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Research Article

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Association of Psychosocial Factors with Exercise Engagement in Adult Users of Primary Health Care

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Abstract

Background: In this study, the association between psychosocial factors and exercise engagement was investigated among adult users of the primary healthcare level. The prevalence of chronic diseases such as overweight/obesity, hypertension, and type 2 diabetes is high in the Mexican adult population. Adherence to healthy lifestyles like regular exercise is part of the prevention and treatment of these diseases, which is why its promotion should be encouraged from the primary healthcare level. To achieve this, it is necessary to understand the factors associated with exercise engagement in this population.

Methods: *A cross-sectional study was conducted. The dependent variable was adherence to exercise recommendations for the adult popu*lation? The Global Physical Activity Questionnaire was used, and the metabolic equivalents per week expended on exercise were calculated. The psychosocial variables included were stages of readiness for change, self-efficacy, decisional balance, and outcome expectations regarding exercise. Sociodemographic and health factors were also included. Ordered logistic regression was employed in the statistical analyses.

Results: 406 adults participated. The multivariate analysis revealed associations between stages of readiness for change and self-efficacy with the categories of exercise adherence. For each point increase in the self-efficacy scale, the likelihood of being in the category meeting the exercise recommendation would increase by 1.8%, while the likelihood of being in the category of not engaging in exercise would decrease. Males versus females, and adults aged 20 to 31 years versus adults aged 32 to 64 years, had higher possibilities of being in the category meeting the exercise recommendation.

Conclusions: Psychosocial factors such as stages of readiness for change and self-efficacy, as well as sex and age, should be considered in developing exercise promotion strategies for Mexican adults utilizing primary healthcare services.

Keywords: Transtheoretical Model, Stages of readiness to Change, Self-efficacy, Primary Health Care.

Abbreviations: PA: Physical Activity; WHO: World Health Organization; TTM: Transtheoretical Model; IMSS: Mexican Institute of Social Security; GPAQ: Global Physical Activity Questionnaire; METs: Metabolic Equivalents; BMI: Body Mass Index; WHR: Waist/Hip Ratio; IQR: Interquartile Range; CI: Confidence Interval OR: Odds Ratio

Introduction

Physical activity (PA) is defined as "Any bodily movement produced by skeletal muscles that results in energy expenditure above resting levels." PA encompasses exercise, sports, and physical activities done as part of daily living, occupation, leisure, and active transportation. Exercise is defined as "PA that is planned, structured, repetitive, and aims ultimately or intermediately at improving or maintaining physical fitness" [1-3]. In 2020, the WHO (World Health Organization) updated the guidelines for PA. The new recommendation for adults 18–64 years, with or without chronic diseases, involves performing moderate-intensity aerobic physical activity for 150–300 minutes or vigorous-intensity aerobic physical activity for 75–150 minutes weekly, or an equivalent combination of both [1,4]. The aim of these recommendations is to achieve health benefits through regular PA; hence, according to the definitions mentioned, they refer more specifically to exercise. Exercise has a protective effect on health, improving cardiorespiratory, musculoskeletal, and neuromotor fitness. In adults living with chronic conditions, it has been associated with a reduced risk of premature mortality or disease progression and improved physical function and quality of life. Therefore, it is part of the treatment for chronic diseases and should be promoted from the primary healthcare level [1-8].

Lifestyle modifications such as exercise are advocated for the prevention, treatment, and control of chronic diseases. Theories and models describing the psychological and social processes leading to behavior change have been useful in research to guide the design of interventions for health promotion and behavior change, such as avoiding smoking, consuming a healthy diet, and increasing physical activity levels [9-15]. These theories help to understand health behaviors and the context in which they occur and are rooted in an understanding of the social determinants of health and health behavior. Health promotion in primary care settings requires a comprehensive approach that focuses on social system factors in addition to personal determinants [16].

Despite the health benefits of exercise, adults commonly do not engage in it regularly. In Mexico in 2022, the National Institute of Statistics and Geography reported that only 42.1% of the population over 18 years old living in urban areas engaged in exercise or practiced sports in their leisure time; of these, 49.5% were men, and 35.6% were women. Only 50% of the population that reported exercising in their leisure time did so with the frequency and intensity necessary to meet the recommendations,

investing an average of 300 minutes per week. Those who did not meet the recommendation exercised on average for 105 minutes per week [17]. Additionally, in Mexico, as in most countries, the prevalence of non-communicable chronic diseases in adults has increased; according to the National Health and Nutrition Survey of 2022, the prevalence of overweight/obesity is 75%, diabetes 18.4%, and hypertension 29.4% [18-20].

