RESEARCH ARTICLE

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Psychometric properties of vaginal penetration cognition questionnaire (VPCQ) in Iranian women with sexual pain disorders

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Abstract

Aim: The aim of this study was to investigate the psychometric properties of the Persian version of the Vaginal Penetration Cognition Questionnaire (VPCQ).

Design: Cross-sectional study.

Methods: This research was conducted in two phases from June 2019 to February 2020. Phase I: The World Health Organization Protocol of forward–backward translation and an expert panel in order to determine face and content validity. Phase II: Survey development with 352 eligible women with sexual pain disorders, construct validity, internal consistency and construct reliability were evaluated.

Results: The exploratory factor analysis showed that the Persian version of VPCQ has three factors that explained 53.94% of the total variance. Confirmatory factor analysis also confirmed the fit of the three-factor model. Convergent and divergent validity were confirmed for all factors. The average measure ICC was 0.99 (95% CI 0.98 to 0.99). The absolute reliability with estimated *SEM* of 2.67 and MDC% of 28% approved the reliability of the questionnaire.

KEYWORDS
cognition, dyspareunia, female sexual pain disorders, genito-pelvic pain/penetration disorder, psychometrics, vaginismus

1 | INTRODUCTION

Vaginismus and dyspareunia are both considered as sexual pain disorders (De Kruiff et al., 2000). Vaginismus is a type of sexual dysfunction that prevents sexual intercourse by involuntary and repeated muscles spasms of one-third of the outer part of the vagina (Fadul et al., 2019). As well, dyspareunia is a persistent or recurrent genital pain that occurs before, during, or after sexual intercourse and is more common in women than men (Graziottin, 2001). According to the American Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-V), vaginismus, along with dyspareunia, are categorized in Genito-Pelvic Pain/Penetration Disorder (GPPPD). It is

defined as persistent or recurrent problems with one or more of the following cases including: inability to perform vaginal penetration during sexual intercourse, pelvic or vulvovaginal pain during intercourse, fear or anxiety during vaginal penetration, and pelvic floor muscle contraction during vaginal penetration attempt (APA.,2013; Binik, 2010).

The results of a study showed that painful intercourse was the second most common disorder in Iranian women aged 20–60 years with a prevalence of 26.7 per cent (Safarinejad, 2006). In another study, 33% of Iranian women reported experiencing pain or fear during intercourse, while this frequency decreased to 16% after using Binik's GPPPD diagnosis threshold (Alizadeh et al., 2019). Various physical, psychological, social and cultural factors are involved in the occurrence of these disorders, so these disorders are considered multidimensional (Bokaie et al., 2017).

The existing cognitive-behavioural approach in sexual pain disorders suggests that incompatible conditions such as misconceptions are the basis of fear response to vaginal penetration (Leiblum, 2000). In patients with vaginismus, there is often a type of avoidant phobia, fear and pain experience with involuntary muscle contraction. This kind of phobia occurs before vaginismus and subsequently leads to unconsummated marriage (Lahaie et al., 2015). These women may consciously want to have sex, but they may unconsciously prevent it (Naseri et al., 2015). Therefore, following the vaginal penetration attempt, which is accompanied by pelvic floor muscle contraction or increased muscle tone, there may be negative cognition and expectations about vaginal penetration (Kuile et al., 2010; Reissing et al., 2004). In dyspareunia, it is assumed that recognizing catastrophic pain (i.e. penetration will always cause pain, this pain will be unbearable) leads to vaginal dryness or increased pelvic floor muscle tone; It subsequently causes friction between the penis and the vulvar skin and eventually exacerbates the pain during intercourse (Rowen & Goldstein, 2018). Like other conservative societies, in Iran also, GPPPD is considered as a woman's failure in the sexual intercourse (Alizadeh et al., 2019). Therefore, more attention has been paid to women with sexual pain disorders in recent years. Moreover, attention is focused from the behavioural aspect of vaginal penetration to the cognitive and emotional factors involved in the processing of sexual stimuli (Klaassen & Ter Kuile, 2009).

Regardless of the important role of cognitive factors in current psychological patterns and treatment approaches in women with vaginismus and dyspareunia, there is no existing tool to assess thoughts and feelings associated with the vaginal penetration considering the effectiveness of these interventions. Vaginismus diagnostic questionnaire was designed and evaluated by Reisy et al. (2015) in Iran. It was used to differentiate vaginismus from dyspareunia, but did not assess the cognitive aspect of these disorders (Reisy et al., 2015). Klaassen and Ter Kuile designed a vaginal penetration cognition questionnaire (VPCQ) to assess the thoughts and feelings of women with vaginismus and dyspareunia regarding vaginal penetration in 2009; the 22-item questionnaire consists of five subscales including control cognitions, catastrophic and pain cognitions,

self-image cognitions, positive cognitions and genital incompatibility cognitions that was designed based on Netherlands women's culture (Klaassen & Ter Kuile, 2009). This questionnaire has been evaluated psychometrically only once in Turkey (Dogan et al., 2015) and no information is available on the reliability and validity of this questionnaire in other languages.

