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Erkek Cinsel Sağlığı

Examination of the psychometric properties of the "Masculinity in Chronic Disease Inventory" in men admitted to infertility outpatient clinic

İnfertilite polikliniğine başvuran erkeklerde "Kronik Hastalıkta Erkeklik Envanteri"nin psikometrik özelliklerinin incelenmesi

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ABSTRACT

OBJECTIVE: Male infertility negatively affects men's perception of masculinity and their health. This study aimed to investigate the psychometric properties of the Turkish version of the Masculinity in Chronic Disease Inventory (MCD-I) in men admitted to an infertility outpatient clinic.

MATERIAL and METHODS: The study was conducted with 208 males. Data were collected after the language validity of MCD-I was ensured. The interclass correlation test was used in the implementation of repeated tests; the Spearman correlation coefficient was employed to analyse the relationship between numerical variables, exploratory and confirmatory factor analyses were used for validity, while Cronbach's alpha values, item-total correlation and split-half analysis were used for reliability.

RESULTS: The inventory comprised 22 items and five subscales, which explained 56.52% of the total variance. All the factor loads were >0.30 in both exploratory and confirmatory factor analyses. The confirmatory factor analysis determined that all the fit indices were >0.85, and the root mean square error of approximation was <0.05. The Cronbach's alpha value for the whole scale was 0.86, and all five subscales were found to vary between 0.52 and 0.83.

CONCLUSION: This study found that the Turkish version of MCD-I is a reliable and valid measurement tool for men who applied to policlinic for complaints of infertility.

Keywords: infertility, masculinity, men, psychometric properties, reliability, validity

ÖZ

AMAÇ: Bu araştırmanın amacı, infertilite polikliniğine başvuran erkeklerde Kronik Hastalıkta Maskülinite Endeksi (KHME)'nin Türkçe versiyonunun psikometrik özelliklerini incelemektir.

GEREÇ ve YÖNTEMLER: Araştırma 208 erkek üzerinde yürütülmüştür. Veriler KHME'nin dil geçerliği sağlandıktan sonra toplanmıştır. Tekrarlı testlerin uygulanmasında sınıflar arası korelasyon testi, sayısal değişkenler arasındaki ilişkiyi analiz etmek için Spearman korelasyon katsayısı, geçerlik için açımlayıcı ve doğrulayıcı faktör analizleri, güvenilirlik için ise Cronbach alfa değerleri, madde-toplam korelasyonu ve yarıya bölme analizi kullanılmıştır.

BULGULAR: Envanter, toplam varyansın %56,52'sini açıklayan 22 madde ve beş alt ölçekten oluşmaktadır. Hem açımlayıcı hem de doğrulayıcı faktör analizlerinde tüm faktör yükleri >0,30 olarak bulunmuştur. Doğrulayıcı faktör analizi, tüm uyum endekslerinin >0,85 olduğunu ve yaklaşık hataların ortalama karekökünün <0,05 olduğunu belirlemiştir. Ölçeğin tamamı için Cronbach alfa değeri 0,86 ve beş alt ölçeğin tamamının 0,52 ile 0,83 arasında değiştiği bulunmuştur.

SONUÇ: Bu çalışma, KHME'nin Türkçe versiyonunun infertilite şikâyeti ile polikliniğe başvuran erkekler için güvenilir ve geçerli bir ölçüm aracı olduğunu göstermiştir.

Anahtar Kelimeler: infertilite, erkeklik, erkekler, psikometrik özellikler, güvenilirlik, geçerlilik

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INTRODUCTION

Chronic diseases currently affect many individuals worldwide, requiring long-term treatment and care.[1] It affect the quality of life in multiple ways by causing physical and psychosocial effects in an individual's life.[2,3] All these effects lead to role changes and a deterioration in the person's body image and lifestyle.[4] Reproductive health issues such as fertility/infertility can lead to perceptual changes such as seeing chronic illness as a crisis, loss of masculinity and stigma.[5]