Engagement in exercise involves environmental, psychological, social, health, and public health policy determinants [15]. Psychosocial factors have been studied under models and theories aiming to explain the process by which individuals engage or do not engage in a behavior or behavior change. Among these models and theories, the Transtheoretical Model (TTM) uses a temporal dimension, the stages of readiness for change, and integrates processes and principles of change from different theories [12,14]. TTM posits that health behavior change involves progress through six stages of readiness for change: precontemplation, contemplation, preparation, action, maintenance, and termination or consolidation. This stage construct is significant, representing a temporal dimension. In the precontemplation stage, individuals do not intend to change their behavior in the near future; in contemplation, they intend to change but do not have a plan; in preparation, they have a plan, but it is not until the action stage that they begin the desired behavior; in the maintenance stage, the behavior has been ongoing for more than six months; and in the consolidation stage, the behavior change has become a habit. In general terms, the stages of change of behavior can be grouped into two main categories: motivational or intention formation, and volitional, in which that intention is executed or implemented [9-14]. The TTM also includes other constructs from other theories, as self-efficacy from Bandura's Social Cognitive Theory, and decisional balance, and outcome expectation. Processes related to these constructs occur to initiate and maintain changes through the stages. Decisional balance is the result of weighing the advantages and disadvantages that a person considers for engaging or not in a behavior. Self-efficacy refers to a person's confidence in performing a specific behavior or behavior change, despite facing adversities, and outcome expectation is the estimation that a given behavior will lead to certain outcomes [12-14, 21].

Patients attending primary health care should receive recommendations for healthy lifestyles, including exercise, as part of their care, since there is evidence supporting the beneficial effects of regular exercise on health; promoting healthy lifestyles is part of the treatment for several chronic diseases [4].

However, for the implementation of strategies that provide appropriate exercise recommendations at the primary health care level, it is first necessary to identify whether the users are engaging in exercise and to know the factors influencing their participation. The objective of this study was to identify if psychosocial factors such as self-efficacy, decisional balance, outcome expectation, and stages of readiness for change are associated with exercise engagement among the adult population who attended a primary health care clinic.

Methods

A comparative cross-sectional study was conducted, inviting participants from primary healthcare users of the Mexican Institute of Social Security (IMSS) in Aguascalientes who were in the waiting room for any reason, whether for health promotion appointments, diagnosis, or treatment follow-up. The study took place between June and December 2016. Participants who agreed to join signed an informed consent form. Individuals with disabilities that prevented them from exercising or completing questionnaires were excluded from the study. The research was approved by the Ethics Commission of the Local Research Committee of IMSS in Aguascalientes, with registration No. R-2015-101-38.

Variables

Exercise: The exercise reported by participants was calculated using data from the Global Physical Activity Questionnaire (GPAQ) in its domain of leisure-time physical activity [22]. Information on the minutes per week and the intensity of physical activity (PA) performed in a typical week was used to calculate the metabolic equivalents per week (METs/week) [22,23]. One MET is defined as the energy expended by an individual while seated at rest. It is estimated that, compared to sitting quietly, a person's caloric consumption is four times higher when being moderately active and eight times higher when being vigorously active [22,23]. Thus, engaging in moderate-intensity PA for 10 minutes averages 40 METs, while vigorous-intensity PA averages 80 METs. To help participants identify the intensity of their PA, they were asked to assess the increase they perceive in their heart rate and breathing during PA: Vigorous-intensity activities are those that require hard physical effort and cause large increases in breathing or heart rate, whereas moderate-intensity activities require moderate physical effort and cause small increases in breathing or heart rate [22,23].

For the analysis of this study, only the leisure-time PA domain of the GPAQ was used since the application of the Transtheoretical Model (TTM) to PA has been directed toward regular exercise [24], and this domain of the questionnaire contains questions related to exercise. The other two domains relate to the PA required for essential activities of daily living in occupation, education, household, and/or transportation [1-3].

Psychosocial factors

In this study, inquiries were made regarding the following constructs that are part of the Transtheoretical Model (TTM):

A) Stage of Readiness for Behavioral Change: This construct explores the participant's perceived stage of readiness for behavioral change, identified through a question that combines the intention to engage in regular exercise and the timeframe for initiating or, if already active, the duration of engagement. Regular physical exercise is defined as leisure-time PA of ≥30 minutes per session, conducted twice or more per week, aimed at enhancing health and physical fitness [24]. For example, in the "maintenance stage," participants continue regular exercise for >6 months. In the "action stage," they have been exercising regularly but for less than 6 months. In the "preparation stage," participants intend to change behavior in the near future and may start making slight progress toward the desired behavior. In the "contemplation stage," participants plan to start exercising in the forthcoming months. And in the "pre-contemplation stage," they have no immediate plans to commence exercise [12, 24].

B) Self-Efficacy*:* This refers to the confidence in one's ability to exercise despite potential obstacles, measured via a 33-item questionnaire across four dimensions: mood, time constraints, social norms, and resource availability. An example item is, "I believe I can exercise even if I feel anxious or have a lot of housework;" responses were captured on a 5-point Likert scale ranging from "Not at all confident" to "Completely confident" [9,12,21].

C) Outcome Expectations: Personal expectations regarding the outcomes of exercising, encompassing three dimensions: weight loss, health improvement, and self-esteem enhancement. Sixteen questions were posed, with responses also on a Likert scale, for example, "Exercising makes me feel good about myself," "Exercising helps me lose weight," with four response options ranging from "Strongly agree" to "Strongly disagree" [9,12].

