



## Original Article

## Identification of the Predictive Value of Demographic Factors on Users' Satisfaction with Lower-limb Orthoses and Services in Ahvaz: A Regression Analysis

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### ABSTRACT

**Background:** Satisfaction with orthotic devices and services results in more significant orthotic usage. Evaluation of users' satisfaction could enhance the quality of service delivery. This study aimed to identify the predictive value of demographic factors on users' satisfaction with lower-limb orthoses and related services.

**Methods:** This study was a cross-sectional one. Ninety-seven users of lower-limb orthoses LLO participated in this cross-sectional study. Users' satisfaction was evaluated with the Orthotic & Prosthetic Users' Survey (OPUS). SPSS version 22 using linear regression test was used to identify which demographic variables explain variation in satisfaction with LLO and services.

**Results:** According to linear regression, the variance of satisfaction with the device was significantly explained by the income level and the type of orthosis ( $P < 0.05$ ). However, the predictive value of these variables was relatively low (Adjusted  $R^2 = 0.118$ ). The results also showed that the variance of satisfaction with services was significantly explained by none of the dependent demographic variables ( $P > 0.05$ ), and the prediction of the independent variable by the demographic variables was very low (Adjusted  $R^2 = 0.063$ ).

**Conclusion:** Orthotists should focus more on clients with low-income to acquire their satisfaction with devices and services. To satisfy their users, they also need to be more careful when making long orthoses such as Knee Ankle Foot Orthosis or Hip Knee Ankle Foot Orthosis.

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### Introduction

The World Health Organization (WHO) global disability action plan 2014-2021 calls for the WHO members to improve access to assistive devices and support services [1]. Prescribing the orthotic devices for people with disabilities is an essential part of a

rehabilitation program to improve their health, quality of life, and performance [2]. An orthotic device is an externally applied device designed and fitted to the body to provide immobilization, support, correction, protection, assistance, and independence [3]. The lower-limb orthoses (LLO), ranging from a medical insole to a Hip Knee Ankle Foot Orthosis (HKAFO), are the most common type of orthoses that are used for neurological disorders, musculoskeletal disorders, and orthopedic injuries [4-6]. Lots of studies show the effectiveness of LLO in the improvement of gait, [7] tone reduction,

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deformity correction, [8] and joint protection [9]. Despite the benefits of using LLO, some patients may not be satisfied with these orthoses in some areas [10].

According to the WHO, one of the main goals of any healthcare system is to respond to consumer expectations [5]. Evaluating users' satisfaction is considered an important outcome measurement in evidence-based healthcare and the client-centered approach [11]. It is assumed as a challenging task that depends on the technical quality of orthosis and the quality of services provided by practitioners and facilities. A user may be satisfied with the device but may be dissatisfied with the services, or vice versa [12].

Users' satisfaction with orthosis greatly affects the use or non-use of orthosis, so dissatisfaction can lead to non-use, which puts a heavy financial burden on the health care system and the clients [13]. Başaran et al. [14] showed the primary cause for not using the prescribed devices was the unsuitableness of the LLO over time. Users' satisfaction leads to increased customer use of the services. In addition, focusing on users' satisfaction minimizes the spread of negative messages by dissatisfied users [15].

Hoerger et al. found that users' satisfaction was directly related to the availability of services, fast delivery, reliability, and device usage training [16]. Swinnen et al. [10] reported that factors associated with functionality and comfort were more important than the aesthetic and psychological aspects of LLO. However, many factors such as the client's physical condition, economic status, and his/her lifestyle could affect users' satisfaction [17]. Therefore, this study aimed to evaluate the predictive value of demographic variables on users' satisfaction with LLO and related services in Ahvaz city.

