) and distributions (skewness and kurtosis) were calculated to examine items' psychometric properties. In order to identify the number of factors best describing the underlying pattern of correlations among the items an Exploratory Factor Analysis (EFA) was computed. The sample size ($N = 287$) was adequate to perform this analysis (DeVellis, 2016). The PIS-I internal consistency was assessed through Cronbach's alpha coefficients and item-total correlations. Alpha values superior to .70 denote good internal reliability and superior to .90 excellent reliability (Kline, 2000). Pearson product-moment correlations were computed to explore associations between the PIS-I and measures of other pertinent constructs. According to Cohen et al. (2003) the effect sizes may be: small ($r = 0.10$ to .29), moderate ($r = 0.30$ to .49), large ($r = 0.50$ to .69), very large ($r = 0.70$ to .89), nearly perfect ($r \geq .90$), and perfect ($r = 1$). To address the PIS-I incremental validity, partial correlations were calculated controlling for the related construct of psychological inflexibility (AAQ-II). These analyses examined whether the PIS-I accounts for significant variance in the other related variables after controlling for the effects of a closely connected construct. In addition, hierarchical regression analyses were conducted considering infertility-related mental health outcomes (infertility-related stress and infertility self-efficacy) and general mental health outcomes (depression, anxiety and stress symptoms) as dependent variables. The AAQ-II was entered in the first step and the PIS-I in the second step. Independent samples t tests were used to explore mean differences between married/living with a partner participants and participants who were single and between participants who had undergone infertility medical treatment and those who were pursuing medical treatment for the first time. In order to compare the PIS-I mean scores considering the different infertility diagnosis, one-way ANOVAs were examined. Test-retest reliability was analyzed through dependent samples t-tests and Pearson product-moment correlations in a subsample of participants ($n = 51$) after a 6-week period.

3. Results

3.1. Dimensionality of the PIS-I

3.1.1. Preliminary data analyses

Univariate and multivariate normality values were analyzed and there was no significant bias to normal distribution (Sk < |3| and Ku < |

10|; (Kline, 2005). Skewness values ranged from −0.38 to 1.00 and kurtosis values ranged from −1.48 to .11. The adequacy of the data to conduct an EFA was confirmed given the results of the Kaiser-Meyer-Olkin test (KMO = 0.94) and the Bartlett's sphericity test ($\chi^2_{(153)}$ = 3542.74; $p < .001$).

3.1.2. Item reliability analysis

Means, standards deviations, item-total correlations and Cronbach alpha if item deleted for the 18 PIS-I items were analyzed in the 287 participants (Table 1).

Item-total correlations ranged from −0.16 (item 3) to .84 (item 14). Inter-items correlation mean was .44. Cronbach coefficient alpha would increase from .94 to .95 with the exclusion of item 3.

Table 1

Means (M), standard deviations (SD), item-total correlations and Cronbach alpha if item deleted of the PIS-I 18 items (N = 287).

Items	M	SD	r (item–total)	α if item deleted
1. I tend to do things in an automatic way without being aware of what I am doing.	3.14	1.45	.18	.94
2. There are no other meaningful things besides my infertility problem.	2.50	1.67	.61	.94
3. When thoughts or feelings arise (e.g. anxiety, sadness) about infertility I try to get rid of them, for example by trying not to think or distracting myself.	4.56	1.60	-.16	.95
4. I feel that I am not the person I would like to be due to my fertility problem.	4.41	1.91	.74	.93
5. Not being able to have children defines me as person.	3.15	2.05	.67	.93
6. I spend a lot of time thinking/analyzing the reasons and consequences of my infertility.	4.18	1.93	.74	.93
7. I need to control my negative thoughts and feelings about infertility.	4.59	1.83	.75	.93
8. It is hard for me to stop doing things even when they are not useful/effective (e.g., searching for infertility information on the Internet).	4.26	1.95	.62	.94
9. I am invaded by thoughts and fantasies about the future (e.g., results of medical tests and treatments, whether or not I will be able to become a parent).	4.85	1.78	.66	.94
10. I often do not persist in doing things that could be important (e.g., being with friends, invest in the relationship with my partner).	3.41	1.87	.74	.93
11. I avoid situations that remind me of my infertility condition (e.g., family meetings, visiting friends with young children, etc.).	3.53	2.18	.64	.94
12. I see myself as different/inferior because I cannot have children.	3.58	2.19	.77	.93
13. Infertility has made me move away or deviate from things that are important in my life.	3.50	2.04	.80	.93
14. I get caught up in my thoughts and feelings about the infertility experience and this is very painful.	4.17	2.07	.84	.93
15. When I start thinking about my infertility it is difficult to do anything else	3.68	2.01	.83	.93
16. I find myself thinking about things from my past that may have influenced this situation of infertility.	3.77	2.28	.65	.94
17. The infertility experience prevents me from getting involved with other important things in my life.	3.41	2.08	.78	.93
18. I feel that I am an incomplete person due to this fertility problem.	4.57	2.14	.76	.93