D) Decisional Balance: The relative valuation given to the pros and cons of changing behavior, in this context, initiating exercise. This construct was assessed using 20 questions, 13 regarding the positive aspects or benefits of exercising, and 7 on the negative aspects or drawbacks, such as "Exercising makes me feel better," "Exercising is costly or boring." The decisional balance was calculated by summing the scores of items indicating positive perceptions and subtracting the sum of items indicating disadvantages, with response options on a Likert scale from "Strongly agree" to "Strongly disagree" [9,12].

The questionnaires employed to gather information on psychosocial factors related to the behavioral change process, specifically exercise regularly, have been validated in the Mexican population and exhibit appropriate psychometric properties, affirming their validity and reliability [25,26].

Covariates

To consider potential confounding variables in the association between psychosocial factors and exercise engagement, socio-demographic factors (sex, age, marital status, education level, whether participants have children under 5 years, occupation, housing tenure) and health conditions (diagnosed diseases or issues hindering exercise) were included. Additionally, nutritional status variables were assessed. Height and weight were measured to the nearest 0.1 cm and 0.1 kg, respectively, with participants wearing light clothing and no shoes. Body Mass Index (BMI) was calculated as kilograms per meters squared, and nutritional status categories were established. Waist and hip circumferences were measured using a non-elastic flexible tape. Waist circumference was measured at the midpoint between the highest point of the iliac crest and the lowest part of the costal margin at the mid-axillary line, while hip circumference was measured at the largest circumference of the buttocks to determine the waist/hip ratio (WHR). A WHR above 0.90 in women and above 1.00 in men was used as the cutoff to indicate abdominal distribution of adipose tissue [27,28].

Statistical analysis

The psychosocial factors and demographic, socioeconomic, and health characteristics of the study population were described using measures of central tendency and dispersion for quantitative variables, and frequencies and percentages for categorical and ordinal variables. The dependent variable, METs/week used in exercise engagement, was categorized based on the recommendations for adult PA: at least 150–300 minutes per week of moderate PA or 75–150 minutes per week of vigorous intensity activity, equivalent to an energy expenditure of at least 600–1200 METs per week. According to the METs/week used in leisure-time PA, participants were classified into three groups: (1) Participants not engaging in leisure-time PA (0 METs/week); (2) Participants engaging in leisure-time PA but not meeting the recommendation (≥40 but < 600 METs/week); and (3) Participants meeting the recommendation, ≥ 600 METs/week.

Comparisons of psychosocial factors related to exercise engagement, socioeconomic, demographic, health, and nutritional characteristics were made among the categories of physical activity levels. For these comparisons, the Kruskal-Wallis test for independent samples was used, and if differences were statistically significant, the Dunn test and post-hoc adjustments for multiple comparisons were applied. Categorical variables were compared using the Chi-square test or Fisher's exact test. Univariate analysis was conducted to obtain crude ordinal odds ratios to analyze the relationship between psychosocial factors, sociodemographic

variables, health variables, and the ordinal outcome variable of exercise engagement using ordered logistic regression.

In the multivariate analysis, all variables with $p < 0.20$ at the univariate analysis were included, and variables were excluded from the model if they did not show an association with the outcome variable and were not identified as confounders in the association between psychosocial variables and the ordinal variable of exercise engagement. A model of ordered logistic regression was used in the multivariate analysis, ensuring proportional odds assumptions using the Brant test, and assessing the model's goodness of fit using the Hosmer-Lemeshow test [29]. Some results were graphically described using predicted probabilities from the model, showing the marginal effect on outcome variable categories by changes in stages of change of the Transtheoretical Model or by unit change in self-efficacy [29]. Statistical analysis was performed using Stata version 13 (Stata Corporation College Station, TX, USA).

Results

The study involved 406 Mexican adults receiving primary care at an IMSS facility in the city of Aguascalientes. The average age of participants was 38.8 ± 12.2 years; 67.5% were female. Over 50% of them reported having paid employment, while 38.2% were homemakers. Slightly more than 39% (39.2%) of participants reported being diagnosed with some diseases, the most common being diabetes and hypertension. Seventeen percent reported musculoskeletal problems limiting their ability to engage in physical activity. Seventy-one percent of participants were overweight or obese, and 69.2% had abdominal adiposity based on waist-to-hip ratio (Table 1). Almost 49% (48.8%) of participants did not engage in moderate or vigorous PA during leisure time, while 17% engaged in PA but at levels lower than 600 METs/week, and 35.2% met the recommended levels of PA (600 or more METs/week) (Table 2).

