Psychosocial determinants of leisure-time physical activity among adults in omdurman city, Sudan: Reasoned Action Approach

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ABSTRACT

Objectives: The level of physical activity among adult in Sudan is low. The purpose of this study used the Reasoned Action Approach to investigate the psychosocial determinants of Leisure-Time Physical Activity Behaviour (LTPA) of Sudanese adults.
Study design: This was a cross-sectional study design among adults in Omdurman city in Sudan.
Methods: A 378 participants (229 male and 149 female) completed a questionnaire to identify intention, attitude, subjective norms, perceived behaviour control about LTPA and actual behaviour. The relationship between studied determinants were examined using different statistical methods.
Results: In all participants, 13% had at least 150 min of moderate-intensity LTPA per week. Analysis revealed that intentions ($\beta = 0.26$) along with perceived behaviour control ($\beta = 0.19$) predicted LTPA and accounted for 12% of the variance in LTPA behaviour. Attitude ($\beta = 0.39$), subjective norms ($\beta = 0.18$), and perceived Behaviour control ($\beta = 0.11$) were associated with intention to perform LTPA. They explained 22% of the variance in intentions.
Conclusion: consistent with RAA expectations, determinants of the intentions and LTPA behaviour were identified. Findings suggest interventions promoting LTPA in Sudanese adults should increase intention, create a positive attitude, build conducive social norms and raise the perception of control over the actual LTPA behaviour.

1. Introduction

Physical activity (PA) helps in preventing and treating many non-communicable diseases such as type 2 diabetes and heart diseases [1]. It also helps in reducing mortality rates [2] and can improve mental health [3,4]. Individuals' physical activity behaviours are paramount to their health, and they cannot be separated. According to the World Health Organization (WHO), adults aged 18–64 years should engage in PA of moderate-intensity at least 150 min or vigorous-intensity at least 75 min [5]. However, physical activities' rates remained globally low. For instance, available data showed that 1 out of 4 of the world's adult population is physically inactive [6], and 31% did not meet the WHO recommendations [7]. The prevalence of PA varies significantly between countries [8].

In Sudan, adults aged 18 and above constitute about 41% of the total

population of whom around 54% are found to be physically inactive [9]. In a study that sampled 216 medical students in Sudan, it was shown that only about 45% of the respondents were engaged in low physical activity [10]. This low level of PA may be contributing to the increasing levels of non-communicable diseases, the prevalence of Diabetes Mellitus among adults which was estimated to be 20% [11,12].

Adults can undertake physical activity in many ways: at work, at home, at transport, and during Leisure-Time. Leisure-Time Physical Activity (LTPA) includes all forms of physical activity that individuals practice in their free time. It can provide health benefits if practiced regularly inadequate durations and intensities [5].

Interventions promoting physical activity by increasing availability and accessibility to physical activity facilities have proven to be useful in raising physical activity rates [13]. The potential barriers of LTPA include lack of physical activity facilities and lack of time [14]. A

previous study showed that improved availability and accessibility to physical activity increased engagement in physical activity [15]. Several studies have shown the association between participation in LTPA and access to places of Physical activities [16–18].

For LTPA behaviour to be realized and become a routine practice, availability of the physical activity is not enough. Literature suggested that social cognitive factors such as intention, attitude, subjective norms and perceived behaviour control (PBC) can influence physical activity behaviors [19–21]. Many studies have indicated that participation in LTPA depends on individual related psychological factors [22–24]. Several studies have examined the influence of social cognitive factors on LTPA behaviour and they reported mixed results. A survey byLatimer and Martin Ginis [22] among patients with spinal cord injury showed that LTPA behaviour was predicted by intention to perform LTPA and the intention was determined by attitude, subjective norms and perceived behaviour control. Eng and Martin Ginis [25]found that the intention was associated with participation in LTPA, and perceived behavioural control was associated with the intentions to LTPA. Social cognitive theories could be useful in understanding determinants of and guiding behaviour change interventions [26,27] targeting health behaviours, including LTPA behaviour [28].