## Methods

This cross-sectional study was performed based on convenient sampling in private and public Orthotics and Prosthetics (O&P) clinics in Ahvaz (Iran) from January 2017 to July 2019. Participants included the people who 1) received their LLO from private or public O&P clinics in Ahvaz, 2) were using their LLO at the time of evaluation, 3) were residents of Ahvaz, 4) were able to read and write in Persian and 5) were willing to participate in the study. The children with intellectual disabilities and people with cognitive impairments were excluded. After obtaining the code of ethics from the Ethics Committee of the Ahvaz Jundishapur University of Medical Sciences (IR.AJUMS.REC.1397.322) and coordination with administrators of the O&P clinics, the patients or their guardians completed the consent form. Demographic information was then taken, including the type of orthosis, gender, age, type of O&P clinic (private or public), income level (low or high), patient diagnosis, and duration of orthotic usage. Age was divided into 4 categories: children and adolescents (8 to 17 years), adulthood (18 to 34 years), middle-aged (35 to 59 years), and elderly (60 years and older). LLOs were classified into four types: 1- Foot Orthoses (FO), including orthopaedic shoes and medical insoles, 2- Ankle Foot Orthoses (AFO), 3- Knee Orthoses

(KO), 4- Knee Ankle Foot Orthosis (KAFO) and HKAF0. The duration of orthotic usage was divided into 2 categories: less than 6 months or short-term usage, and more than 6 months or long-term usage. The users were classified into two categories based on their diagnosis including Neurological disorders such as stroke, spinal cord injuries, cerebral palsy, multiple sclerosis, and myelomeningocele; and musculoskeletal disorders or orthopaedic injuries such as muscular dystrophy, anterior cruciate ligament reconstruction, and knee osteoarthritis. After obtaining the demographic information, the users' satisfaction with LLO was evaluated using the Orthotics and Prosthetics Users' survey (OPUS) questionnaire through face-to-face paper-based interviews with each participant by a second author.

The OPUS questionnaire was used to assess users' satisfaction because it showed to be an appropriate tool for evaluating satisfaction with the orthosis and related services in clinical settings [18]. The OPUS is a self-report questionnaire first developed in the United States in 2003 by Allen Heinemann [19]. It consists of 21 items, its first 11 items are related to the satisfaction with the device, and the next 10 items are related to the satisfaction with services. Each item scores based on a Likert scale of five possible responses. The responses "strongly agree", "agree", "neither agree nor disagree", "disagree", and "strongly disagree" were scored as 5, 4, 3, 2, and 1, respectively. Don't know/not applicable option was considered as missing data and was not included in the scoring. The total summation score of items for each satisfaction subscale was converted to an equal interval score determined by the OPUS developer based on Rasch analysis. So, for each subscale, the satisfaction score ranged from 0 (the lowest possible satisfaction) to 100 (the highest imaginable satisfaction). The scores above 50 (average) were considered higher than average satisfaction, and those below 50 were considered lower than average satisfaction. This questionnaire was translated into Persian. Cronbach's alpha coefficient was 0.71 and 0.89 for device and service satisfaction, respectively [12].

Descriptive analysis in terms of frequency, percentage, mean, and standard deviation was performed by SPSS-26. Kolmogorov-Smirnov test showed the data were distributed normally, so the Pearson correlation was used to identify the relationship between the variables. The linear regression test was used to identify which factors explain variation in satisfaction with devices and services. All independent variables entered the equation simultaneously (Inter method). Before regression analysis, regression assumptions, including the normality, linearity, homoscedasticity, and absence of multicollinearity, were checked. Scatterplot graph between the standardized predictive value of the dependent variables with the standardized residual from the regression justified the linearity and the homoscedasticity assumptions of a linear regression model. The one-way analysis of variance and t-test were used to test for differences among each section of demographic variables in terms of satisfaction with device and orthosis. The significance level was considered to be 0.05.

**Results**

Initially, 113 users enrolled in this study, but 16 people who did not meet the inclusion criteria, were excluded [Could not read and write in Persian (N=10); were not the residents of Ahvaz (N=2); and had intellectual or cognitive impairments (N=4)]. The final sample size was 97 users (mean age: 27.27±19.72 years) (Response rate=85.84%). Table 1 shows the characteristics of these participants. Most orthotic users were in the children and adolescents age group; the most used orthoses were FO with 46.4%, and the least used was KO with 14.4%. Also, most participants used their device less for than 6 months (57.7%), and the neurological patients were the most users of orthoses (61.9%).