Infertility, a chronic health problem, is defined as the inability of a couple to become pregnant after 12 months

of regular, unprotected sexual intercourse.[6] The psychosocial effects of infertility are similar to the effects of chronic diseases such as heart disease and cancer.[7] The incidence of infertility worldwide is between 8–12%, and approximately 50% of couples male-induced infertility.[8] For many men and women, the experience of infertility reflects a deterioration in adult identity, leading to anxiety about whether they are fulfilling gender role expectations.[9] However, it is seen that the effects of infertility on women are mostly investigated, and studies on men are limited.[10,11] Infertility has a humiliating and damaging effect on men, and men feel more stigmatized than women.[12] Furthermore, men who perceive this situation as a crisis think they have lost an essential component of their masculinity and their sexual life is affected adversely.[13] In this context, researchers emphasize the need to expand and deepen research about the connection between infertility and masculinity.[14,15] Male infertility remains under-researched, making fertility treatment a complex process involving social norms, taboos, and power dynamics. This journey is stressful, lengthy, and challenging for both men and women. However, no measurement tool exists in the literature to assess the perception of infertility and masculinity together. Chambers et al.[16] developed the Masculinity in Chronic Disease Inventory (MCD-I) to measure the beliefs and ideologies about masculinity of men with prostate cancer. Many researchers have used it to assess to masculinity in men with chronic illnesses.[17–19] Studies evaluating perceptions of chronic conditions, particularly infertility and masculinity in Turkish men, are limited. Since infertility is a chronic condition, the MCD-I is expected to help fill this gap.

Aim of the Current Study

This study aims to investigate the content, construct and convergent validity and reliability of the MCD-I in men admitted to an infertility outpatient clinic. In this way, the suitability of its use in infertility patients were investigated.

MATERIAL and METHODS

Research Design

This methodological study was conducted between June 2021 and January 2022.

Sample and Recruitment

In scale adaptation studies, the number of participants be between five and ten times the number of scale items.[20] Accordingly, the aim of the study was to reach 110 to 220 participants. During data collection, 384 men were invited to participate, but 176 (45.83%) declined. Data collection ended once the target sample was reached, with 208 men (54.17%) completing the study.

Participants' mean age was 33.81±5.53. Of them, 40.9% were high school graduates; 29.8% were employees. Participants' mean duration (years) desire to have a child was 3.56±3.08 (Table 1).

Data Collection Tools

Original version of the MCD-I*:* It is a 5-point Likert-type scale, has 22 items and six subscales that represent different facets of masculinity; optimistic capacity, sexual importance, family responsibilities, emotional self-reliance, strength, and action approach. The increase in scores indicates stronger approval of masculine ideals.[16] It was applied after content validity had been ensured.

Turkish Version of the MCD-I*:* After the content validity of the MCD-I was ensured with 22 items. Although the number of items and factors is the same as the original, it was observed that some items were in different sub-dimensions, different from the original. The "optimistic capacity" and "strength and action" subscales were named "optimistic approach" and "strength", respectively.

In this study, the measurements to assess the convergent validity of the MCD-I are given below:

International Index of Erectile Function (IIEF)*:* This index was used in order to assess to male sexual function. It consists of 15 questions and five subscales; erectile function, orgasmic function, sexual desire, intercourse satisfaction, and general satisfaction.[21] In this study, the Cronbach's alpha value was between 0.58–0.92.

Male Role Norms Scale (MRNS)*:* The MRNS is a 26-item scale widely employed to evaluate beliefs about appropriate roles and behaviors for men. It has three subscales: Status, antifemininity, and toughness. High score shows the more adherence of the masculinity.[22] In this study, the Cronbach's alpha values were between 0.53 and 0.85.

Patient Health Questionnaire (PHQ-9)*:* The PHQ-9 evaluates depressive symptoms. A high total score demonstrates severe depressive symptoms. It was adaptated in Turkish by Sari et al.[23] In this study, the Cronbach's alpha value was 0.82.