Variable	***n* = 406**	**%**
Age, years (mean ± SD)	38.8 ± 12.2	
Age groups		
20–31 years	142	35.0
32–64 years	264	65.0
Sex		
Female	274	67.5
Male	132	32.5
Marital status		
Single	66	16.3
Married/Living with a partner	305	74.8
Divorced, widowed, or separated	36	8.9
School grade		
Elementary school	88	21.7
Middle school	170	41.9
High school or technical	100	24.6
College or more	48	11.8
Occupation		
Employed	235	57.9
Home/Study/Retired	171	42.1
Diagnosed diseases		
None	287	60.8
Hypertension	50	12.3
Diabetes	33	8.1
Hypertension and diabetes	17	4.2
Others	59	14.5
Health problems that limit exercise		
None	337	83.0
Musculoskeletal problem	44	10.8
Convalescence after surgery	8	2.0
Other problems	17	4.2

Nutritional status by BMI		
Undernutrition	7	1.7
Normal	111	27.3
Overweight	139	34.3
Obesity	149	36.7
Body fat distribution by WHR		
Peripheral	125	30.8
Abdominal	281	69.2

BMI= Body Mass Index: BMI<18.5 undernutrition, BMI ≥18.5–24.9 normal weight, BMI ≥ 25–29.9 overweight, BMI≥30 obesity
WHR= Waist/Hip Ratio. Peripheral distribution: WHR <0.80 to female and <1.0 to male. Abdominal distribution: WHR ≥0.80 to female and WHR ≥1.00 to male.

Table 1. Sociodemographic and health characteristics of the participants.

Characteristics	**No exercise *n*=194 (47.8%)**		**Exercise using <600 METs/week *n*=69 (17.0%)**		**Exercise using ≥600 METs/week *n*=143 (35.2%)**		***P* Value [a]**
	n	**%**	***n***	**%**	**n**	**%**	
Psychosocial Factors, Median (IQR)							
Self-efficacy	74 (59–91)		81 (59–94)		87 (74–100)		<0.001[b]
Outcome Expectation	59.5 (52.0–64.0)		60.0 (53.0–64.0)		60.0 (52.0-64.0)		0.888
Decisional Balance	27 (23–32)		29 (24–33)		31 (26–35)		<0.001[c]
Stage of Change							
Pre-contemplation	46	23.7	9	13.0	0	0.0	
Contemplation	59	30.4	9	13.0	14	9.8	
Planning	45	23.2	12	17.4	16	11.2	
Action	15	7.7	17	24.7	24	16.8	
Maintenance	16	8.2	16	23.2	41	28.7	
Consolidation	13	6.7	6	8.7	48	33.6	<0.001
Sociodemographic Characteristics							
Sex							
Female	149	76.8	51	73.9	74	51.8	
Male	45	23.2	18	26.1	69	48.2	<0.001
Age (years)							
20–31	63	32.5	20	29.0	59	41.3	
32–64	131	67.5	49	71.0	84	58.7	0.247
Marital Status							
Single	21	10.8	16	23.2	29	20.3	
Married/Living with a partner	150	77.3	44	63.8	110	76.9	
Divorced, widowed, or separated	23	11.9	9	13.0	4	2.8	0.001
With children under 5 years							
Yes	73	37.6	17	24.6	39	27.3	
No	121	62.4	52	75.4	104	72.7	0.049

School grade							
Elementary school	48	24.7	14	20.3	26	18.2	
Middle school	89	45.9	27	39.1	54	37.8	
High school or technical	41	21.1	18	26.1	41	28.6	
College or more	16	8.2	10	14.5	22	15.4	0.164
Occupation							
Employed	104	53.6	43	62.3	88	61.5	
Home/Study/Retired	90	46.4	26	37.7	55	38.5	0.247
Housing Tenure							
Owed	97	50.0	29	42.0	74	51.8	
Credit	46	23.7	14	20.3	36	25.2	
Rented	30	15.5	16	23.2	21	14.7	
Lent	21	10.8	10	14.5	12	8.3	0.501
Health Characteristics							
Diagnosed Disease							
None	119	61.3	36	52.2	92	64.3	
Hypertension	18	9.3	13	18.8	19	13.3	
Diabetes	16	8.2	3	4.4	14	9.8	
Hypertension + diabetes	11	5.7	4	5.8	2	1.4	
Others	30	15.5	13	18.8	16	11.2	0.112
Health problems that limit exercise							
Yes	33	17.0	17	24.6	19	13.3	
No	161	83.0	52	75.4	124	86.7	0.119
Body Mass Index (kg/m^2), median (IQR)	28.9 (24.9–32.7)		28.5 (25.4–32.1)		26.3 (23.6–30.7)		0.004[d]
Nutritional Status by BMI							
Undernutrition	5	2.6	0	0.0	2	1.4	
Normal	45	23.2	15	21.7	51	35.7	
Overweight	65	33.5	25	36.3	49	34.3	
Obesity	79	40.7	29	42.0	41	28.7	0.057
Waist/Hip Ratio, median (IRQ)							
Male	0.93 (0.88–0.98)		0.98 (0.94–1.00)		0.92 (0.88–0.95)		0.026[e]
Female	0.88 (0.85–0.93)		0.86 (0.81–0.92)		0.86 (0.82–0.91)		0.020[f]
Body fat distribution by WHR							
Abdominal	156	80.4	48	69.9	77	53.8	
Peripheral	38	19.6	21	30.4	66	46.2	<0.001

[a] Kruskal-Wallis test for discrete variables or Pearson's χ^2 test for categorical variables.
Dunn's Pairwise Comparison, with Bonferroni adjustment for multiple comparisons:
[b] 3 vs. 1 $p < 0.001$, 3 vs 2 p=0.042.
[c] 3 vs. 1 p <0.001
[d] 3 vs. 1 p=0.0.006, 3 vs. 2 p= 0.008
[e] 3 vs. 2 p=0.011
[f] 3 vs. 1 p= 0.010
WHR=Waist/Hip Ratio, abdominal distribution: WHR ≥0.80 to female and WHR ≥1.00 to male, and peripheral distribution: WHR <0.80 to female and <1.0 to male.