The overall mean and standard deviation of

satisfaction with device and services was 50.65±8.67 and 58.61±13.83, respectively. According to Table 1, there was a significant difference in satisfaction with the device between the high and low-income people, so people with low-income levels had significantly lower satisfaction with their device (P<0.05). There was a significant difference in device satisfaction among users of different types of orthoses (P<0.05). After the Tukey's test, it was found that the observed difference was due to a difference in users' satisfaction with the KAFO+HKAFO and the users' satisfaction with the FO (P<0.05). However, none of the demographic variables had a significant relationship with service satisfaction (P>0.05).

The mean and standard deviation of each item of the OPUS questionnaire is shown in Table 2. Higher than

**Table 1:** Demographic characteristics, satisfaction scores and significant differences among different variables in the study

Demographic variable		Frequency Num (Per)	Satisfaction with device Mean±SD	Test Statistics and Significant value	Satisfaction with services Mean±SD	Test Statistics and Significant value
Age Group	8-17 years	40 (41.2)	50.71±8.08	F=0.729 P=0.868	59.23±14.65	F=1.430 P=0.699
	18-34 years	24 (24.8)	51.96±10.28		56.40±11.24	
	35-59 years	25 (25.8)	49.63±8.31		57.74±12.82	
	More than 60	8 (8.2)	49.55±8.51		64.86±19.51	
Duration of orthotic usage	Less than 1 years	69 (71.1)	50.32±8.88	t=-0.593 P=0.556	59.45±14.63	t=1.042 P=0.301
	More than 1 years	28 (28.9)	51.44±8.23		56.52±11.59	
Type of Orthosis	Foot Orthosis	45 (46.4)	52.57±7.94	F=13.963 P=0.003	58.79±13.61	F=3.427 P=0.330
	Ankle Foot Orthosis	18 (18.6)	52.76±11.88		61.18±17.35	
	Knee Orthosis	14 (14.4)	48.92±6.86		52.88±10.98	
	Knee Ankle Foot Orthosis+ Hip Knee Ankle Foot Orthosis	18+2 (20.6)	45.68±5.90		59.90±12.37	
Gender	Male	41 (42.3)	50.45±7.80	t=-0.077 P=0.939	59.57±13.37	t=-0.934 P=0.350
	Female	56 (57.7)	50.79±9.32		57.91±14.23	
Income level	High	51 (52.6)	53.00±10.09	t=-1.882 P=0.049	61.87±15.02	t=-2.134 P=0.033
	Low	46 (47.4)	48.52±6.56		55.67±12.06	
Type of O&P clinic	Private	42 (43.3)	51.42±9.19	t=-0.722 P=0.470	60.76±14.40	t=-1.640 P=0.101
	Public	55 (56.7)	49.64±7.94		55.80±12.67	

**Table 2:** Mean and standard deviation of OPUS questionnaire

Item Number*	Item description	Mean	SD
1	My orthosis fits well	4.37	0.82
2	The weight of my orthosis is manageable	3.63	1.25
3	My orthosis is comfortable throughout the day	3.71	1.20
4	It is easy to put on my orthosis	3.82	1.12
5	My orthosis looks good	4.28	0.87
6	My orthosis is durable	3.33	1.25
7	My clothes are free of wear and tear from my orthosis	3.60	1.06
8	My skin is free of abrasions and irritations	3.55	1.07
9	My orthosis is pain free to wear	3.55	1.07
10	I can afford the out-of-pocket expenses to purchase and maintain my orthosis	2.75	1.25
11	I can afford to repair or replace my orthosis as soon as needed	3.13	1.28
12	I received an appointment with a orthotist within a reasonable amount of time	4.43	0.93
13	I was shown the proper level of courtesy and respect by the staff	3.96	1.08
14	I waited a reasonable amount of time to be seen	3.93	1.11
15	Clinic staff fully informed me about equipment choices	4.26	0.98
16	The orthotist gave me the opportunity to express my concerns regarding my equipment	4.48	0.78
17	The orthotist was responsive to my concerns and questions	4.56	0.66
18	I am satisfied with the training I received in the use and maintenance of my orthosis	4.43	0.78
19	The orthotist discussed problems I might encounter with my equipment	4.49	0.68
20	The staff coordinated their services with my therapists and doctors	2.78	1.13
21	I was a partner in decision-making with clinic staff regarding my care and equipment	3.50	1.08