Procedure

Translation Procedure

Permission for the Turkish adaptation was taken from researchers, who developed the MCD-I.[16] Then, the translation-back translation technique was used. Three independent experts translated the MCD-I into Turkish. The researchers reviewed the translations, and a Turkish version was created. It was then sent and feedback was received from a total of seven experts such as physicians, nurses, sociologists, social workers, and psychologists working on men and masculinity to test the content validity. The content validity was calculated and the Turkish version was recreated. Then, opinions were received from two Turkish language experts to evaluated its linguistic and expressive aspects. The final Turkish version was then translated back into English by two independent experts and a new English version was created. This version was sent to the authors who had developed MCD-I and they reviewed it. A pilot study was conducted using the final Turkish version. This involved seven men who were part of the research population and met the inclusion criteria. The inventory was only applied after its content validity was ensured (see Appendix. Turkish version of MCD-I).

Data Collection Procedure

In the hospital that the research was conducted, infertility polyclinic service is provided for men once a week. Patients who met the inclusion criteria were directed to a separate room by the doctor. Data were collected from patients who volunteered anonymously.

Appendix. Turkish version of MCD-I: Aşağıda erkeklerin kendileri hakkında düşündükleri, hissettikleri ve kendileri için neyin önemli olduğu konusunda birtakım ifadeler yer almaktadır. Kendinizi değerlendirin ve lütfen her bir ifadenin sizin için ne ölçüde doğru olduğunu 1 "Hiç doğru değil", 3 "Kısmen doğru" ve 5 "Çok doğru" anlamına gelecek şekilde ölçek üzerinde belirtin. Doğru ya da yanlış cevap yoktur. Lütfen kişisel düşüncelerinizi ve duygularınızı en doğru şekilde ifade eden yanıtları verin.

Kronik Hastalıkta Maskülinite Endeksi (KHME)

		Hiç doğru değil		*Kısmen doğru*		*Çok doğru*
1	Fiziksel olarak güçlü olmak benim için önemlidir.	1	2	3	4	5
2	Cinsel ilişkiye girmeye fiziksel olarak yeterli olmak benim için önemlidir.	1	2	3	4	5
3	Her zaman olaylarda iyi olanı ararım.	1	2	3	4	5
4	Duygularımı kendime saklarım.	1	2	3	4	5
5	Sertleşmeyi sağlayabilmek benim için önemlidir.	1	2	3	4	5
6	Sorunlar karşısında harekete geçmeyi severim.	1	2	3	4	5
7	Eşime veya aileme baktığımı (sahip çıktığımı) bilmek hoşuma gider.	1	2	3	4	5
8	Formda olmak benim için önemlidir.	1	2	3	4	5
9	Mücadeleci bir insanım.	1	2	3	4	5
10	Bir şeyi başarmak istersem yapabilirim.	1	2	3	4	5
11	Cinsel ilişkiye girebilecek durumda olduğumu bilmek hoşuma gider.	1	2	3	4	5
12	Pozitif (olumlu) bir insanım.	1	2	3	4	5
13	Kaygılarım hakkında konuşmama eğilimliyim.	1	2	3	4	5
14	Partnerime veya aileme maddi güvence sağlamam gerekir.	1	2	3	4	5
15	Aktif bir insan olmak benim için önemlidir.	1	2	3	4	5
16	İleri görüşlü bir düşünce yapısına sahibim.	1	2	3	4	5
17	Cinsel ilişkiye girebiliyor olmak, koşabiliyor olmak gibidir.	1	2	3	4	5
18	Partnerimin veya ailemin geçimini sağlayabilmek benim için önemlidir.	1	2	3	4	5
19	Gelecek konusunda iyimserim.	1	2	3	4	5
20	Rekabetçi bir insanım.	1	2	3	4	5
21	Koşullara karşı genel yaklaşım tarzım uyum sağlamaktır.	1	2	3	4	5
22	Partnerimi ya da ailemi koruma sorumluluğu bana aittir.	1	2	3	4	5

Açıklama: KHME'nin beş alt ölçeğinden oluşan yirmi iki maddesi vardır: Her bir madde birden beşe kadar (1 = "Hiç doğru değil", 5 = "Çok doğru") puanlanmaktadır. Alt ölçek puanları, her bir alt ölçekteki maddelerin toplanarak madde sayısına bölünmesi ile, toplam puan ise alt ölçek puanlarının toplanması ile elde edilmektedir. Toplam puanın artması, kişinin daha fazla erkeksi ideolojileri içselleştirdiği anlamına gelmektedir.
Puanlama: Güçlü olma = (9+10+15+6+16+8+20) /7; Cinselliğin önemi = (2+5+1+11+17) /5; Aile sorumluluğu = (18+22+14+7) /4; İyimser yaklaşım = (12+19+21+3) /4 ve Duygusal öz yeterlilik = (4+13) /2.

