Journal of Iranian Medical Council, Volume 9, Issue no. 4
http://dx.doi.org/10.18502/jimc.v9i4.22464

Original Article

Validity and Internal Consistency of the Persian Version of the Copenhagen Hip and Groin Outcome Score for Evaluation of Hip and Groin Pain among Iranian Athletes

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Abstract

Background: Copenhagen Hip and Groin Outcome Score (HAGOS) was previously translated to Persian. In this study, the construct validity, discriminative validity, and internal consistency of HAGOS among Iranian athletes were evaluated.

Methods: This study was cross-sectional conducted between 2014 and 2015 at the physiotherapy clinics and sport clubs of Tehran. One hundred athletes with hip and groin pain and 50 healthy athletes were included. Participants completed the Persian version of HAGOS, and the Visual Analog Scale (VAS) was used to assess the severity of their hip and groin pain. The construct validity, discriminative validity, and internal consistency of the HAGOS were assessed.

Results: In total, 100 athletes with hip and groin pain (mean age= 25.5 *yr*, SD=3.3) and 50 healthy athletes (mean age= 24.7 *yr*, SD= 3.5) participated in the study. The mean total HAGOS score and all its subscale scores were significantly lower in athletes with pain compared to healthy athletes ($p<0.001$), indicating the discriminative validity of the Persian version of HAGOS. HAGOS' total score had a strong correlation with VAS score (coefficient -0.75, $p<0.001$), and all its subscales had moderate negative correlations with the VAS score ($p<0.001$), confirming the construct validity. The total HAGOS score had a Cronbach's alpha of 0.87, indicating acceptable internal consistency.

Conclusion: The present study demonstrated the internal consistency, discriminative validity, and construct validity of the Persian version of HAGOS for assessing hip and groin pain and function among Iranian athletes. This tool can be considered as a useful tool for both clinical practice and research involving Iranian athletes with hip and groin pain.

Keywords: Athletes, Groin, Hip, Pain

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Received: 1 Aug 2025
Accepted: 4 Oct 2025

Citation to this article
Valian S, Nakhostin Ansari N, Jalaie Sh, Salsabili N, Naghdi S. Validity and Internal Consistency of the Persian version of the Copenhagen Hip and Groin Outcome Score for Evaluation of Hip and Groin Pain among Iranian Athletes. *J Iran Med* Counc. 2026;9(4):955-61.

Introduction

Hip and groin pain is one of the most common and diagnostically challenging conditions within the spectrum of musculoskeletal disorders (1). While it can affect both the general population and professional athletes, the consequences for athletes are much more significant. Athletes with ongoing hip and groin pain might experience increased dependency on medication, higher surgical intervention rates, limited participation in training and competition, and potentially early retirement (2). This significant burden is largely due to the complex pathophysiology of hip and groin pain, such as femoroacetabular impingement, labral pathologies, and osteoarthritis/arthritic changes. The anatomical proximity of multiple musculoskeletal and soft tissue components makes it difficult to isolate the exact source of pain, leading to substantial diagnostic and prognostic challenges (3).

To better understand, manage, and evaluate treatment outcomes for hip and groin pain in athletes, a validated and reliable measurement tool is essential. The Copenhagen Hip and Groin Outcome Score (HAGOS) is a self-reported questionnaire for young to middle-aged, physically active individuals with hip and groin pain. Developed by Thorborg *et al* in 2011, HAGOS consists of 37 items on pain, symptoms, function in daily living, sport and recreation function, and hip-related quality of life. The questionnaire's scores range from 0 to 100, with higher scores indicating more severe symptoms (4). Initially being developed in English, to date, HAGOS has been translated and validated in several languages, including Swedish, Danish, Norwegian, Portuguese, Italian, Chinese, Brazilian, and Dutch (5-14). However, to ensure its effective use in Iranian settings, this tool must be culturally adapted and validated in Persian to allow for accurate assessment and meaningful interpretation in both clinical and research contexts in Iran.