\*The device satisfaction: Items 1 to 11, The service satisfaction: Items 12 to 21

**Table 3:** The correlation between service and device satisfaction and demographic variables

Variables		Age group	Duration of Orthotic Usage	Income Level	Gender	Clinical Setting	Type of Orthosis	Patient Diagnosis
Service satisfaction	Pearson Correlation	-0.038	-0.053	0.225	-0.059	-0.179	-0.023	-0.011
	P value	0.714	0.604	0.027	0.563	0.080	0.823	0.916
Device satisfaction	Pearson Correlation	-0.007	0.034	0.259	0.019	-0.102	-0.308	-0.086
	P value	0.949	0.744	0.010	0.851	0.319	0.002	0.401

**Table 4:** ANOVA results related to linear regression test for satisfaction with device and services

Variables	Model	Degree of Freedom	Mean Square	F	P value
Satisfaction with device	Regression	7	279.309	4.718	0.000
	Residual	89	59.203		
	Total	96			
Satisfaction with services	Regression	7	169.217	0.877	0.528
	Residual	89	192.995		
	Total	96			

**Table 5:** Predicting value of different demographic variables regarding the device and services satisfaction based on linear regression

Variables	Satisfaction with Device			Satisfaction with Services		
	Coefficients (a) Adjusted R <sup>2</sup> =0.118			Coefficients (b) Adjusted R <sup>2</sup> =0.063		
	B	Test statistics (t)	Significant value	B	Test statistics (t)	Significant value
(Constant)	42.244	6.458	0.000	58.222	5.247	0.000
Age Group	0.685	0.724	0.471	0.500	0.311	0.756
Duration of orthotic usage	0.622	0.837	0.405	0.006	0.005	0.996
Type of Orthosis	-2.436	-3.124	0.002	-0.172	-0.130	0.897
Gender	1.205	0.680	0.498	-1.664	-0.554	0.581
Income level	5.054	2.670	0.009	4.641	1.445	0.152
Type of O&P clinic	1.126	0.573	0.568	-3.129	-0.939	0.350

average (score 3) in most items of both sections of the questionnaire showed that users were relatively satisfied with their orthoses and related services. According to this table, in the device satisfaction section, item 1 entitled “my orthosis fits well,” had the most satisfaction mean score (4.37±0.82), and item 10 entitled “I can afford the out-of-pocket expenses to purchase and maintain my orthosis” had the least satisfaction mean score (2.75±1.25). In the service satisfaction section, item 17 entitled “The orthotist was responsive to my concerns and questions,” received the highest satisfaction mean score (4.56±0.66), and item 20 entitled “The staff coordinated their services with my therapists and doctors” received the least satisfaction mean score (2.78±1.13).

The Pearson correlations between the variables are shown in table 3. According to the results, the device satisfaction was significantly correlated with income level and type of orthosis, whereas the service satisfaction was significantly correlated with income level (P<0.05) (Table 3).

Table 4 shows the ANOVA results related to the linear regression test for satisfaction with devices and services. The results of the linear regression showed that the independent variable of device satisfaction was significantly affected by the demographic variables of income level and the type of orthosis (P<0.05) (Table 5). However, the predictive value of these variables was relatively low (R<sup>2</sup>=0.118). The results also showed that the independent variable of service satisfaction was affected by none of the dependent demographic variables (P>0.05), and the prediction of the independent variable

by demographic variables was very low (R<sup>2</sup>=0.063).