There are two main approaches to assessing the reliability of the test-retest method: the continuous and intermittent methods.[20,24] In this study, the intermittent method was used. The Turkish version of the MCD-I was administered to 50 male volunteers three weeks apart. At the end of the first data collection period, participants were asked for their consent to participate in the second testing phase. To reach the participants again, their contact details were taken, and they were asked to create pseudonyms to match the forms.

Ethical Considerations

Approval was obtained from the Ethics Committee of the Faculty of Medicine of Sakarya University (resolution number E-71522473-050.01.04-21438-195), and written and verbal consent was obtained from the participants.

Statistical Analysis

Data were analyzed using IBM Statistical Package for Social Sciences (SPSS) program v.25 and AMOS 26. Frequency distribution was used to evaluate categorical variables, while numerical variables were evaluated using descriptive statistics. The interclass correlation test was used in the implementation of repeated tests and Spearman's correlation coefficient was deployed to investigate the relationship between numerical variables. Exploratory factor analyses (EFA) were performed to test scale validity. Also, confirmatory factor analysis (CFA) was performed to confirm the construct obtained from EFA. For the model's fitness, Chi-square/degrees of freedom (χ^2/df), goodness fit index (GFI), non-formed fit index (TLI), incremental fit index (IFI), comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) were used. For reliability the Hotelling T^2, Cronbach's alpha, item-total correlation, and split-half analysis were used. For statistical significance $p \leq 0.05$ was accepted.

RESULTS

Descriptive Statistics

The mean scores on Status, Toughness, Antifemininity, and total MRNS were 5.03±1.10, 3.60±0.83, 3.21±1.04, and 3.95±0.80, respectively. The mean score on IIEF was 65.24±8.59 and PHQ-9 was 6.39±4.19. The MCD-I strength, sexual importance, family responsibilities, optimistic capacity, and emotional self-reliance mean scores were 4.47±0.58, 4.50±0.61, 4.86±0.30, 4.42±0.62, and 3.58±1.06, respectively. The total of MCD-I was 4.46±0.42 (Table 2).

Table 1. Sociodemographic characteristics of participants

Variable		*Min-Max*	*x̄ ± Sd*
Age (year)		22–53	33.81±5.53
Duration of desire to have children (year)		1–19	3.56±3.08
		n	%
Education	Primary education	55	26.4
	High school	85	40.9
	University	56	26.9
	Postgraduate	12	5.8
Occupation	Retired	2	1.0
	Salaried employee	52	25.0
	Self-employed	32	15.4
	Government employee	60	28.8
	Employee	62	29.8
Income	≤2400 ₺	10	4.8
	2400 ₺ – 3600 ₺	76	36.5
	3601 ₺ – 4200 ₺	56	26.9
	≥4201 ₺	66	31.7
Perceived income	Income < expenses	73	35.1
	Income = expenses	96	46.2
	Income > expenses	39	18.8
Place of residence	Village	62	29.8
	District	59	28.4
	Provincial center	87	41.8
Family type	Nuclear	116	55.8
	Extended	92	44.2
Number of children	None	157	75.5
	One child	39	18.8
	Two children	12	5.8
Physical illness	Yes	15	7.2
	No	193	92.8
Mental illness	Yes	3	1.4
	No	205	98.6
Total		208	100

% may not equal 100% due to rounding.