Since having a valid and reliable tool is the most important stage in designing studies, it seems that the vaginal penetration cognition questionnaire has the potential to be used as a suitable tool to measure the cognition of women with vaginismus and dyspareunia. Thus, considering the taboo nature of sexual problems in most societies, especially in Iranian society, due to cultural, religious and social issues and the lack of such a tool in Iranian texts, it seems necessary to translate and adapt such beneficial tools, interculturally. Since the validity and reliability of this questionnaire have not been done in Iran so far, the present study was conducted with the aim of localizing the VPCQ in 2019–2020.

2 | METHODS

2.1 | Study population

This cross sectional study was conducted between June 2019 and February 2020. All women who were recruited to sexual health clinics affiliated to Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Inclusion criteria considered as follows: 1) Iranian women aged 50–18 years old; 2) ability to read and write; 3) having at least 6 months of sexual activity or attempting to have sexual activity; and 4) definitive diagnosis of primary vaginismus or dyspareunia by a specialist. Pregnancy, breastfeeding and menopause; suffering from acute and chronic diseases according to the patient`s statement; spousal sexual disorders, and experiencing an unfortunate event or mental problems over the past two weeks were considered as the exclusion criteria.

2.2 | Ethical considerations

The present study was approved by the Ethics Committee Shahid Beheshti University of Medical Sciences, Tehran, Iran (IR.SBMU. RETECH.REC.1399.120). The purpose of this study was explained to the participants, and they were ensured of the confidentiality of their data. For this purpose, the questionnaires were provided to the participants anonymously and in coded form. Also they signed a written consent form without any force, threats or seduction.

2.3 | Main outcome measures

Data were collected using a Sociodemographic Information and VPCQ—brief self-report.

2.3.1 | Sociodemographic information

All participants responded to the checklist of demographic and mid-wifery characteristics (such as age, level of education, length of marriage and marriage pattern, etc.).

2.3.2 | VPCQ—brief self-report

In order to collect the data, vaginal penetration cognition questionnaire which was based on Netherlands women's culture and designed by Klaassen and et al, was used. The original version had 40 items and decreased to 22 items after initial validity and reliability in 2009. This questionnaire is used to examine the thoughts and feelings of women with vaginismus and dyspareunia. The Likert range of answering these items ranges from 0 (never) to 6 (always). This questionnaire measures five aspects of vaginal penetration cognition which consists of control cognitions (4 items), catastrophic and pain cognitions (5 items), self-image cognitions (6 items), positive cognitions (5 items), and genital incompatibility cognitions. (2 items). Only items of the "control cognitions" subscale have a reverse score, so higher scores show higher levels of perceived penetration control (Klaassen & Ter Kuile, 2009).

2.4 | Linguistic Validation

Translation and intercultural adaptation of the original English version of VPCQ to the Persian version was done using the World Health Organization's standard protocol (WHO, 2014). The goal of linguistic validation was to create a Persian version of the VPCQ that was conceptually similar to the English version and made it possible to collect and analyse information through the country. Linguistic validation was performed in the following three steps:

2.4.1 | Step 1: Forward and expert panel back-translation

First, the permission to translate the original version of the VPCQ was obtained from the developer, and then the English version was translated into Persian by two researchers whose mother language was Persian and had sufficient proficiency in English and specialized medical terms. Then, the Persian version was reviewed and each item was examined in terms of its relevance to the English version. Finally, a Persian version of this questionnaire was prepared by taking into account the comments and proposed options for the word equivalence. Then, the obtained Persian version was translated into English by two different professional translators who were master in English and Persian languages (different from the two primary translators) and no information of English version of the questionnaire. After reviewing and comparing the two English translated versions, the required corrections were made and the final English version

was obtained. Finally, the English version was sent to the developer of the questionnaire, and the rest of the translation and cultural adaptation steps were performed after her approval.

2.4.2 | Step 2: Pre-testing and cognitive interviewing

The final Persian version was evaluated by 10 experts, in terms of the relevance of each item into its English version. Also, it was completed by 20 women with wide range of educational level who were referred to a sexual health clinic in Tehran, Iran to examine the questionnaire in terms of its clarity, intelligibility, appropriateness and cultural relevance. Face-to-face interviews were conducted with the participants to find out any problems in understanding and interpreting the items of questionnaire.

2.4.3 | Step 3: Final version

The final Persian version of the VPCQ was completed by 352 participants to ensure translation compatibility, use of the Persian version questionnaire in Iran, and cultural comparison between the versions.