3.1.3. Exploratory factor analysis and reliability

An EFA was conducted and a two-factor solution was obtained explaining 60.36% of the total variance, with factor 1 explaining 52.73% and factor 2 explaining 7.63% of the variance. The analysis of the items' factor loadings showed that the second factor comprised only two items (item 1 and item 3). Considering that two items are not enough for an independent factor, the EFA was repeated forcing a one-factor solution. This solution explained 52.73% of the variance. Items 1 and 3 presented low factor loading (.19 for item 1 and −0.18 for item 3). These items were also the ones presenting the lowest item-total correlations and the removal of item 3 would improve the scale reliability from .94 to .95 (Table 1). Based on these criteria, item 1 and 3 were removed and a new EFA was conducted. A one-factor solution for the 16 items explained 58.92% of the total variance. Factor loadings and communalities are presented in Table 2.

The examination of the factor loadings indicated that these ranged from .64 (item 2 – "There are no other meaningful things in my life besides my infertility problem") to .87 (item 17 - "The infertility experience prevents me from getting involved with other important things in my life"). All items presented communalities above .40.

3.1.4. PIS-I measure scoring and internal consistency

The final PIS-I version encompassed 16 items written in a way that higher scores are indicative of greater infertility-related psychological inflexibility. The total score is computed by summing all the items' answers. In the current sample scores ranged from 16 to 112 (which is also the range in possible scores), with a mean score of 61.56 (*SD* = 24.51). The PIS-I showed an excellent internal consistency with a Cronbach alpha of .95.

Table 2

Factor loadings and communalities (h^2) of the PIS-I items (16 items).

Items	Factor loading	h^2
2. There are no other meaningful things besides my infertility problem.	.64	.41
4. I feel that I am not the person I would like to be due to my fertility problem.	.79	.63
5. Not being able to have children defines me as person.	.73	.53
6. I spend a lot of time thinking/analyzing the reasons and consequences of my infertility.	.79	.62
7. I need to control my negative thoughts and feelings about infertility.	.78	.60
8. It is hard for me to stop doing things even when they are not useful/effective (e.g., searching for infertility information on the Internet).	.67	.44
9. I am invaded by thoughts and fantasies about the future (e.g., results of medical tests and treatments, whether or not I will be able to become a parent).	.70	.48
10. I often do not persist in doing things that could be important (e.g., being with friends, invest in the relationship with my partner).	.77	.59
11. I avoid situations that remind me of my infertility condition (e.g., family meetings, visiting friends with young children, etc.).	.72	.52
12. I see myself as different/inferior because I cannot have children.	.83	.69
13. Infertility has made me move away or deviate from things that are important in my life.	.85	.73
14. I get caught up in my thoughts and feelings about the infertility experience and this is very painful.	.87	.76
15. When I start thinking about my infertility it is difficult to do anything else	.86	.74
16. I find myself thinking about things from my past that may have influenced this situation of infertility.	.70	.49
17. The infertility experience prevents me from getting involved with other important things in my life.	.82	.67
18. I feel that I am an incomplete person due to this fertility problem.	.81	.66