The Reasoned Action Approach (RAA) theory [29] suggests that the behavioural intention of an individual to perform a particular behaviour is a function of three sub-determinants [30]. They are attitude toward behaviour which represents their beliefs about the advantage and disadvantage of consequences of performing the behaviour [30]; subjective norms, which is individuals perceived social pressure from others to do or not do a behaviour [30] and perceived behaviour control (PBC), which is people's perceived ease or difficulty of doing the behaviour [30]. The RAA evolved from the Theory of Planned Behavior [30] that have been used to explain and change many health behaviors [31]. To our knowledge, no study used RAA to investigate determinants of LTPA among adults in Sudan. Thus this study aims to examine the psychosocial determinants of LTPA behaviour in Sudanese adults using the RAA model.

2. Methods

The STROBE guidelines to report observational studies was followed in this study [32].

2.1. Study design and settings

This was a population-based cross-sectional study conducted in Omdurman city in Khartoum State, Sudan. It is a big city in Khartoum State and has a multi-ethnic population of about 2.5 million. The town consists of nine localities, and each locality has between 6 and 8 sub-localities.

2.2. Participants

A multi-stage random sampling method was used to include three localities out of the nine and five sub-localities from each of the three localities. Fifteen households from each sub-locality were selected by random sampling method to be included in the study. Individuals' eligibility criteria included being adult aged 18–64 years, resident in Omdurman city for at least six months and they had no injuries or medical reasons that prevent them from physical activity. Participants were informed that participation in the study was voluntary, and they provided written informed consent before completing the questionnaire. A total of 384 eligible candidates were invited to participate in the study. A total of 378 adults completed an anonymous questionnaire between April and December 2018. The participants' age ranged from 18 to 51 years (M = 34.6 ± 6.83). The sample consisted of 149 (%39) females and 229 ((%61) males. No incentives were provided to the participants.

2.3. Variables

The outcome variables in this study were behavioural intentions to do moderate-intensity LTPA for 30 min a day for five days or more in the next week and their actual behaviour. The behaviour definition was adopted from the WHO global recommendations of physical activity for health [5]. The predictor variables were attitude, subjective norms and perceived behaviour control regarding LTPA.

2.4. Measurements

An LTPA self-administered questionnaire was developed based on the recommendations of the RAA questionnaire, previous research, and preliminary research of LTPA behaviour in the study population. The test-retest reliability of the study instrument was assessed by inviting 27 participants from the study population to complete the survey twice with seven days interval.

The participants' moderate-intensity LTPA behaviour was measured by asking if they did a moderate physical activity in their leisure time in five days or more during the past week, like quick walking, running, etc. The respondents reported the number of days per week, and the time they spent doing such physical activity on one of those days. An average of daily time (minutes/day) across five days was taken because most of the participants had reported five days of being moderately active per week.

Three items were used to measured intention to participate in LTPA: I intend/I expect/ I want to do physical activity in my leisure time in the next week for at least 30 min, five times or more. The participants answered on a seven-point scale ranging from 1(unlikely) to 7 (Likely).

The attitude of the participants about LTPA behaviour was measured by one item "Doing moderate physical activity during my leisure time for at least 30 min per day for five days or more in the next week is … ", followed by four paired evaluative adjectives, namely good-bad, harm-beneficial, pleasant-unpleasant, and enjoyable-unenjoyable on a seven-point scale.

Three items assessed subjective norms: "Most people who are important to me think that I should/ people who are important to me would like me to/I feel under social pressure to "do moderate-intensity LTPA,30 min at least per day for five days in the next week". Responses were taken on a seven-point scale ranging from 1 (disagree) to 7 (agree).

The following items assessed the PBC: "I am confident that I could do at least 30 min per day for five days in the next week"; "For me to do a moderate-intensity of LTPA at least 30 min per day for five days in the next week is difficult"; " The decision to do a moderate-intensity of LTPA at least 30 min per day for five days in the next week is beyond my control" and "Whether or not I do a moderate-intensity LTPA at least 30 min per day for five days in the next week is entirely up to me". The participants' responses were ranging from 1 (strongly disagree) to 7 (strongly agree).

Respondents were also asked to give information about their gender, age, educational level, marital and working status.