2.5 | Psychometric evaluation

2.5.1 | Face and content validity evaluation

In order to assess the face validity, VPCQ were delivered to the 20 women who were referred to the sexual health clinics and were asked to commented on appropriateness, clarity and potential ambiguity of the items explored, and logical sequence of items to achieve the qualitative face validity assessment. The group's comments were included in the final version. Impact score was used for quantitative face validity assessment which examines the items of this questionnaire in the 5-point Likert: 1 (Not important) to 5 (Completely important). If the impact score of the item was greater than 1.5, the item was considered as suitable and it was maintained in the questionnaire (Nia et al., 2014). The content validity of VPCQ was evaluated both qualitatively and quantitatively. Twenty experts (including 4 gynaecologists, 10 reproductive health specialists, 4 psychologists and 2 sex therapists) were asked to assess the wording, item allocation and scaling of the items in evaluating the qualitative content validity. Then the VPCQ revised based on their comments (Colton & Covert, 2007). Content validity ratio (CVR) and content validity index (CVI) were used to assess the essentiality and relevance of the items, respectively, in quantitative content validity assessment. CVR of each item was calculated using the following formula: $CVR = (Ne – N/2) / (N / 2)$, where Ne was the number of experts who considered the intended item essential and N was the total number of experts. To evaluate these two indexes, the VPCQ was again given to the same twenty experts. The minimum acceptable CVR is 0.42 when the number of experts is 20 (Lawshe, 1975). The same experts were also asked to rate

each item in term of relevance in four-point scale (1: "Irrelevant"; 2: "Somewhat relevant"; 3: "Relatively relevant"; and 4: "Completely relevant"). Then, the CVI of each item (i.e. I-CVI) was calculated through dividing the number of experts who rated that item 3 or 4 by the total number of experts. In this study, Modified Kappa Statistic (K*) was used to calculate I-CVI. In fact, K* is an index that provides an agreement between evaluators on the relevancy of an item and does not calculate an irrelevancy agreement (Ebadi et al., 2017).

2.5.2 | Construct validity evaluation

The construct validity of the VPCQ was evaluated using factor analysis. Sample size for factor analysis was estimated using rule of thumb (MacCallum et al., 1999). Therefore, 352 eligible women (176 samples for exploratory factor analysis (EFA) and 176 samples for confirmatory factor analysis (CFA)) were selected. Participants recruited from sexual health clinics affiliated to Shahid Beheshti University of Medical Sciences, Tehran, Iran. EFA was performed using maximum-likelihood method and Promax rotation. The appropriateness of the sample size was assessed using Kaiser–Meyer–Olkin (KMO) and Bartlett tests. The KMO rate of 0.7–0.8 and 0.8–0.9 was interpreted as good and excellent, respectively (Nia et al., 2014). The presence of an item was determined to be approximately 0.3 based on the formula (CV =5.152 / √ (n - 2)). CV refers to the extracted factors and n is the sample size of the study (Fok, 2011). According to the three-indicator rule, there must be at least three items for each factor, and the number of extracted latent factors was estimated using parallel analysis (Munro, 2005). Items with communalities less than 0.2 were excluded from EFA (Samitsch, 2014). After EFA, first-order of CFA was performed using maximum-likelihood method and the most common goodness of fit indices was evaluated in structural equation model. Parsimonious Normed Fit Index (PNFI) >0.5, Parsimonious Comparative Fit Index (PCFI) >0.5, Adjusted Goodness of Fit Index (AGFI) >0.5, Comparative of Fit Index (CFI) >0.9, Incremental Fit Index (IFI) >0.9 and Root Mean Square Error of Approximation (RMSEA) <0.08 were acceptable. Moreover, Minimum Discrepancy Function divided by Degrees of Freedom (CMIN/DF) is acceptable when it is less than 3 (Pahlevan Sharif & Sharif Nia, 2018). Then, the second order CFA was performed with the assumption that the latent extracted factors in the first-order analysis reflected another level of the relevant concept and could show a broader concept at a higher level (Gatignon, 2003).

2.5.3 | Convergent and discriminant validity evaluation

The convergent and discriminant validity of the VPCQ is calculated through the Fornell and Larcker approach using average variance extracted (AVE) and maximum shared squared variance (MSV). Convergent validity is when the items of the questionnaire have high correlation with each other and represent their construct. Also,

there is discriminant validity if the extracted factors are separate from each other (Fornell & Larcker, 1981). To establish a convergent validity, the AVE must be greater than 0.5, and to confirm the discriminant validity, the MSV must be less than the AVE (Ahadzadeh et al., 2015; Hair, Black, Babin, & Anderson, 2013).

2.6 | Reliability evaluation

Internal consistency of VPCQ was evaluated using AIC (Average inter-item correlation), Cronbach's alpha (α), Omega McDonald (ω) and maximum reliability (MaxR (H)) (Javali et al., 2011). Cronbach's alpha and Omega McDonald >0.7(Lawshe, 1975), AIC between 0.4–0.2 (Cox & Ferguson, 1994) and maximum reliability >0.8(Hancock, 2001) are considered acceptable. Next composite reliability (CR) has been calculated through CFA (Munro, 2005; Schreiber et al., 2006). Composite reliability is the replacement of replaces Cronbach's alpha in the structural equation model and it is acceptable when it is greater than 0.7 (Esposito Vinzi et al., 2010). Also, in order to determine reliability, the Intraclass correlation coefficient (ICC) was determined using two-way mixed intra-class correlation coefficient for absolute agreement at the level of individual items. Therefore, the questionnaire was completed and evaluated by the samples over the two weeks' interval. The results were interpreted as following: 0–0.2 (low), 0.21–0.40 (fair), 0.41–0.60 (moderate), 0.61–0.80 (substantial), and 0.81–1 (almost perfect) (Landis & Koch, 1977). Power analysis was performed to assess the appropriate number of samples to measure reliability through test-retesting. This analysis shows that a sample of 20 women with vaginismus and dyspareunia was needed to detect a test-retest correlation of 0.90 at a significance level of 0.05 (Cohen, 1992; Walter et al., 1998). We also used standard error of measurement (*SEM*) and minimum detectable changes (MDC) to determine the percentage of absolute reliability. MDC% less than 30 and less than 10 is considered "acceptable and "excellent," respectively (Harvill, 1991; Huang et al., 2011).