3.1.5. PIS-I relationship with other measures

Results concerning the PIS-I relationship with other measures are presented in Table 3. Criterion validity was assessed by calculating correlation coefficients between the PIS-I and AAQ-II and a significant positive large association was found. Concurrent validity was assessed by testing the associations between the PIS-I and depressive symptoms, anxiety symptoms, stress symptoms, infertility-related stress and self-efficacy to deal with infertility. Significant positive moderate to large correlations were found between the PIS-I and depressive, anxiety and stress symptoms. A positive large correlation was found between the PIS-I and infertility related stress as measured by the Fertility Problem Inventory (FPI). A moderate negative correlation was found between the PIS-I and Infertility Self-efficacy (ISE).

Incremental validity was tested through the computation of partial correlations, controlling for the AAQ-II. When controlling for the AAQ-II, correlations were small or moderate, suggesting that the PIS-I accounts for important variance in several measures after accounting for the related construct of general psychological inflexibility (Table 3). Additionally, hierarchical regression models were used to test the incremental validity of the PIS-I in predicting infertility-related mental health outcomes and more general mental health outcomes (Table 4). Regarding infertility related mental health outcomes, in the first step the AAQ-II predicted infertility-related stress (FPI) and infertility self-efficacy (ISE) with R^2 values of .41 and .19, respectively. In the second step the PIS-I significantly predicted these dependent variables above and beyond the AAQ-II with increases in R^2 values of .14 ($p <$ .001) and .03 ($p = $ .001). When considering general mental health outcomes, in the first step the AAQ-II acted as a significant predictor with an R^2 value of .38 for depressive symptoms, of .24 for anxiety symptoms and of .30 for stress symptoms. In the second step, the PIS-I also significantly predicted with increases in R^2 values of .10 ($p <$ .001) for depressive symptoms, of .01 ($p = $ .005) for anxiety symptoms and of .04 ($p <$ .001) for stress symptoms.

3.1.6. Test retest reliability

Test retest reliability with a 6-week interval was calculated in a subsample of 51 participants. Dependent samples t-tests showed that there were no significant differences between the scores of the two assessment moments ($t_{(50)} = 0.36$; $p = .722$). As a further analysis of test-retest reliability, Pearson correlations were conducted, and a moderate correlation was found ($r = 0.48$; $p < .001$).

3.1.7. Data concerning age, marital status, years of education, infertility diagnosis duration, infertility diagnosis (factor), and previous infertility medical treatment

There were no significant associations between the PIS-I and age, years of education, or duration of the infertility diagnosis ($p > .050$). Furthermore, no significant differences were found in the PIS-I mean scores when considering participants marital status ($t_{(285)} = -1.27$; $p = $ .205) or infertility diagnosis (female, male, female and male, unknown) ($F_{(3, 283)} = 1.18$; $p = .319$). A similar pattern was found concerning

Table 3

Zero-order and partial correlations between the Psychological Inflexibility Scale – Infertility (PIS–I) and other variables (N = 287).

	PIS-I	Partial correlations (controlling for AAQ-II)
AAQ-II	.69**	–
DASS-21 Depression	.65**	.39**
DASS-21 Anxiety	.44**	.17**
DASS-21 Stress	.53**	.24**
FPI	.71**	.48**
ISE	-.43**	-.20**

Note. AAQ-II = Acceptance and Action Questionnaire; DASS-21 Depression = DASS depression subscale; DASS-21 Anxiety = DASS anxiety subscale; DASS-21 Stress = DASS stress subscale; FPI = Fertility Problem Inventory; ISE = Infertility Self-efficacy Scale; **$p < .001$.

Table 4

Hierarchical regression results testing the incremental validity of the PIS-I over the AAQ-II in predicting infertility-related mental health outcomes (infertility-related stress and infertility self-efficacy) and general mental health outcomes (depression, anxiety and stress symptoms).