## Discussion

The results of this study on users’ satisfaction with LLO and services indicated the satisfactory performance of orthotists in providing and fitting orthoses, which was stated as good adjustment, light, comfortable and painless fabrication, without any significant damage to clothing and skin. The most dissatisfaction was with the cost of purchasing, replacing, maintaining, and repairing the orthoses. The results regarding the service satisfaction showed that the orthotists were responsive to users about possible problems with orthoses and were responsive to their questions and concerns about using orthoses. It should be noted that the orthotist evaluates the patient after the referral by the physician, performs the necessary mouldings and measurements, and designs and fabricates the orthosis. However, they had a poor performance in coordinating with the physicians and rehabilitation professionals regarding teamwork and involving the patient in the decision-making process.

Our findings were consistent with Ghoseiri’s study’s results in both device and service satisfaction sections. In both studies, users were not satisfied with the coordination of services between therapists and physicians, and there was relatively high satisfaction with orthosis fitness [4]. The physicians should pay more attention to certain issues, including the proper usage of the orthoses, regular follow-ups, patient education, and engagement of the users to satisfy the patients [14]. In Magnusson’s study

in Sierra Leone, the greatest dissatisfaction was with repairs, maintenance, and after-sales service, which is somewhat consistent with our results [20]. The results of this study differed from Holtkamp [21], Federici [13], and Swinnen et al. [10]. The results of these studies indicated that aesthetic issues, weight, appearance, comfort, safety, adjustment, efficiency, and lack of adequate training were the reasons for users' dissatisfaction. In contrast, in our study, less dissatisfaction was seen in these items. Magnusson showed that the people in Sierra Leone and Malawi had low expectations. These low expectations led orthosis users in these countries to look at features like appearance, weight, comfort, and adjustment differently from the orthosis users in developed countries [22, 23]. In Iran, as a developing country, the situation is the same, and due to the current economic situation, users are more involved in cost-related issues. They, therefore, may pay less attention to other aspects. The rough economic conditions of Iran could be a source of dissatisfaction with the costs of purchasing, repairing, and maintaining devices. In most O&P clinics in Iran, the process of orthosis fabrication is costly, with the high price of high-quality materials that affect the quality of fabrication, durability, and the final price of the orthosis. In addition, in private O&P clinics, the cost of orthosis and after services is much higher than in public clinics. Lack or low support of insurance companies in the payment and compensation of costs may be the reason of users' dissatisfaction. At the same time, in the communities which were studied by Federici (Italy), Holtkamp (Netherlands), and Swinnen (Belgium), these devices are covered by insurance. As a result, dissatisfaction is less pronounced in this section. In the study of Alsancak [24], the greatest dissatisfaction was with the size of the assistive device, which differs from the present study. In Alsancak's study, satisfaction with wrist splints was investigated. The size and dimension are probably more important in upper limb orthoses than the LLO because of the elegance and appearance of upper limb orthoses and the variety of upper limb movements.

Due to the low satisfaction with the coordination between orthotists and physicians, it is recommended to all rehabilitation team members, including the physicians (orthopedist, physiatrist, neurologist, ...), the orthotists, the physical therapists, and the occupational therapists, to have more collaborate in the form of interdisciplinary teamwork regarding the prescription of orthoses for the clients in a client-centered approach. Jahanbin et al. stated that teamwork is uncommon in Iran, and there is rarely a team that supports the patient. Many physicians and therapists have not received adequate and formal training regarding teamwork and generally have a negative attitude toward it [25]. Also, in the Stratil study, poor collaboration between physicians and rehabilitation professionals was reported, which is consistent with our findings [26]. On the other hand, one of the most important aspects of patient satisfaction is paying attention to his/her requests and priorities in a client-centered approach [11]. McKay and Rivard stated that O&P interventions should be tailored to each client's specifications and unique conditions in a client-centered approach [27].

Unfortunately, this approach is less considered among rehabilitation professionals, including the orthotists in Iran, which should be given more importance. The orthotists are suggested to pay more attention to the needs and priorities of the clients.

The results also showed that gender and age were not associated with users' satisfaction with an orthosis. Heidari et al. [26] and Chen et al. [11] also showed no significant relationship between users' satisfaction and age and gender, [11]. Still, in a study conducted by Hall and Dornan [28], older people were more satisfied with health care than others, which was inconsistent with our results. It should be noted that in the recent study, the number of older adults was relatively low (8%), and this small number could hardly affect the study results. In another study, Magnusson found that women were less satisfied with their orthoses than men, which is not consistent with the results of this study. This discrepancy might be related to gender discrimination among women in Sierra Leone who are among the most marginalized socially, economically, and politically in the world, which may affect Sierra Leone's women's access to services [29].