2.7 | Statistical Analysis

Univariate distribution was calculated using skewness coefficient (±3) and kurtosis coefficient (±3), while multivariate distribution was calculated using Mardia coefficient (more than 8). The missing values were evaluated through multiple imputations and then they were replaced by the participants' average response (Lawshe, 1975). Latent factors were extracted based on Horn's Parallel Analysis in the first step (Çokluk & Koçak, 2016). All data analysis was performed using SPSS-AMOS24, JASP0.11.1 and SPSS R-Menu 2.0.

3 | RESULTS

All the samples answered the questions and the characteristics of the studied samples were reported in Table 1.

TABLE 1 Subject characteristics for women

Variables		N (%)	Med (IQR)
Age	Less than 20 years	10 (2.8)	28 (7)
	20–40 years	327 (93.2)	
	More than 40 years	14 (4.0)	
Age partner	Less than 20 years	2 (0.6)	32 (6)
	20–40 years	328 (93.4)	
	More than 40 years	21 (6.0)	
Duration of marriage	Less than 5 years	329 (68.1)	4 (5)
	5–15 years	101 (28.8)	
	More than 15 years	11 (3.1)	
Number of sexual activity (per month)	Less than 4	113 (32.2)	6 (6)
	4–12	204 (58.1)	
	More than 12	34 (9.7)	
Level of education	Non-university education	51 (14.5)	-
	University education	300 (85.5)	
Employment status	housewife	181 (51.6)	-
	Employed	170 (48.4)	
Marriage pattern	Traditional	181 (51.6)	-
	Modern	170 (48.4)	

Abbreviations: N, Number; Med, Median, IQR, Interquartile Range.

3.1 | Face and content validity evaluation

All the items of VPCQ were appropriate in terms of their difficulty, appropriateness, and ambiguity based on the face validity results. Impact Score of all items was higher than 1.5 and acceptable. Content validity`s experts have confirmed the content of the VPCQ in terms of their wording, item allocation, and scaling of the items. The CVI results of all items were above 0.79, which were considered appropriate and did not need to be reconsidered in the final version. Also, the CVR of VPCQ`s items were higher than the minimum value of 0.42 (according to the assessment of 20 experts) in Lawshe's table.

3.2 | Construct, convergent and discriminant validity evaluation

KMO for assessing the appropriateness of the sample size was 0.942 and the Bartlett's test score was 5,293.697 (p <.001) in the current study. In EFA, three factors were extracted for VPCQ (including catastrophic and control cognition, positive cognition and self-image cognition), which determined the total of 53.945% of the variance of VPCQ variables (items). The eigenvalues of all three factors were 6.75, 2.66, and 2.04, respectively (Table 2). Item No. 8 was removed from the EFA due to communality less than 0.2. After EFA, Cronbach's alpha of the three extracted factors was between the range of 0.849-0.918 that was acceptable.

The extracted factor structure was evaluated using first-order CFA and some of the fitness indicators confirmed the model ($\chi2$ = 339.250; N = 176; p <.001; PCFI =0.797; PNFI =0.749; CMIN / DF =2.081; RMSEA =0.054; AGFI =0.811; IFI =0.930) (Table 3 and Figure 1). After analyzing the first-order CFA, the second order CFA was performed to identify whether all the factors can be placed under a broader concept. Goodness of fit of model improved the secondary model (Table 3 and Figure 2). Figure 2 shows the structural model and the results of the second-order CFA with standardized factor loading.

The factor loading of all items (except item 18) were more than 0.3 (p <.001). Therefore, item No. 18 was removed from the CFA due to its factor loading of less than 0.3. As it shown in Table 4, the AVE of all the relevant questionnaire factors was 0.519, 0.655 and 0.545, respectively, this is higher than 0.5 and represents the acceptable convergent validity. The MSV of the first and third factor were more than their related AVE. So, the discriminant validity was not confirmed. Therefore, second-order CFA was performed.