Outcome	Step	AAQ-II ß	PIS-I ß	Adjusted R^2
FPI	1	.64**		.41**
	2	.29**	.51**	.55**
ISE	1	-.44**		.19**
	2	-.27**	-.24**	.22**
DASS-21 Depression	1	.62**		.38**
	2	.33**	.42**	.48**
DASS-21 Anxiety	1	.49**		.24**
	2	.35**	.20**	.25**
DASS-21 Stress	1	.55**		.30**
	2	.36**	.28**	.34**

FPI = Fertility Problem Inventory; ISE = Infertility Self-efficacy Scale; DASS-21 Depression = DASS depression subscale; DASS-21 Anxiety = DASS anxiety subscale; DASS-21 Stress = DASS stress subscale; **$p < .001$.

having undergone previous medical treatments for infertility or being pursuing treatment for the first time, no differences were found between these two groups of participants regarding the PIS-I mean scores ($t_{(285)} = 0.84$; $p = .403$).

4. Discussion

An extensive body of literature has pointed to psychological inflexibility as a core transdiagnostic mechanism involved in the development and maintenance of a wide range of psychological difficulties (Levin et al., 2014; Masuda et al., 2014). Therefore, there has been a growing interest in research regarding its measurement.

Despite advances in psychological inflexibility assessment, with a dissemination of several context-related measures, to our knowledge, there is no measure targeting infertility-related psychological inflexibility. Ong et al. (2019) suggest that whenever there is a context-specific validated measure of psychological inflexibility, it should be used either by itself or along with another psychological inflexibility general measure and this was not viable for infertility. Thus, the current study sought out to develop and examine the psychometric properties of a new measure of psychological inflexibility designed for people with infertility (PIS–I), with potential applicability in clinical and research settings.

The PIS-I items were generated based on the AAQ-II, other psychological inflexibility specific self-report instruments and clinical experience using the ACT model within the infertility field. Moreover, the key constructs of cognitive fusion, experiential avoidance, conceptualized self, conceptualized past and future, lack of values clarification, and inability to commit with values driven actions were considered in a way that they would represent common infertility experiences. The PIS-I items were framed in relation to distinctive aspects of the infertility experience (e.g., avoidance of infertility reminders, thoughts and fantasies about medical treatment results) and tried to include pertinent manifestations of psychological inflexibility that would be easily identified by the majority of people dealing with this medical condition. Based on psychometric analyses the preliminary version of the PIS-I, encompassing 18 items, was refined to a 16-item, single-factor structure showing excellent internal consistency and satisfactory test-retest reliability.

Exploratory factor analysis of the PIS-I denoted that a one-factor solution was more appropriate. Several domain-specific AAQ variants also showed a single factor structure or a two-factor structure. For example, the Acceptance and Action Questionnaire – Substance Abuse (Luoma et al., 2010) found a defused acceptance factor and a values commitment factor, and the Psychological Inflexibility in Pain Scale (Wicksell et al., 2008) indicated an avoidance of pain factor and a cognitive fusion with pain factor. Nevertheless, there are also other

measures that showed a single-factor solution, such as the Acceptance and Action Questionnaire for Weight-Related Difficulties (Lillis and Hayes, 2008) or the Body Image Psychological Inflexibility Scale (Callaghan et al., 2015), among others. One may hypothesize that these differences in factor structure may be related to (1) the existence of positive and negatively worded items, (2) a more broad approach of psychological inflexibility (with items illustrating the several core processes), (3) a more focused approach (with items targeting particular aspects, such as avoidance or cognitive fusion). Nevertheless, the PIS-I factor structure should be tested through confirmatory factor analysis in future studies.