Although the study team previously translated and culturally adapted HAGOS into Persian and demonstrated its acceptable test-retest reliability (intraclass correlation coefficient (ICC) of 0.74 (95% CI: 0.59-0.84) in a sample of 50 young male athletes (15), the validity of the Persian version has not been evaluated yet. Therefore, further studies are still needed to evaluate other aspects of the reliability and validity of the Persian version. In this study, the aim was to further evaluate HAGOS in a population of athletes with and without hip and groin pain. Herein, HAGOS construct validity, discriminative validity, and internal consistency across its total scores and its subscales was assessed in a cross-sectional study.

Materials and Methods

Design

This study was a cross-sectional one conducted between 2014 and 2015 at the physiotherapy clinics and sport clubs of Tehran. The present investigation complements the authors' previous study, which detailed the translation, cross-cultural adaptation, and test-retest reliability of the Persian HAGOS in a sample of 50 athletes (15). The Ethics Committee of Tehran University of Medical Sciences approved the study protocol (ethics code: IR.TUMS.REC.1394.1700).

Participants

A convenience sampling method was assessed to recruit 100 athletes with hip and groin pain and 50 healthy athletes from physiotherapy clinics and sports clubs in Tehran, the capital of Iran. The sample size was determined based on Terwee *et al*'s guidelines, which recommend a minimum of 50 participants to assess construct validity and at least 100 participants to evaluate internal consistency (16). The eligibility criteria were: (1) age between 18 and 45 *yr*, (2) participation in at least three training sessions per week, each lasting a minimum of two hours, (3) ability to read and write in Persian, (4) absence of any other musculoskeletal disorders, and (5) willingness to participate and provide informed consent. one hundred athletes had hip and groin pains at the time of the study, and 50 were healthy with no hip and groin pain.

Outcome measures

Copenhagen hip and groin outcome score: HAGOS, which was initially developed by Thorborg *et al* and later translated to Persian by Valian *et al*, consists of 37 items in 6 domains: symptoms (7 items), pain (10 items), physical function in daily living (5 items), function, sports, and recreational activities (8 items), participation in physical activities (2 items),

and quality of life (5 items). Each item was rated by the participants on a Likert scale ranging from 0 to 4, with higher scores indicating less difficulty and less severe symptoms. Subscale scores and total HAGOS scores were calculated by summing the relevant item scores and then converting the total to a percentage (4,15). The Persian version of HAGOS was used in this study.

Visual analog scale

The Visual Analog Scale (VAS) is a reliable and valid self-report measure used in this study to assess the severity of hip and groin pain (17). It is rated on a scale from 0 to 10, with higher scores indicating greater pain intensity.

Procedure

Participants were informed about the study's goals and objectives and provided written informed consent before being enrolled in the study. After that, they were enrolled in the study and completed the study's questionnaire, and their basic and demographic characteristics were recorded, Also the participants' age and height in cm and weight in kg were recorded.

Discriminative validity

For the evaluation of discriminative validity, the HAGOS total score and its subscale scores were compared between participants with and without hip and groin pains.

Construct validity

The construct validity was assessed by comparing the total and subscale scores of the HAGOS with the VAS scores.

Statistical analysis

The mean and Standard Deviation (SD) was calculated for the continuous variables and frequency and percentage for categorical variables. The HAGOS scores were compared between athletes with and without pain using the Independent-samples t-test. Furthermore, Pearson's correlation test was used to evaluate the association between the HAGOS and VAS scores. The correlation coefficients were interpreted as follows (18):

<0.1: Negligible correlation
0.1-0.39: Week correlation
0.4-0.69: Moderate correlation
0.7-0.89: Strong correlation
0.9-1: Very streong correlation

Finally, the Cronbach's alpha to was calculated to assess the questionnaire's internal consistency. Cronbach's alpha values between 0.7 and 0.9 were considered to be acceptable (19). SPSS version 17 for data analysis was used, and considered $p<0.05$ statistically significant.