Validity

Firstly, the content validity index (CVI) were calculated from the seven expert opinions using Davis' technique.[25] The content validity average (CVA) of the items was between 0.86 and 1.00, while the CVI of the scale was 0.94. Statistically, the value of 0.80 was taken as the criterion and no item was removed.[25]

The EFA analysis was first performed to test the construct validity, and it was seen that some items were in different sub-dimensions from the original structure. The EFA demonstrated that the Kaiser-Meyer Olkin (KMO) coefficient was 0.865; the Bartlett test χ^2 value was 1521.480;

Table 2. Correlation between MCD-I, MRNS, IIEF, and PHQ-9

	x̄ ± Sd	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
1. Status	5.03±1.10	1	0.56	0.38	0.82	-0.03	0.01	0.09	-0.00	0.02	0.01	0.13	0.23	0.36	0.30	0.18*	0.12	0.33*
2. Toughness	3.60±0.83		1	0.51	0.82	-0.13	-0.02	-0.02	-0.11	-0.12	-0.12	0.30	0.01	0.16*	0.05	0.05	0.15*	0.11
3. Antifemininity	3.21±1.04			1	0.78	-0.11	0.08	0.10	0.03	0.03	-0.01	0.13	0.04	0.01	0.02	0.07	0.28	0.10
4. Total MRNS[a]	3.95±0.80				1	-0.11	0.03	0.08	-0.03	-0.02	-0.04	0.22	0.12	0.22*	0.16*	0.13	0.23	0.24*
5. Erectile function	26.82±4.13					1	0.50	0.35	0.55	0.55	0.86	-0.44	0.15*	-0.04	-0.01	0.13	-0.12	0.06
6. Orgasmic function	9.47±1.22						1	0.41	0.60	0.65	0.74	-0.28	0.11	-0.03	0.05	0.14*	0.05	0.10
7. Sexual desire	7.92±1.52							1	0.45	0.56	0.63	-0.23	0.19	0.15*	0.19	0.20	0.13	0.24*
8. Intercourse satisfaction	12.13±2.31								1	0.71	0.83	-0.38	0.00	-0.10	-0.01	0.06	-0.07	-0.03
9. General satisfaction	8.90±1.53									1	0.83	-0.46	0.16*	-0.01	0.06	0.18*	0.02	0.13
10. Total IIEF[b]	65.24±8.59										1	-0.47	0.15*	-0.03	0.04	0.17*	-0.04	0.10
11. PHQ-[9] c	6.39±4.19											1	-0.10	0.05	-0.01	-0.11	0.17*	-0.02
12. Factor 1	4.47±0.58												1	0.56	0.42*	0.60*	0.11	0.86*
13. Factor 2	4.50±0.61													1	0.42*	0.47*	0.17*	0.80*
14. Factor 3	4.86±0.30														1	0.35*	0.03	0.55
15. Factor 4	4.42±0.62															1	0.11	0.76
16. Factor 5	3.58±1.06																1	0.37
17. Total MCD-[I]d	4.46±0.42																	1

[a]Male Role Norms Scale, [b]International Index of Erectile Function, [c]Patient Health Questionnaire-9, [d]Masculinity in Chronic Disease Inventory, *p<0.05

the p-value was <0.01. Accordingly, it was seen that the sample size in the data set was sufficient for factor analysis. The five subscales explained 56.52% of the total variance (Table 3). As a result of the EFA, the first item in the original scale was included in the "strength and action" subscale, whereas it was included in the "sexual importance" subscale. Moreover, items 9, 10, 6, 16, and 20 in the "optimistic capacity" subscale were included in the "action approach" subscale. Accordingly, when the item contents were evaluated in terms of meaning and integrity, the "optimistic capacity" and "strength and action" subscales in the original version were named "optimistic approach" and "strength", respectively. The factor loads of these five subscales ranged from 0.50 to 0.82 (Table 3).