Table 2: *Psychosocial, sociodemographic, and health factors, and their relationship with exercise engagement categories (METs/week). Univariate analysis.*

Psychosocial factors in physical exercise engagement

In exercise engagement, 52% of participants perceived themselves in motivational stages (precontemplation, contemplation, and preparation), while 48% were in volitional stages (action, maintenance, and consolidation) (Table 2). The stage of readiness for change in which participants were classified showed a significant relationship with METs/week used in leisure-time PA. Significant differences were found in METs/week used in leisure-time PA between those categorized in the precontemplation stage and those in the action, maintenance, and consolidation stages (Figure 1, Table 2).

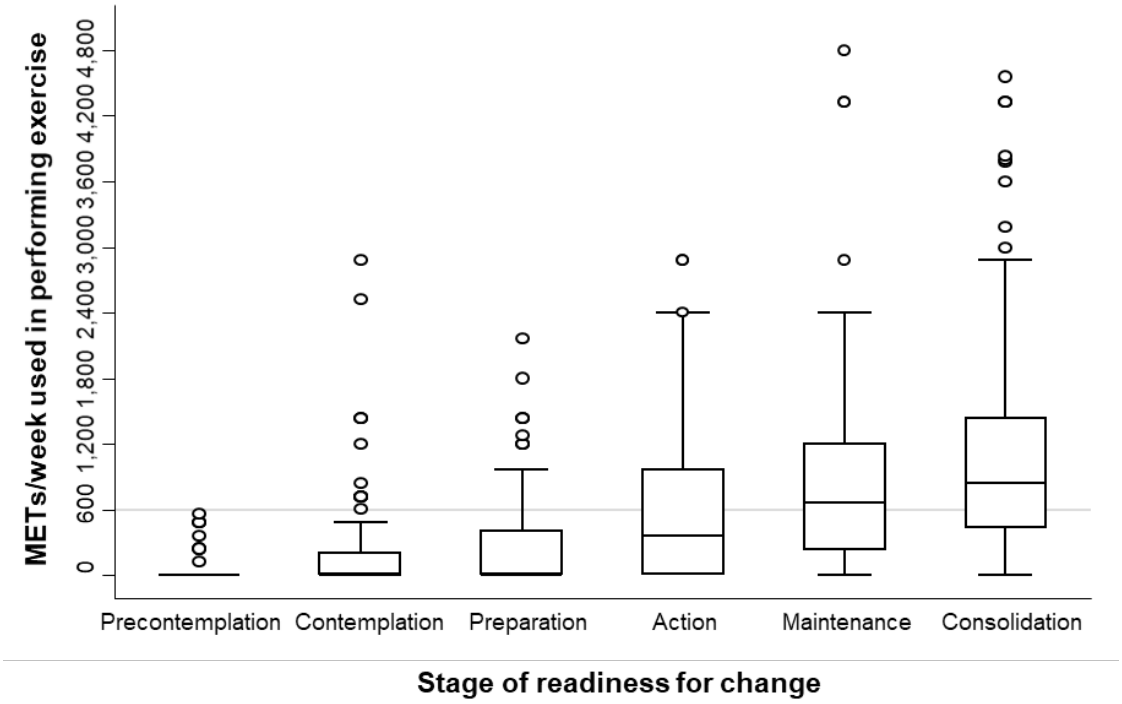

Figure 1: METs/week used in performing moderate or vigorous exercise, by the stage of readiness for change in which participants perceive themselves. The horizontal line marks the recommendation to use at least 600 METs/week in performing exercise for the adult population. Spearman's correlation coefficient 0.542, $p<0.001$. Significant differences between the METs/week used among those in the action, maintenance, and consolidation stages, versus those in the precontemplation stage ($p<0.05$).

The median and interquartile range (IQR) on the self-efficacy scale were 80.5 (63–94) points out of a maximum possible score of 125 points. For the outcome expectancy construct, the median and IQR were 60 (52–64) out of a maximum possible score of 64 points. The median and IQR on the decisional balance scale were 29 (24–33) points out of a maximum possible score of 45 points.

Relationship between exercise and psychosocial, sociodemographic, and health factors

In the univariate analysis, as shown in Tables 2 and 3, a relationship was found between scores on the self-efficacy and decisional balance scales, as well as stages of readiness for change, with the categories of adherence to exercise recommendation. Regarding self-efficacy and decisional balance scores, a difference was observed between participants meeting the exercise recommendation and those not exercising. Similarly, a significant difference was found in self-efficacy between those meeting the recommendation and those exercising but not meeting it. These comparisons, using unadjusted ordered logistic regression, revealed the same associations between self-efficacy, decisional balance, and stages of change with the ordinal variable of exercise meeting recommendation. Higher scores on these scales indicated a greater likelihood of being in a higher exercise category.