2.5. Statistical methods

The study data was analyzed using the Statistical Package for Social Sciences (SPSS) and Analysis of Moment Structures (Amos) software [33]. Frequencies and percentages were calculated to describe participants' characteristics, BMI and LTPA behaviour, with mean and standard deviation for age and BMI variables. A score of each RAA variable was calculated by averaging the items' score of each construct. Means and standard deviations were calculated for RAA variables, and Pearson's correlations were computed to examine the interrelationship between RAA variables.

A structural equation modelling (SEM) using Amos was applied to analyze the relationship between RAA variables simultaneously with measures of model fit. In SEM, a maximum likelihood estimation was

used with constrain of the error variances of intention and LTPA behaviour. Model fit was examined using Chi-Square, the Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), and Root Means Square Error Approximation (RMSEA). Values of ≥ 0.9 for GFI, AGFI and CFI, a Chi-square with p-value > 0.05, an amount of ≤ 0.05 for RMSEA indicate an acceptable model fit.

2.6. Ethical considerations

The Ministry of Health National Research Ethical Committee approved the study, and participants provided informed consent before being included in the study.

3. Results

Of the 384 participants invited to take part in the study, 6 (1.6%) refused to participate, claiming that they had no time. Table 1 shows the descriptive statistics of the participants, BMI, and LTPA behaviour. The results showed that the majority (61%) were male. 12% of the participants were in the age group 18–24 years, 29% in the age group 25–34 years, 51% in the age group 35–44 years, and 8% were 45 years and older. Among them, 65% had a university education and above. More than one-third of the participants were nongovernmental employee, 27% were governmental employees, and 15% were not working. About half(53%) of them were never married. The mean BMI of the participants was 26.5 (SD = 2.7). Nearly half (51%)had a normal BMI range while overweight and obesity were 32% and 17% respectively. About 13% of the participants had performed moderate-intensity LTPA at least 30 min for five days per week.

3.1. Intercorrelations and descriptive statistics of the RAA variables

Table 2 illustrates the descriptive statistics and inter-correlations of the RAA variables. The results showed that the participants spent on average 19.39 (SD = 9.77) minutes/day per five days in moderate LTPA behaviour. The participants mean scores of the attitude, subjective norms, PBC and intention to LTPA were high, ranging from 4.16 to 5.34.

Table 1
Descriptive statistics of the participants, BMI and leisure-time physical activity behaviour (N = 378).

Gender		
Male	229	61%
Female	149	39%
Age group	Mean = 34.62(SD ± 6.83)	
18–24	47	12%
25–34	110	29%
35–44	191	51%
45 and above	30	8%
education level		
Primary	53	14%
Secondary	79	21%
University	144	38%
Above university	102	27%
Working status		
Not working	57	15%
Student	72	19%
Governmental employee	102	27%
Nongovernmental employee	147	39%
Marital status		
Never married	199	53%
Ever married	179	47%
BMI category	Mean = 25.41(SD ± 2.34)	
Normal Weight	254	67%
Overweight a	98	26%
Obese	26	7%
Moderate LTPA min/day/ five days per week		
≥30 min	51	13%
< 30 min	327	87%

Also, Table 2 shows the correlations between and among RAA variables, which indicate that the variables had small to moderate correlations and all correlations were positive and significant. Among them, the LTPA behaviour was significantly correlated with attitude (r = 0.19, p < 0.01); subjective norms (r = 0.17, p < 0.01); PBC (r = 0.22, p < 0.01) and intention (r = 0.31, p < 0.01). The correlation between the intention to do LTPA and attitude (r = 0.40, p < 0.01) was the highest followed by correlation between intention and subjective norms (r = 0.28, p < 0.01).

3.2. Test retested reliability coefficients

The test-retest reliability with a week gap yielded reliability co-efficients of 0.83, 0.79, 0.75, and 0.73 for intention, attitude, subjective norms and PBC, respectively (see Table 2).

4. RAA model statistics

The model fit statistics showed that the model had an acceptable fit with the data (Goodness of fit index (GFI) = 0.99; Adjusted Goodness of Fit Index (AGFI) = 0.98; Comparative Fit Index (CFI) = 0.99; root mean square error of approximation(RMSEA) = 0.038; chi-square (2df) = 2.03, p > 0.05).