3.3 | Reliability evaluation

The internal consistency of the VPCQ was appropriate. McDonald's ω and Cronbach's alpha of the three extracted factors was between the range of 0.819-0.929 and 0.817-0.927, respectively. Also, AIC and Maximal Reliability of all the factors were acceptable (515-0.651 and 0.842-0.939, respectively). The CR of the first two factors was

TABLE 2 The results of performing exploratory factor analysis on vaginal penetration cognition questionnaire

Factor	Q_n. Item	Loading	h^2	λ	Variance%
Catastrophic and control cognition (F1)	Q16: I'm afraid of cramping the vaginal muscles during penetration.	0.966	0.787	6.752	32.155
	Q5: I'm afraid that I am not able to do anything to reduce the pain of penetration.	0.964	0.819		
	Q1: I'm afraid that my vagina is too tight for penetration.	0.945	0.688		
	Q6: I'm afraid that I get into a panic during penetration.	0.913	0.754		
	Q2: I'm afraid that I lose my control during penetration.	0.729	0.584		
	Q11: Penetration will not surely performed successfully.	0.661	0.606		
	Q13: My husband's penis is very big for my vagina.	0.644	0.338		
	Q7: I'm afraid that penetration becomes more difficult in the future.	0.644	0.623		
	Q21: Lack of awareness of what happens in my body during penetration is scary.	0.643	0.613		
	Q17: I feel a sin when penetration is not possible for me.	0.608	0.732		
	Q9: I am afraid that the pain of penetration gets into much worse in the future.	0.567	0.495		
	Q15: I am the only woman in the world who has unsuccessful penetration.	0.511	0.399		
Positive cognition (F2)	Q14: penetration is enjoyful and pleasant.	0.884	0.798	2.666	12.07
	Q3: Penetration has a good feeling to me.	0.762	0.763		
	Q12: I become sexual arousal by penetration.	0.723	0.536		
	Q18: Penetration will result in orgasm.	0.636	0.346		
	Q4: Penetration is loving moment with my partner	0.614	0.527		
Self-image cognition (F3)	Q19: I'm afraid that because of unsuccessful penetration my husband will leave me and I become alone in the future.	0.863	0.700	2.042	9.72
	Q20: I am afraid that I can not affect what is happening during penetration.	0.684	0.534		
	Q22: Even if I do not have a good penetration, I am a good partner (wife).	−0.668	0.344		
	Q10: I'm not a good sexual partner until I have successful penetration.	0.619	0.610		

Abbreviations: λ, Eigenvalue; h^2, communality.

TABLE 3 The fit model indices of first- and second-order factor analyses

Indices* Model	χ^2	Df	P value	CMIN/DF	RMSEA	PCFI	PNFI	AGFI	IFI	CFI
First-order	339.25	163	< 0.001	2.081	0.054	0.797	0.749	0.811	0.930	0.854
Second-order	339.73	163	< 0.001	2.084	0.053	0.797	0.749	0.810	0.930	0.929

Note: Acceptable values are as follows: > 0.5 for PNFI, PCFI, AGFI; > 0.9 for CFI and IFI; < 0.08 for RMSEA; and >0.5 for CMIN/DF.
*First-order and second-order are significant (<0.001).

acceptable (0.927 and 0.883), while the composite reliability values of the third factor were unacceptable (Table 4). The mean of ICC was 0.995 (95% CI 0.98 to 0.99 and p <.001). Absolute reliability estimated by *SEM* was 2.67 and the MDC% was 28% that confirmed the reliability.

4 | DISCUSSION

The current research is the first study that evaluates the Persian version of VPCQ psychometrically and has confirmed this questionnaire in Persian. Klaassen and Ter Kuile, who developed the VPCQ,

FIGURE 1 The corrected model of first-order confirmatory factor analysis for the Persian VPCQ
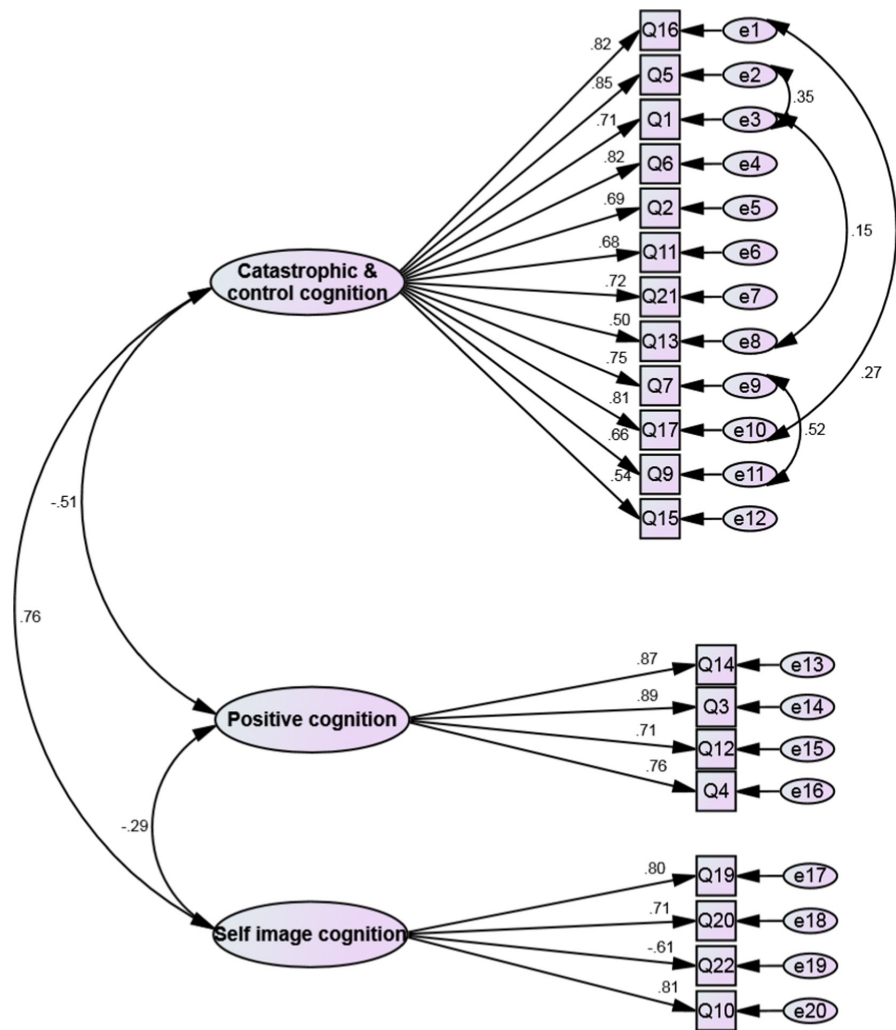