Results

In total, 100 athletes with hip pain (mean age= 25.5, SD= 3.3) and 50 healthy athletes (mean age= 24.7, SD=3.5) participated in the study (Table 1). The mean VAS score was 5.6 (SD=1.5) in the group with hip and groin pain. The mean total HAGOS score and all its subscale scores were significantly lower in athletes with pain compared to those without pain ($p<0.001$), indicating the discriminative validity of the Persian version of HAGOS (Table 2).

The HAGOS total and its subscales' scores correlations with the VAS score are shown in table 3. HAGOS' total score had a strong correlation with VAS score (coefficient -0.75, $p<0.001$). All subscales had moderate negative correlations with the VAS score ($p<0.001$).

Table 4 presents the Cronbach's alpha values for the HAGOS total score and its subscales. The total

Table 1. Basic and demographic characteristics of participants

Variables	With pain (n=100)	Without pain (n=50)
Age (year)	25.5(3.3)	24.7(3.5)
Height (*cm*)	176.9(4.5)	176.1(4.1)
Weight (*kg*)	74.1(4.1)	72.7(3.8)
Values are reported as mean (SD)		

Table 2. Comparison of copenhagen hip and groin outcome score and visual analog scale score between athletes with and without pain

Variable		With pain (n=100)	Without pain (n=50)	p-value
Copenhagen hip and groin outcome score	Symptom	57.7(15.6)	95.4(4.3)	<0.001
	Pain	61.8(14.1)	98.4(2.2)	<0.001
	Physical function in daily living	59.3(13.6)	99.9 (0.7)	<0.001
	Function, sports, and recreational activities	39.2(15.0)	97.7(3.6)	<0.001
	Participation in physical activities	44.1(18.5)	93.5(8.8)	<0.001
	Quality of life	43.3(14.8)	98.5(3.2)	<0.001
	Total score	50.2(13.3)	97.2(2.3)	<0.001

Table 3. Copenhagen hip and groin outcome total and subscales scores' correlations with the visual analog scale score among athletes with hip pain (n=100)

Variable	Correlation with VAS score	
	Pearson's correlation coefficient	P-value
Symptom	- 0.6	<0.001
Pain	- 0.65	<0.001
Physical function in daily living	- 0.64	<0.001
Function, sports, and recreational activities	- 0.62	<0.001
Participation in physical activities	- 0.56	<0.001
Quality of life	- 0.79	<0.001
Total score	- 0.75	<0.001

Table 4. Internal consistency of copenhagen hip and groin outcome total and subscales scores (n=150)

Scale	Cronbach's alpha
Symptom	0.8
Pain	0.86
Physical function in daily living	0.74
Function, sports, and recreational activities	0.89
Participation in physical activities	0.64
Quality of life	0.78
Copenhagen hip and groin outcome score	0.87

HAGOS score had a Cronbach's alpha of 0.87, indicating acceptable internal consistency. Among the subscales, the function, sports, and recreational activities subscale showed the highest (Cronbach's alpha=0.89), while the participation in physical activities subscale had the lowest (Cronbach's alpha= 0.64) Cronbach's alpha.

Discussion

In this study, the reliability and validity of the Persian version of the HAGOS, which was developed previously and its test-retest reliability confirmed, was further evaluated (15). The findings demonstrated that the HAGOS has acceptable internal consistency.

Moreover, HAGOS' moderate to strong correlations with VAS scores, along with significant differences in HAGOS scores between athletes with and without hip pain, support both the discriminative and construct validity of the tool.