Variable	Ordinal OR	95% CI	P Value
Psychosocial factors			
Self-efficacy	1.02	1.01–1.03	0.000
Decisional Balance	1.08	1.04–1.11	0.000
Outcome Expectation	1.00	0.97–1.03	0.853
Stage of Change			
Pre-contemplation	1.00		
Contemplation	2.28	0.97–5.35	0.059
Planning	3.58	1.54–8.32	0.003
Action	12.21	5.17–28.81	0.000
Maintenance	18.57	7.98–43.22	0.000
Consolidation	32.84	13.39–80.56	0.000
Sociodemographic characteristics			
Sex			
Female	1.00		
Male	2.62	1.75–3.92	0.000
Age (years)			
32–64	1.00		
20–31	1.36	0.92–2.00	0.122
Marital Status			
Single	1.00		
Married/Living with a partner	0.60	0.36–0.97	0.039
Divorced, widowed, or separated	0.27	0.12–0.59	0.001
With children under 5 years			
No	1.00		
Yes	0.64	0.43–0.96	0.030
School grade			
Elementary school	1.00		
Middle school	1.10	0.67–1.80	0.707
High school or technical	1.70	0.98–2.93	0.057
College or more	2.18	1.12–4.24	0.021
Occupation			
Employed	1.00		
Home/Study/Retired	0.74	0.51–1.08	0.124
Housing tenure			
Owned	1.00		
Credit	1.02	0.64–1.63	0.922
Rented	0.98	0.59–1.64	0.941
Lent	0.84	0.46–1.56	0.587
Health characteristics			
Diagnosed disease			
None			
Hypertension	1.31	0.75–2.28	0.340
Diabetes	1.10	0.54–2.23	0.788
Hypertension + diabetes	0.42	0.16–1.13	0.087
Others	0.78	0.46–1.34	0.370

Health problems that limit exercise			
No	1.00		
Yes	0.85	0.52–1.37	0.498
Body Mass Index (kg/m²)	0.96	0.93–0.99	0.025
Nutritional Status by BMI			
Normal	1.00		
Undernutrition	0.30	0.06–1.62	0.162
Overweight	0.70	0.44–1.13	0.144
Obesity	0.53	0.33–0.84	0.008
Waist/Hip Ratio[b]	0.02	0.00–0.25	0.003
Body fat distribution by WHR			
Peripheral	1.00		
Abdominal	0.34	0.23–0.52	<0.001

[a] Categories of PA by week (0=0 METs/week, 1=40 to 599 METs/week, 2=≥600 METs/week).
Ordinal OR: Ordinal odds ratio; 95% CI: 95% confidence interval
[b] WHR=Waist/Hip Ratio, abdominal distribution: WHR ≥0.80 to female and ≥1.00 to male, and peripheral distribution: WHR <0.80 to female and <1.0 to male.

Table 3: *Factors associated with exercise engagement in ordered categories*[a] (METs/week): Univariate analysis.

Factors	Ordinal OR[b]	95% CI	Percentage of change
Self-efficacy	1.02	1.01–1.03	1.8
Stage of change			
Precontemplation/Contemplation	1.00		
Preparation	2.50	1.34–4.67	149.7
Action	7.77	4.08–14.80	676.8
Maintenance	11.17	5.97–20.91	1017.1
Consolidation	18.51	9.15–37.44	1751.3
Age (years)			
32–64	1.00		
20–31	1.80	1.14–2.84	80.4
Sex			
Female	1.00		
Male	2.63	1.66–4.17	163.0
Brant test to odds proportionality: X^2=10.97, p=0.140			
Goodness of fit of the model (Likelihood Ratio):-333.83 X^2= (7fd)=161.89, p<0.001			

[a] Categories of PA per week (0=0 METs/week, 1= 40 to 599 METs/week, 2=≥600 METs/week
[b] Adjusted ordinal odds ratio, ordinal logistic regression model.
95% CI: 95% Confidence Interval

Table 4: *Factors associated with physical activity engagement in ordered categories [a] (METs/week): Multivariate analysis*

Regarding sociodemographic factors, a relationship was found between sex, marital status, and number of children under 5 years old, with the categories of exercise meeting recommendation.

In terms of nutritional status, a relationship was found between BMI and waist/hip ratio, as well as their respective categories of nutritional status, with the categories of exercise meeting recommendation. BMI [26.3, IQR (23.6–30.7) vs. 28.9, IQR (24.9–32.7)] and the prevalence of obesity (28.7% vs. 40.7%) were lower in those meeting the exercise recommendation compared to those not

exercising in their leisure time. The percentage of participants with abdominal adipose tissue distribution was higher in those not exercising compared to those meeting the recommendation (80.4% vs. 53.8%). In univariate analysis using ordered logistic regression, these relationships were similar. Both BMI and nutritional status categories derived from BMI, as well as waist/hip ratio and categories of adipose tissue distribution, showed a relationship with the ordinal variable of exercise meeting recommendation. Higher BMI and waist/hip ratio reduced the likelihood of being in a higher category of exercise compliance recommendation. Individuals with obesity and those with abdominal adipose tissue distribution had lower chances of being in a higher category of exercise compliance recommendation than those with normal nutritional status (Tables 2 and 3).