showed that this questionnaire is a valid and reliable tool for assessing the recognition of vaginal penetration in women with vaginismus and dyspareunia in their study (Klaassen & Ter Kuile, 2009). Cognitive domain has a broad meaning that consists of Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation (Bloom, 1956). Cognition of vaginal penetration plays an important role in the aetiology and treatment of sexual pain disorders, but only a small number of available tools assess cognitive aspect in vaginal penetration (Klaassen & Ter Kuile, 2009). Based on this shortcoming, especially in Iranian society, this study examined the psychometrics of this tool in Iran and concluded that the Persian version of 20 items of VPCQ is a valid and reliable tool in Iranian population.

The findings of the present study showed that the Persian version of 20 items of VPCQ has three subscales: catastrophic and control cognition, positive cognition, Self-image cognition, which explains 53.945% of the cumulative variance of VPCQ items. On the other hand, Doğan et al., in psychometric evaluation of Turkish version of this questionnaire, extracted 5 subscales that were similar to the original version of VPCQ with a variance of 66.93% (Dogan et al., 2015) which was not similar to the present study in terms of name and number of factors. In the current study, catastrophic and control cognition of the VCPQ-Persian version, to some extent,

consisting of three factors of the original version of it that named as catastrophic and pain cognitions, control cognitions and genital incompatibility cognitions.

The first subscale of the VCPQ-Persian version was catastrophic and control cognition. In fact, Catastrophic is a multidimensional characteristic in which the activation, evaluation, attention, and coping with the experience of noxious events are intertwined (Sullivan et al., 2001). From a cognitive-behavioural point of view, it was assumed that catastrophic beliefs about vaginal penetration is a response to fear and avoidance behaviour in women with vaginismus and dyspareunia (Klaassen & Ter Kuile, 2009). As catastrophic cognition is thematically relevant to the experience of dyspneic fear, the perceived-control component may be an important item (Ley, 1989). These women were more concerned about loss of control during vaginal penetration (Borg et al., 2012) and reported lower levels of perceived-control penetration and higher levels of catastrophic and pain cognitions (Dogan et al., 2015; Klaassen & Ter Kuile, 2009). This subscale included 12 items with variance of 32.15%. Its loading factor ranged between 0.511–0.966 and the highest loading factor in catastrophic and control cognition was related to the item *"I'm afraid of cramping the vaginal muscles during penetration."* In one study, Iranian women with LLV (lifelong vaginismus) had higher levels
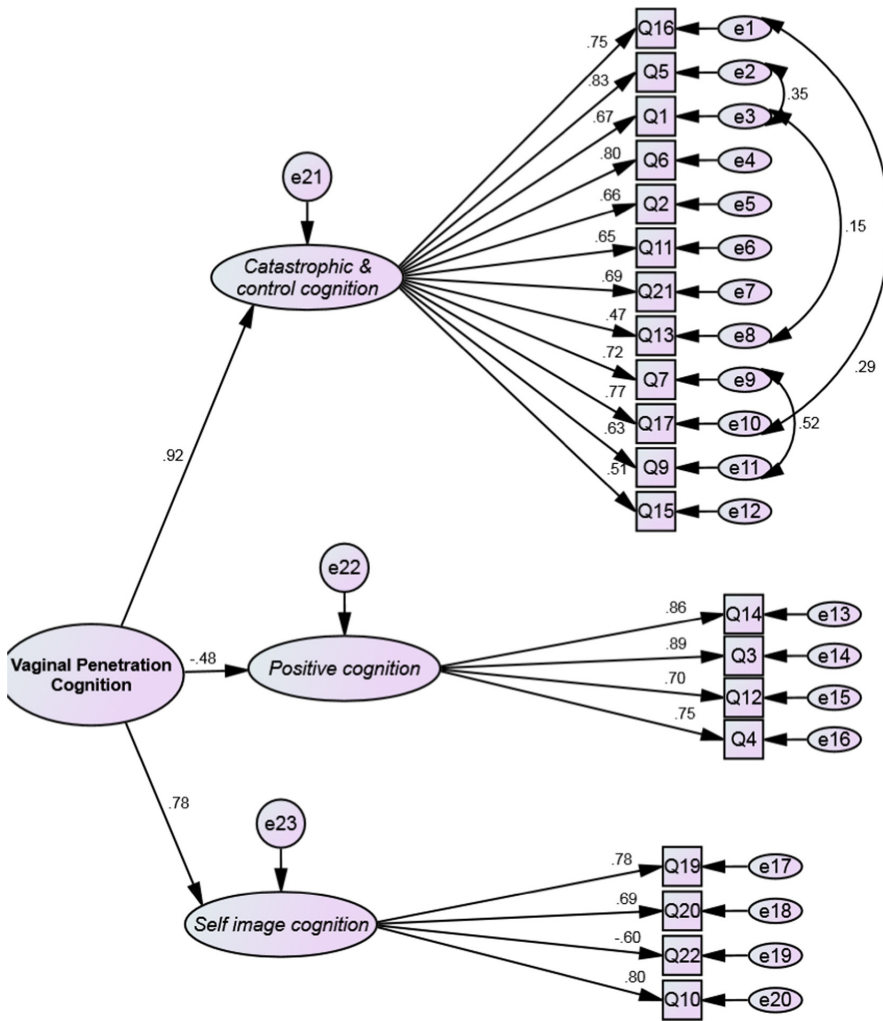
TABLE 4 Convergent and discriminant validity, Cronbach's alpha, and composite reliability indices of the Persian VPCQ