The CFA showed that the first model was poorly fit (χ2/df: 1.79, GFI: 0.87, TLI: 0.87, IFI: 0.89, CFI: 0.88, RMSEA: 0.06, and SRMR: 0.062). To improve the fit indices, a two-way relationship was established between the error terms of the items with the highest modification indices value (3rd – 6th, 10th – 16th, 3rd – 9th, 21st – 2nd, and 22nd – 4th). And, a relational construct between the factors was made to determine the expected covariance between the dimensions. In the final stage, fit indices were investigated for the five-factor, first-order CFA model. The fit indices were as follows: χ^2:307.823, df: 194, χ^2/df: 1.59, GFI: 0.89, TLI: 0.90, IFI: 0.92, CFI: 0.92, RMSEA: 0.05, and SRMR: 0.067**.** The standardized regression coefficients varied between 0.44 and 0.75 (Figure 1, Table 3).

A further means of testing validity is to use the convergent validity method. The convergent validity of the MCD-I was assessed using the MRNS, IIEF, and PHQ-9 (Table 2).

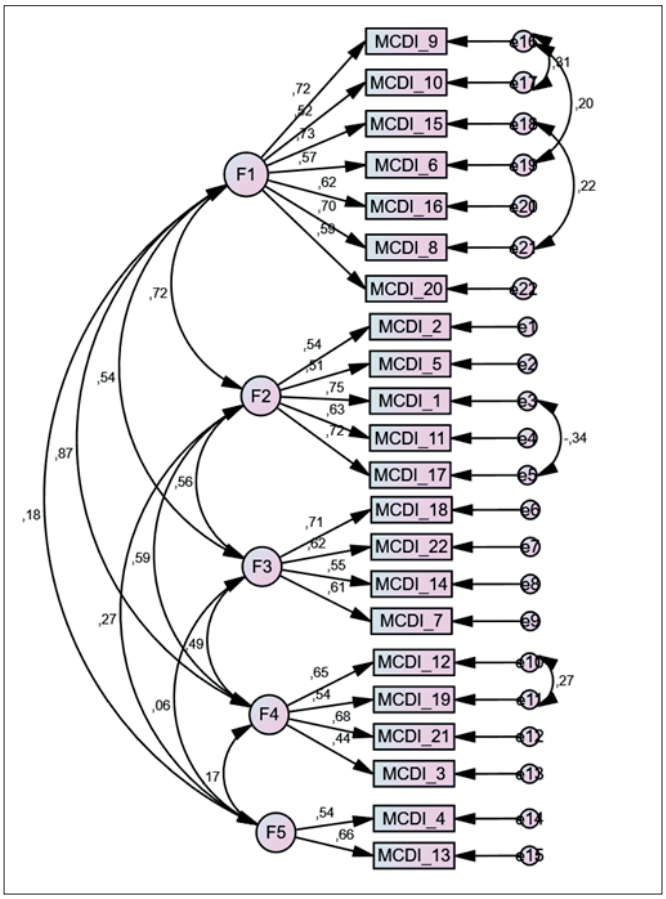

Figure 1. First order CFA model of MCD-I with five subscales

Reliability

Hotelling T^2, Cronbach's alpha coefficient, item-total correlation coefficients and split-half analysis were applied to test the MCD-I internal consistency. The Hotelling T^2 value was 479.602, F=20.632 (p<0.01).

Table 3. Exploratory factor analysis, standard regression coefficients, item-total correlation, and Cronbach's alpha

					EFA[a]			CFA[b]
Subscale	*Number of item*	*Item-total correlation*	*Cronbach's alpha if item deleted*	*Cronbach's alpha*	*Factor load*	*Eigenvalue*	*Explained variance*	*Standard regression coefficients*
Strength	9	0.49	0.85	0.83	0.75	6.57	16.80	0.57
	10	0.62	0.85		0.71			0.72
	15	0.43	0.85		0.65			0.52
	6	0.63	0.87		0.64			0.73
	16	0.51	0.85		0.64			0.62
	8	0.66	0.85		0.56			0.70
	20	0.53	0.85		0.54			0.59
Sexual importance	2	0.44	0.84	0.74	0.70	1.73	12.41	0.54
	5	0.40	0.85		0.68			0.51
	1	0.57	0.85		0.66			0.75
	11	0.51	0.85		0.57			0.63
	17	0.56	0.85		0.56			0.72
Family responsibilities	18	0.42	0.87	0.70	0.75	1.68	11.22	0.71
	22	0.33	0.85		0.70			0.62
	14	0.34	0.84		0.66			0.55
	7	0.39	0.85		0.65			0.67
Optimistic approach	12	0.49	0.85	0.69	0.76	1.29	9.69	0.65
	19	0.46	0.85		0.70			0.54
	21	0.54	0.85		0.54			0.68
	3	0.43	0.85		0.50			0.44
Emotional self-reliance	4	0.13	0.85	0.52	0.82	1.17	6.40	0.54
	13	0.20	0.86		0.80			0.66
Total Cronbach's alpha				0.86				
Total explained variance							56.52	
Kaiser-Meyer Olkin (KMO)=0.865. Bartlett's test χ^2value 1521.480; p <0.01								
Note. [a]exploratory factor analyses, [b]confirmatory factor analyses								