Fig. 1 and Table 3 show the results of the path analysis of the RAA variables. The path coefficients were significant and positive for the effects of attitude, subjective norms and perceived behaviour control on intention. Attitude had the most potent effect on intention (β = 0.39, p < 0.001), followed by subjective norms (β = 0.18, p < 0.001), and perceived behaviour control (β = 0.11, p < 0.01). Attitude, subjective norms and perceived behaviour control explained 22% of the variance of intention.

The path effect of the intention and perceived behaviour control on LTPA behaviour were statistically significant, explaining 12% of the variance in the behaviour. The influence of intention on LTPA was stronger (β = 0.26, p < 0.001) than perceived behaviour control (β = 0.19, p < 0.001). Taken together, the two variables explained 12% of the variance on LTPA behaviour.

5. Discussion

The study purpose was to examine the psychosocial determinants of leisure-time physical activity among Sudanese adults using RAA as a framework. The RAA model showed an adequate good fit for the data. Overall 13% of the participants in this study were found to be spending 150 min of moderate-intensity physical activity at least per week during leisure-time which is recommended by World Health Organization guidelines of physical activity for the health of adults aged 18–64 years. This finding agreed with the result of previous studies in Sudan [9,10] and also with a survey from Nigeria [34] suggesting a need for physical promoting interventions to increase LPTA rates among Sudanese adult individuals.

The results obtained from path analysis showed that attitude, subjective norms and PBC were significant positive predictors of intentions to perform LTPA. The percentage of explained variance of the prediction of LTPA intention was 22%, which was lower than that reported by Armitage and Conner [35]study. The attitude was a significant predictor of intention to be active in leisure time. This means that adults who anticipated positive rather than negative consequences of physical activity, would intended to engage in leisure-time physical activity. In agreement with our finding, in a previous study investigating physical activity, attitude appeared as an important predictor of intention to physical activity [36]. This implies that physical activity promotion message to increase the willingness of adults should target attitude beliefs that they hold about the advantages of performing LTPA. Also, behaviour change messages based on the subjective norms might have a positive effect on the intention of the adult to participate in leisure-time physical activity.

Table 2

Inter-correlations, descriptive data and Reliability statistics for Reasoned Action Approach (RAA) measures and adult leisure Time Physical Activity Behaviour (N=378).

Variables		1	2	3	4	5	M	SD	Range
1	**Attitude**	–					5.12	1.42	1–7
2	**Subjective norms**	0.21**	–				4.89	1.53	1–7
3	**PBC**	0.17**	0.10*	–			4.18	1.42	1–7
4	**Intention**	0.45**	0.27**	0.20**	–		5.34	1.36	1–7
5	**LTPA Behaviour (minutes/day)**	0.21**	.12**	0.24**	0.29**	–	19.31	9.87	0–40
	Test-Retest Reliability coefficients	0.79	0.75	0.73	0.83				

Note. PBC: Perceived Behavioural Control; LTPA: Leisure-time Physical Activity.
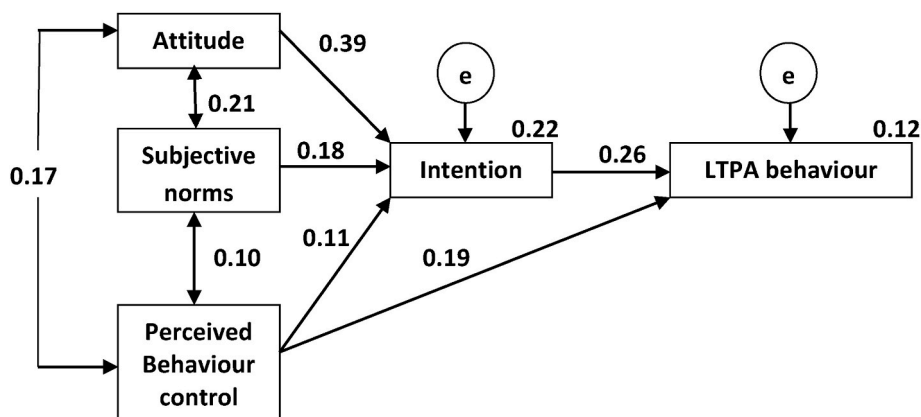*p < 0.05; **p < 0.01.