Indices Factors	AVE	MSV	MaxR (H)	CR	α (95% CI)	AIC	Ω
Catastrophic and control cognition	0.519	0.584	0.939	0.927	0.927 (0.912 to 0.941)	0.515	0.929
Positive cognition	0.655	0.261	0.901	0.883	0.882 (0.852 to 0.906)	0.651	0.884
Self-image cognition	0.545	0.584	0.842	0.618	0.817 (0.768 to 0.857)	0.599	0.819

of fear and contraction of the pelvic floor muscles when the penis, finger or any other object entered the vagina. These women also reported higher levels of catastrophic cognition about their genital incompatibility (Molaeinezhad et al., 2014). In sexual pain disorders, pain or pain prediction may similarly exacerbate catastrophic thoughts (e.g. vaginal penetration will be painful) and fear that both are associated with vaginal penetration (E. D. ter Kuile et al., 2010; Reissing et al., 2003). Reissing et al. reported that women with vaginismus experienced not only a higher level of catastrophic pain during intercourse or attempting vaginal penetration, but also they show a higher level of emotional distress and higher frequency of

defensive / avoidant distress behaviours during pelvic examinations (Reissing et al., 2004). Fear-avoidance model of vaginismus (FAM-V) states that maladaptive and catastrophic thoughts about vaginal penetration cause fear of penetration, which in turn leads to avoidance of intercourse (ter Kuile & Reissing, 2014).

Positive cognition was the second subscale of the VPCQ—Persian version with a 12.07% variance. The highest loading factor of this subscale related to item No. 14 *"penetration is enjoyful and pleasant."* Moreover, loading factors range of items was between 0.614 and 0.884. Positive cognition reflects optimistic thoughts that may act as protective factors (Zauszniewski et al., 2009). This factor contains

5 items which include positive concepts related to vaginal penetration (items 3, 4, 12, 14 and 18). This subscale consisted of 6 items with a variance of 12.64% and its loading factor ranged between 0.62–0.79 in the psychometric survey of Turkish version of VCPQ. In this version, the highest loading factor was related to the item No, 14 that was similar to the results of the current research (Dogan et al., 2015). In two study, women with vaginismus and dyspareunia both reported similar levels of positive cognition about vaginal penetration (Dogan et al., 2015; Klaassen & Ter Kuile, 2009). In another study, only positive cognitive score in women with GPPPD (Genito-Pelvic Pain and Penetration Disorder) was significantly lower than in the control group (Ünal et al., 2020). In fact, the more intimacy, marital satisfaction, and positive attitudes towards treatment a couple has, the greater the severity of stress and anxiety they will experience (Molaeinezhad et al., 2014).

The third subscale of the VPCQ- Persian version was Self-image cognition. Body image is a complicate mental construct that can affect a person's personality through cognitive, emotional, and behavioural concepts (Ackard et al., 2000). Body image and genital self-image refer to a person's feelings and beliefs about her body and genitals, and both aspects are involved during a person's sexual activity (Pazmany et al., 2013). In the present study, this subscale had 4 items with a variance of 9.72% and a factor loading range between 0.619–0.863, and the highest factor loading in this subscale was *"I'm afraid that because of unsuccessful penetration my husband will leave me and I became alone in the future."* In Doğan et al.'s study, this subscale had 2 items with a variance of 6.81%, and the highest loading factor in this subscale was the item *"I am the only one in the world for whom penetration is unsuccessful"* (Dogan et al., 2015). Klaassen and Ter Kuile, showed that women with vaginismus have higher levels of negative self-image cognition and genital incompatibility cognition (Klaassen & Ter Kuile, 2009).