Table 4. Results of split half analysis

Subscale	*First-half Cronbach's α*	*Second-half Cronbach's α*	*Spearman-brown*	*Guttman split-half*	*Correlation between split halves*	*x̄ ± Sd (Min-Max)*
	0.75	0.75	0.85	0.85	0.75	
Strength						4.47±0.58 (2.71–5.00)
Sexual importance						4.50±0.61 (1.20–5.00)
Family responsibilities						4.86±0.30 (3.25–5.00)
Optimistic capacity						4.42±0.62 (2.00–5.00)
Emotional self-reliance						3.58±1.06 (1.00–5.00)
Total MCD-I						4.46±0.42 (2.91–5.00)

The Cronbach's alpha coefficient for the total MCD-I was 0.86, and ranged between 0.52 and 0.83 for the subscales. The item-total correlation coefficients varied between 0.13 and 0.66 (Table 3).

In addition, to test internal consistency split-half analysis was applied. The Cronbach's alpha was calculated as 0.75 for the first half and 0.75 for the second half. The correlation coefficient between the first and second half was 0.75 ($p<0.05$), the Spearman-Brown coefficient and the Guttman split-half value were 0.85 (Table 4).

The test-retest method was used in determining the MCD-I's ability to give results that were consistent between applications, its time invariance and its reliability (n=50).[26] No statistically significant difference was found between the first and second applications (ICC [95% CI]=0.821 [0.686–0.898]).

DISCUSSION

To ascertain whether experts' opinions to evaluate the content validity were consistent, the CVA and the CVI for the

entire inventory should be >0.80.[27] In this study, both were >0.80. The results thus demonstrated that the level of agreement among experts was high and that the inventory provides adequate measuring of the subject and language validity for the Turkish sample.

Bartlett's sphericity test and KMO were employed to assess whether the data were sufficient and suitable for factor analysis. The literature emphasizes that the Bartlett sphericity test value needs to be statistically significant and that there should be a KMO value of at least 0.60.[27] These results showed that the data and the sample size were found to be sufficient for EFA.

The literature also emphasizes that the variance explained in multidimensional scales should be over 40% and that the greater the total variance, the stronger the scale's construct validity.[27,28] It was seen that the structure and variance were similar to those reported in the original development study[16] and the study conducted by Occhipinti et al.[19] examining the validity of MCD-I in chronic patients other than prostate cancer. An item's factor load must be at least 0.30 for it to be part of a scale.[29] Our results showed that the Turkish version provides construct validity for the current sample, because the factor loads were ≥30 and were thus similar to the factor loads of the original scale.

The literature suggests using CFA to test the construct validity of EFA in cross-cultural adaptation studies.[29,30] For the Turkish MCD-I, the suitability of the factor structure obtained from the EFA was assessed using CFA. The CFA showed that the χ^2/df was less than five, that the RMSEA was less than 0.08, that the other fit indices were greater than 0.90, and that the standard regression coefficients of all items were greater than 0.30. These results are consistent with the results reported in both the original scale study[16] and the study of Occhipinti et al.[19] The CFA results confirmed the five-factor structure of the Turkish inventory. Each subscale's items adequately defined the factors they were included in and measured the concept they were supposed to in an adequate manner.[29,30] These results demonstrated the MCD-I possesses a good factor structure for Turkish samples.