As shown in Table 4 and Figure 2, in the multivariate analysis, the likelihood of being in a higher category of leisure-time exercise compliance recommendation increased by 1.8% per unit increase in self-efficacy scale score, holding other variables constant. The association between stages of change and the ordinal variable of exercise compliance recommendation remained. Compared to the reference category grouping precontemplation and contemplation stages, the likelihood of being in a higher category of exercise compliance recommendation was 2.5 times higher for those in the preparation stage, 7.8 times higher for those in the action stage, 11.2 times higher for those in the maintenance stage, and 18.5 times higher for those in the consolidation stage, with other variables held constant. The decisional balance construct did not maintain statistical significance when included in the multivariate analysis, nor did it prove to be a confounding variable among other psychosocial variables and categories of exercise compliance recommendation in the adult population. Individuals under 32 and men had a greater likelihood of being in a higher category of exercise compliance recommendation.

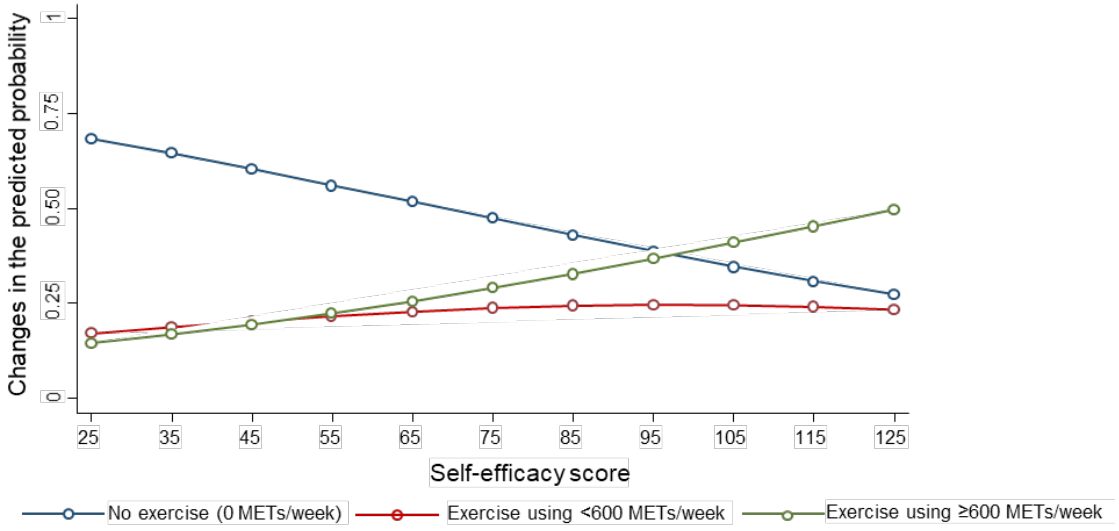

Figure 2: Changes in the predicted probability of being in the exercise categories for an increase in self-efficacy, holding constant the other variables included in the model.

Based on the results of the model shown in Table 4, the predicted probability of being in the category of those not engaging in leisure-time exercise was 0.47 (95% CI 0.04–0.93); for the category of those who engage in less exercise than recommended, it was 0.17 (95% CI 0.04–0.25); and for the category of those using 600 or more METs/week in exercise engagement, it was 0.36 (95% CI 0.03–0.91). According to this model, if self-efficacy is increased, the likelihood of being in the category meeting the exercise recommendation (using 600 or more METs per week) would increase, while the likelihood of being in category 1 (those not engaging in leisure-time exercise) would decrease (Figure 2).

Discussion

This study found that only 52% of adults utilizing primary health care services at a clinic within the IMSS engaged in regular leisure-time exercise. Among them, 35% met the recommendation, meaning they used 600 or more METs/week in moderate and/or vigorous activities, while 17% did not meet the recommended quantity/intensity. Among psychosocial factors, self-efficacy, and participants' perceived stage of readiness for change were associated with exercise compliance recommendation categories.

The percentages of regular leisure-time exercise were higher than those reported nationally for residents in urban areas, 52% vs. 42.1%. Furthermore, in the national study, 55% of those exercising met the recommendation, whereas in our study, 67% of those engaging in leisure-time exercise complied with it [17]. This difference may be attributed to the fact that participants in this study do not represent the general adult population but rather individuals seeking primary health care services, among whom 39% had diagnosed illnesses, with type 2 diabetes and hypertension being the most common. Therefore, they might have received recommendations to exercise or had greater awareness of the importance of exercise as part of their treatment regimen.

In this study, a significant association was found between the participants' perceived stage of readiness for change and the categories of exercise compliance recommendation. Similar relationships have also been observed in other studies. In Mexico, studies by Astudillo, Rojas, and colleagues revealed that university students who perceived themselves in volitional stages of change, such as action and maintenance, were more likely to engage in physical exercise than those in motivational stages [25,26].