The goodness of fit of the model was checked for all suitable indices and all factors loading were more than 0.5, which indicates the existence of a minimum acceptable factor loading. Therefore, according to the CFA results, the observed indices were approved and all model goodness of fit indices had suitable standard levels. The first-order subscales (catastrophic and control cognition, positive cognition, self-image cognition) did not function entirely as independent variables, and strong correlations between them reflected a broader construct at the secondary conceptual level. Therefore, we decided to use the second-order factor analysis to achieve a more accurate structural equation model (*SEM*), after the first-order factor analysis of the VCPQ. In fact, the structural equation model is the most appropriate way to evaluate this structure because it can reveal the variables that are hidden in the first-order CFA (Gatignon, 2003; Hair et al., 2013). Some researchers recommend that it is best to first create the desired factor structure through first order factor analysis and then use second factor analysis to evaluate the *SEM* to fit the conceptual structure (Anderson & Gerbing, 1988).

In the present study, there was a need to run a second-order CFA due to the lack of discriminant validity and the lack of distinction between VPCQ subscales in the first-order CFA (Pahlevan Sharif & Sharif Nia, 2018). This kind of factor analysis confirmed the convergent validity of the Persian VPCQ and showed that the subscale of this questionnaire represents a broader concept called "vaginal penetration cognition." Sexual problems and their issues, such as vaginal penetration disorders, are highly dependent on the social and cultural matters of any society. Moreover, an important part of this cognition is formed over time in relation to people's experiences in personal life or observing the experiences of others or social experiences (Bokaie et al., 2017). On the other hand, due to the taboo nature of these problems, people are never able to retell them in many societies (Karagüzel et al., 2016) and this variable remains hidden. Along with taboo and cultural issues, sexual shame is another important concern, which is influenced by individuals' knowledge of events and causes feelings of anxiety, guilt or shame in people (Jaffe, 2009), which helps to hide the variable.

In the present study, internal consistency was assessed through AIC, Cronbach's alpha, McDonald's omega and Maximum Reliability, which were acceptable for all subscales of the Persian version of VPCQ. Previous studies have also shown that the values of Cronbach's alpha on its subscales were 0.7–0.83 (Klaassen & Ter Kuile, 2009) and 0.71–0.92 (Dogan et al., 2015). Also in the present study, CR was at a high level. One of the important features of CR (compared to Cronbach's alpha) is that this is not affected by the number of items and the obtained structure of the questionnaire. It depends on the actual amount of factor loading of each item of the latent variable (Esposito Vinzi et al., 2010). The CR, AIC, McDonald's omega and Maximum Reliability of the VPCQ were calculated for the first time in this study. One of the strength points of the present study was the use of more accurate and reliable tests to assess factor structure and reliability measurement. Also, the number of modern Parallel Analysis criteria was determined using SPSS R-meno Version 2. Moreover, unlike previous studies, CFA was used to validate the VPCQ and confirm it in Iranian society besides to EFA in this study.

4.1 | Study Limitations

There were limitations in the current study. The authors are confident that the forward backward translation method has been performed to the highest possible standard, and the developer of the VPCQ has confirmed the accuracy of the translation. However, there is always the potential problem of using the questionnaire; it was originally designed for a different population and cultural differences and subtle linguistic variations may not be translatable, and users of this questionnaire are advised to be aware of this potential issue. Another major limitation of the present study was the participants` concern about the authors' judgment of their response to VPCQ items due to Iranian cultural context. We have tried to manage this limitation by making it possible to answer the questionnaire in a private place and ensure that their information is kept confidential. Therefore, considering that Iran is a multi-cultural country, it is recommended to measure this questionnaire in different Iranian cultures.

5 | CONCLUSION

The Persian version of the VPCQ has acceptable validity and reliability in the Iranian population and measures the broad concept of "vaginal penetration cognition." This concept includes three subscales labelled as Catastrophic and control cognition, Positive cognition, and self-image cognition. This questionnaire can be used to cognitively assess vaginal penetration among Iranian women with sexual pain disorders. Healthcare providers, including reproductive health professionals, gynaecologists, psychologists, and sex therapists, can use the Persian version of VPCQ as an assessment tool to measure the content and severity of vaginal penetration in women sexual pain disorders an in clinical trials. Therefore, they can offer solutions to improve these disorders. Also, this questionnaire can be used to check the response to treatment.

CONFLICT OF INTEREST

The authors have no conflicts of interest relevant to this article.

AUTHOR CONTRIBUTIONS

MB, NK, GO: Study design. MB, NK, GO, MN and HSH: Data collection. MB, HSH and MN: Data analysis. MB, MN, GO and HSH: Study supervision. MB, NK and HSH: Manuscript writing. MB. NK, GO, HSH and MN: Critical revisions for important intellectual content.

DATA AVAILABILITY STATEMENT

The data sets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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