One method to test reliability is Cronbach's alpha coefficient. It was ranged from 0.52 to 0.83 for the subscales and was 0.86 for the total of MCD-I. Accordingly, the subscales showed moderate to excellent reliability and the total tool indicates excellent reliability.[26] Considering the findings of the original study, as well as the study conducted by Occhipinti et al.[19], it was seen that the lowest Cronbach's alpha value was reached in the emotional self-reliance subscale, similar to our results.

Another significant factor that affects validity and reliability is response bias. This arises when research participants respond to items based on social expectations or their idea of what the researchers want instead of expressing their own opinions. When response bias occurs, the homogeneity of the measurement is impaired, affecting both validity and reliability.[29] In our study, no examples of response biasnwere found.[31] This result supports the conclusion that the MCD-I is a valid and reliable tool. However, response bias could not be compared because it was not evaluated previous study.[16]

Another method used to estimate reliability is item-total analysis. This shows how much the scale items are associated with each other, the subscale or the entire scale and whether or not they are able to measure the variable in question.[27,29] It is expected that the correlation revealed in the item-total analysis will be positive and above 0.20.[29] It was observed that the correlation of the fourth item in the "emotional self-reliance" subscale, which consists of only two items, was <0.20 in the item-total correlations in the Turkish version of MCD-I. It is recommended not to include a single item in the subscales of the tools.[26,30] For this reason, the split-half test, which is one of the reliability test methods, was applied without removing the fourth item. As a result of the split-half analysis a strong and significant correlation was found between the two halves. In addition, the Spearman-Brown and Guttman Split-Half coefficients show that the scale is highly reliable.[28] These results show that the scale provides internal validity. Previous studies[16,19] did not use these tests, so the results could not be compared.

In addition, the convergent validity analyses support the domains of toughness, status and antifemininity domains, which represent domains of masculinity in infertile men. These results show that the measures are conceptually correlated. Furthermore, statistically significant correlations between the subscales of the MCD-I and IIEF and PHQ-9 support convergent validity. These results are consistent with previous research results showing an association between sexual function and general health status in infertile men.[32] Chambers et al.[16] used similar measurement as those employed in the current study and the results support each other. For this reason, it can be suggested that the factors of the MCD-I show the most prominent and relevant characteristics in men diagnosed with infertility and capture the basic conceptual structures pertaining to masculinity.

Limitations and Future Research Directions

This study has several limitations. First, the cross-sectional design only reflects perceptions of masculinity among

men attending an infertility clinic. Second, the small sample size limits generalizability to other men in Türkiye and beyond. Additionally, the study highlights the challenge of recruiting male participants, as men may feel hesitant to discuss infertility and masculinity, potentially stigmatizing themselves and questioning their masculinity even while responding to the questions.

The third limitation is that the analysis was performed on the same data since the sample size needed to be increased for applying EFA and CFA by dividing the data set into two. Although CFA is considered sufficient in scale adaptation studies.[26,33] since the results of CFA were not found to be acceptable in this study, EFA was performed, and it was seen that some items were included in different sub-dimensions from the original structure. Although it is recommended in the literature to apply CFA in a different sample in this case, the same data set was used due to the difficulty of data collection. Future studies can expand the current methodology to include participants from various locations to test and expand on the findings from this study.

CONCLUSION

In conclusion, this study revealed that the Turkish version of MCD-I has good validity and reliability in men diagnosed with infertility. This inventory will assist researchers in evaluating the internalized beliefs of these men about masculinity, and help to improve their health of men. For future research, it is recommended that the construct validity of the Turkish version of MCD-I in men be tested with different chronic diseases, such as diabetes, heart disease, hypertension, kidney disease and asthma.

Ethics Committee Approval
The study was approved by Sakarya University Ethics Committee. (date and number of approval: 30.03.2021/E-71522473-050.01.04-21438-195).

Peer-review
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Conflict of Interest
No conflict of interest was declared by the authors.

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