Results showing a large correlation between the PIS-I and a similar construct measure (AAQ-II) provided evidence for its convergent validity. Our findings are also in accordance to what has been consistently reported, specifically the existence of strong associations between psychological inflexibility and measures of psychological difficulties (e.g., depression, anxiety, stress) and negative associations with measures of psychological health (e.g., Bond et al., 2011; Hayes et al., 2006). Nevertheless, it is worth noting that previous studies have raised concerns about the AAQ-II discriminant validity (e.g., Tyndall et al., 2019; Rochefort et al., 2018; Wolgast, 2014), suggesting that more than a measure of experiential avoidance it may capture psychological distress. Although experiential avoidance and psychological distress may to some extent overlap, the PIS-I items were intended to address, not only the unwillingness to stay in contact with infertility-related aversive private events, but also cognitive strategies and behaviors.

Furthermore, incremental validity, defined by Hunsley (2003, p. 443) as the "extent to which a measure adds to the prediction of a criterion beyond what can be predicted with other data", for the PIS-I was found for predicting infertility-related mental health outcomes as well as more general mental health outcomes. Partial correlations results and regressions results indicated that the PIS-I assesses a similar psychological inflexibility process while accounting for more variance generally.

Findings demonstrated that this new measure was not associated with demographic (age, years of education) or clinical variables (infertility duration) and scores did not differ in terms of marital status, infertility causes or previous medical treatment. Overall, this suggests that it may be a measure able to capture infertility-related psychological inflexibility regardless of these demographic and clinical characteristics. These findings also corroborate the hypothesis that psychological inflexibility unfolds in regard to particular thoughts, emotions or behaviors, in specific contexts and time periods, rather than in regard to demographic or clinical features.

Although the current sample size was adequate to perform the analyses, it only encompassed female participants. Though the study was designed to include men, their participation was very low and, consequently, they were not included. In fact, it has been acknowledged that men are less likely to participate in surveys in general, and in particular in reproductive studies, with Slauson-Blevins and Johnson (2016) stating that the strongest explanation is that both women and men tend to perceive "reproduction as women's domain". Future research should be conducted in larger samples with a balanced representation of women and men in order to examine the PIS-I model measurement and structural invariance. For this purpose, a multi-actor study design may be adequate, enhancing the probability of male partners' participation.

The recruitment process (online survey) has also some limitations, such as sampling bias, self-selection concerns, or under-representation of the population (e.g., recruitment of participants accessing online platforms), and consequently restricts the possibility of making generalizations (Wright, 2005). Furthermore, the study was disseminated through a patients' association, limiting the inclusion of people with infertility problems who do not seek medical treatment. Additionally, given that the study was conducted in the Portuguese population, future studies should analyze the PIS-I in different populations and languages (e.g., English).

Future research should study the PIS-I sensitivity to therapeutic change in ACT and related interventions for psychological consequences of infertility. In fact, previous studies have found that ACT (Peterson & Eifert, 2011; Peterson et al., 2009) and the Mindfulness Based Program for Infertility (MBPI; Galhardo, Cunha, & Pinto-Gouveia, 2013b, 2019), which also addresses ACT components, have shown to be effective for people experiencing infertility. Also, Schumachera et al. (2019) state that domain-specific psychological flexibility measures may be more sensitive to change in psychological processes underlying treatment and therefore better measures for studying mechanisms of change in treatment trials. Moreover, and from a clinical perspective, therapists can use the PIS-I items' answers as a starting point to examine more in-depth the patient's specific aspects. The PIS-I can also be used in different time points of the therapeutic process and provide the therapist an indicator of clinical improvements and of adjustments that may be adequate or competencies that need further development.

5. Conclusions

The PIS-I is a new, context-specific measure of psychological inflexibility targeting people facing fertility problems that proved to be a short, reliable and valid measure. The PIS-I may be seen as an important contribution for clinical work (e.g., initial assessment, intervention planning and assessment of clinical changes). Moreover, the PIS-I may be used as a screening tool, identifying people with infertility that may present higher vulnerability for developing emotional difficulties and, therefore, act in a preventive way. It can also be useful in research settings, for example, in studies aiming to better understand the role of infertility-related psychological inflexibility in psychological adjustment or in efficacy studies of ACT interventions for this population.

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