Another result of this study was the lack of relationship between clinic types, whether private or public and satisfaction with devices and services. Numerous studies have shown that patients are more satisfied with private sector services than public health care systems [30-32]. On the other hand, in some studies, there was no significant difference between satisfaction with public and private health care services [33]. It should be noted that these studies were generally performed in hospital wards, and no study was found in O&P clinics so more studies are warranted.

The results also showed that the duration of orthotic usage did not significantly affect the satisfaction with the device and services. Heidari et al. [26] also showed the same results. Chen et al. [11] found that people who used their orthoses for less than a year were more satisfied than those who used them for more than a year, which was inconsistent with the recent study. The reason for this discrepancy could be the duration of orthotic usage in our study, which was mainly less than one year (71.1%). Furthermore, in this study, only the LLO was evaluated, while in Chen's study, the spinal orthoses were also examined in addition to LLO. Also, the test used in Chen's study was Quest, which differs from the recent study.

The results also showed that low-income people were less satisfied with devices and services than those with higher incomes. As previously mentioned, the satisfaction with the device was also lower in the cost-related items, including the item #10 "I can afford the out-of-pocket expenses to purchase and maintain my orthosis," and the item# 11 "I can afford to repair or replace my orthosis as soon as needed". Numerous studies show the poor economic situation of people with disabilities [34, 35]. The costs of medical, rehabilitation, and transportation for people with disabilities and their families are very high [34]. Magnusson also showed that some people with disabilities in Malawi and Sierra Leone could not access O&P services due to poverty [20, 22, 23]. Because

most clients of O&P clinics have frequent medical and rehabilitation visits, including occupational therapy and physiotherapy, and unfortunately the health insurance companies do not cover the rehabilitation services, the orthotic costs put huge pressure on these people and mostly affect the poor people. Although most people go to public clinics, even governmental tariffs are high for these clients. Because some of them have no income and live only with subsidies, the insurance companies and governmental and non-governmental organizations need to provide more support to these people in terms of receiving orthoses and after-sales services.

Finally, the results showed that users of KAFO and HKAFO had lower satisfaction with their orthoses than those of FO. The type of orthosis affected the users' satisfaction with the device and the services. The KAFO and HKAFO are mainly prescribed for people with more severe and chronic disabilities such as spinal cord injuries and polio [36]. These orthoses are larger, heavier, more expensive, and time-consuming than FO. Federici and Borsci [13] reported that the reasons for the dissatisfaction of Italian users were the high weight of the device, lack of personalization, lack of comfort, and low efficiency, all of which are challenging for the users of long orthoses such as KAFO and HKAFO. Vahhab-Kashani et al. [37] identified the defects in the prescription and fabrication of long orthoses, including the incompatibility of orthoses with clinical and technical principles, so that elimination of these defects could ensure the users' satisfaction. The KAFO and HKAFO are generally made of metal, making the orthosis heavier, so the use of light plastic materials makes orthosis easier to wear and helps solve these kinds of problems. Also, due to the higher price of these orthoses, the need for insurance support becomes more apparent in this regard.

The present study had some limitations, such as the non-cooperation of some O&P managers in allowing their clients to participate in the study. Therefore, besides the adequacy of sample size in the regression model, if the sample size were greater, the prediction value would get higher given the number of independent variables included in the regression analysis. It is also recommended that future research uses the OPUS questionnaire to assess the users' satisfaction with other orthoses.

## Conclusion

Orthotists should focus more on clients with low-income to acquire their satisfaction with devices and services. To satisfy their users; they need to be more careful when making long orthoses such as Knee Ankle Foot Orthosis or Hip Knee Ankle Foot Orthosis. They should also emphasize the quality of device fabrication, teamwork, and a client-centered approach to ensure the users' satisfaction with LLO and related services.

**Conflict of Interest:** None declared.

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