These findings suggest that a simple question assessing self-perception of readiness for exercise behavior change can provide a useful and rapid diagnosis regarding exercise engagement or intention to engage. Such a diagnosis is essential in planning exercise promotion programs or strategies, whether at an individual or group level [11]. However, planning interventions based on individuals' perceived readiness for change, as suggested by the transtheoretical model, poses a significant challenge in population-based exercise promotion interventions. This challenge arises from the need to plan specific activities tailored to each stage of readiness for change to achieve behavioral change, such as engaging in exercise sufficiently to yield positive health effects [12].

Moreover, in providing personalized exercise recommendations in primary care settings, it is beneficial to determine whether the patient engages in regular exercise and whether they are willing to do so. Questions about self-perceived readiness for exercise behavior change could have advantages over the use of questionnaires, which are often lengthier and more complex. For instance, some questionnaires, like the Global Physical Activity Questionnaire (GPAQ), require respondents to assess the intensity of physical activity undertaken, a task that can be challenging, particularly for individuals not accustomed to structured exercise programs. It has been reported that estimating physical activity through GPAQ responses can both overestimate and/or underestimate the amount and intensity of activity undertaken by individuals [30]. Although the GPAQ has demonstrated good-to-very-good test–retest reliability over short- and long-term intervals, its concurrent validity when compared with accelerometers, pedometers, and physical activity logs has been poor to fair [30,31]. Further, while the GPAQ assesses physical activity domains, including activity during work, household chores, and active transportation, recommendations for physical activity focus primarily on leisure-time activity to achieve health benefits [1-4]. The exercise compliance recommendation for the adult population is considered in the question regarding readiness for change in the MTT questionnaire when applied to acquiring exercise behavior [24].

Self-efficacy, or the confidence individuals have in their ability to carry out a particular action or behavior change despite facing difficulties, is one of the most crucial constructs in theories describing the psychological and social process leading to behavior change [10,11,21,32,33]. In this study, self-efficacy was significantly associated with exercise engagement; higher scores on this scale correlated with a greater likelihood of being in a higher category of exercise compliance recommendation. Similar associations have been observed in other studies. For instance, Sasaki's study in Japan, which included patients with peripheral arterial disease and aimed to identify physical, personal, and environmental factors related to exercise behavior, also found an association between self-efficacy and exercise engagement [34]. This association was similarly observed in McElfish's study, which aimed to identify the association between self-efficacy and self-care behaviors such as exercise in adults who are overweight or obese [35].

In a review by Ha et al. on the role of self-efficacy in exercise engagement among patients with heart failure, it was found that self-efficacy was associated with exercise engagement, and interventions aimed at increasing self-efficacy led to increased levels of physical activity and adherence to it [36]. In a study conducted in China involving university students, the mediating role of self-efficacy in exercise engagement was analyzed, revealing that self-efficacy serves as a mediator that promotes both the intention and action of engaging in physical activity [37]. However, a systematic review on the effect of interventions using behavior change techniques to increase both self-efficacy and exercise engagement in individuals with obesity found a non-significant relationship

between changes in self-efficacy and changes in physical activity. The authors suggest that when participants perceive the outcome of increasing physical activity as insufficiently significant, despite believing they can engage in physical activity or increasing their self-efficacy to do so, it does not translate into a change in behavior [33]. Nonetheless, these findings differed from those reported in another review that included studies involving healthy individuals who were not obese, where a significant effect of interventions on physical activity self-efficacy was found, although the mean effect size was small [32].

Our study has several limitations, one of which is that adherence to the recommended level of physical activity was based solely on physical activity performed during leisure time. However, various studies focus on exercise as a subtype of physical activity, especially those concerning behavioral changes and lifestyle modifications to achieve health benefits. Additionally, population recommendations for physical activity and various strategies for adherence primarily pertain to exercise. Yet, there remains a lack of knowledge about the effects of different types of physical activity, including those of light intensity, on health [1-4,38,39].

One of the strengths of our study is the inclusion of an adult population attending primary healthcare services. Given the high prevalence of chronic diseases in the Mexican population, it is essential to characterize the exercise engaged by adults and the factors associated with its practice to appropriately plan strategies for exercise promotion within healthcare services. Often, many exercise promotion interventions are directed at children and adolescents, excluding the adult population; this may be because implementing interventions in educational settings might be easier. However, the practice of exercise is associated with health benefits at all ages, and engaging in exercise is considered a protective factor against the development and progression of non-communicable chronic diseases, which are common in adulthood [4,39].

Conclusion

Our study shows that a high proportion of Mexican adult users of a primary healthcare facility do not engage in exercise at the recommended levels to experience health benefits. Therefore, efforts to promote exercise, as part of chronic disease prevention, treatment, and control, need to be intensified at the primary level of health care. To design exercise promotion interventions for this population, the identified influencing psychosocial factors, such as stage of readiness for change and self-efficacy, as well as other factors like age and sex, should be taken into account.

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