In the present study, the Persian version of HAGOS questionnaire demonstrated acceptable internal consistency. The Cronbach's alpha values for its subscales ranged from 0.7 to 0.9, which falls within the acceptable range, except for the participation in physical activities subscale, which had a lower alpha value of 0.64. In the original version of the HAGOS, the pain (Cronbach's alpha= 0.91) and function, sports, and recreational activities (Cronbach's alpha= 0.93) subscales had Cronbach's alpha values slightly above 0.9, which may indicate some redundancy among the items within these subscales (4,19). A similar issue was also observed in the Dutch version of the HAGOS, where all subscales had Cronbach's alpha values above 0.9, except for the participation in physical activities subscale, which had a slightly lower Cronbach's alpha of 0.89 (9). On the other hand, for the Swedish version of HAGOS, Cronbach's alphas for all subscales were between 0.7 and 0.9 (5) . While the Persian version of the HAGOS may not match the Swedish version in terms of internal consistency, it also does not have the redundancy issues observed in the original and Dutch versions of the questionnaire. The low Cronbach's alpha for the participation in physical activities subscale in this study might be due to the small number of items (n=2) in this subscale. In the preliminary version of the questionnaire, these two items were originally part of the function, sports, and recreational activities subscale, but were later categorized into a separate participation in physical activities subscale, as the authors found that in the factor analysis these items assessed a distinct factor compared to the other eight items in the preliminary function, sports, and recreational activities subscale. Therefore, one possible solution might be to merge the function, sports, and recreational activities subscale with the participation in physical activities subscale in the Persian version of HAGOS, and conduct further analyses to determine whether the issues with internal consistency and factor structure can be resolved.

The present study confirmed both the discriminative and construct validity of the Persian version of HAGOS and all its subscales' scores. To the best of authors knowledge, no study has assessed the association between the severity of pain using VAS scores and HAGOS scores among athletes. A study by Thorborg *et al* assessed the association between HAGOS and 36-Item Short Form Survey (SF-36) and their subscales' scores. In that study, HAGOS showed weak to strong correlations with the physical functioning subscale, weak to moderate correlations with the physical role and bodily pain subscales, weak correlations with general health, vitality, social functioning, and mental health subscales, and no correlation with the emotional role subscale of SF-36 (4). For the Chinese version, there were moderate correlations with the physical functioning, physical role, and bodily pain subscales, weak to moderate correlations with the general health subscale, and weak correlations with the vitality, emotional role, social functioning, and mental health subscales of SF-36 (7). Taking these two studies into account, the strongest correlations were observed with the physical function and bodily pain subscales of SF-36 (4,7). The moderate to strong correlation observed between the Persian version of HAGOS and VAS score, along with the findings from other studies that have demonstrated the associations between different versions of HAGOS and measures of pain and functions, shows that HAGOS can effectively measure hip and groin pain and function.

Limitations

This study had several limitations worth noting. First, certain psychometric properties of the Persian version of the HAGOS, such as responsiveness, have not yet been assessed. Further research is needed to comprehensively evaluate its reliability and validity. Second, the present study population was limited to Iranian athletes in Tehran, which may restrict the generalizability of the findings.

Additional studies with larger sample sizes are required to assess the validity and reliability of the HAGOS in broader Iranian populations. Finally, only a limited number of demographic variables were recorded in this study, and future studies should include and assess a broader range of variables, such as gender and type of sport, to better evaluate the generalizability of the findings.

Conclusion

Present study demonstrated the internal consistency, discriminative validity, and construct validity of the Persian version of HAGOS for assessing hip and groin pain and function among Iranian athletes, building on the previous study that had demonstrated its test-retest reliability (15). While further studies are needed to assess the reliability and validity of the Persian version of HAGOS in different Iranian populations, it can be considered a useful tool for both clinical practice and research involving Iranian athletes.

Funding

The study was supported as a part of a thesis by Tehran University of Medical Sciences.

Acknowledgement

We gratefully acknowledge the athletes who participated in this study and thank the Research Deputy of Tehran University of Medical Sciences (TUMS) for their support

Conflict of Interest

There was no conflict of interest in this manuscript.

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