Fig. 1. Path diagram of the structural equation model shows the standardized path coefficients between the Reasoned Action Approach (RAA) variables and Leisure Time Physical Activity behaviour(e = error). Goodness of fit index (GFI) = 0.99; Adjusted Goodness of Fit Index (AGFI) = 0.98; Comparative Fit Index = 0.99; root mean square error of approximation = 0.038; chi-square (2df) = 2.03, p > 0.05.

Table 3

Standardized and Unstandardized path Coefficients of the RAA model (N = 378).

	β	B	SE	R [2]
AT→ BI	0.39	0.37***	0.05	0.22
SN→BI	0.18	0.16***	0.04	
PBC→BI	0.11	0.11**	0.04	
PBC→LTPA	0.19	1.86***	0.36	0.12
BI→LTPA	0.26	1.29***	0.34	

Note: *p < 0.05; **p < 0.01; ***p < 0.001.

In a previous study investigating physical exercise behaviour among undergraduate students at a UK university [37], intention to physical exercise is strongly influenced by attitude and subjective norms. Also,in systematic reviews of physical activity among adolescent [38] and older adults [39], spending time in LTPA is positively associated with social support. A previous meta-analysis suggested that change in the attitude and subjective norms resulted in a change in intentions [40]. Therefore, interventions to enhance intentions of Sudanese adult to be active in leisure time should also target the social context(i.e. friends, family) as a whole rather than focusing on the individual.

Actual participation in LTPA was significantly associated with intentions and perceived behaviour control (Fig. 1). The significant intention-behaviour relationship is consistent with the RAA assumption. Our finding also agreed with results from meta-analytic review by Hagger, Chatzisarantis [41] in which they found that intention and PBC were associated with physical activity behaviour and with another meta-analysis that reported intention to be a significant predictor of performing physical exercise [19]. Generally, the RAA explained 12% of the variance in LTPA behaviour. This explained variance in behaviour is lower than that has been reported in previous studies [35,42].

The significant perceived behaviour, control-behaviour relationship in our study could be due to participants having an accurate perception

of their actual control over-performing LTPA behaviour [30]. This means that the actual LTPA behaviour among Sudanese adult is influenced by their perception of physical activity in terms of ease and difficulty. This finding support that physical activity promotion interventions for the adult individual should focus on raising the intention of non-intender along with targeting factors that can improve the perceived behaviour control (i.e., skills to overcome barriers) regarding performing LTPA behaviour.

Several limitations are present in this study. First, use of the cross-sectional design in this study may limit its conclusion regarding causality. Further research using a prospective study design could be useful to examine the relation between psychosocial determinants and LTPA. The second limitation was the self-reporting of all LTPA behaviour and its constructs. To reduce the impact of the self-report in our study, the participants had received full explanations about the purpose of the study, which encourage them to provide more accurate and honest responses. Third, the participants of the study were adults aged 18–64 years from three localities of Omdurman city and this may influence the generalizability of the study findings to population in the same aged group in other Omdurman localities and in Sudan. However, we believed that our participants are quite similar to adult population in the city and Sudan. Further researches with large sample that included more population sub-groups in Sudan is needed. The fourth limitation was that the study assessed the direct measures of RAA constructs but not the indirect measures (the salient beliefs)that were underlying each RAA constructs. Studying both direct and indirect measures of RAA constructs would provide more insight into the determinants of LTPA behaviour in Sudan's context. Despite these limitations, the current study represents an essential step in using a theoretical model for understanding the social cognitive determinants of LTPA among Sudanese adults.

In summary, the results of the current study suggest that attitude, subjective norms and perceived behaviour control were significant

predictors of LTPA intention. The intention and PBC were the predictors of actual LTPA behaviour, highlighting the psychosocial determinants as essential elements to be targeted with LTPA promotion interventions for adults in Sudan.

Declarations

Statements of ethical approval:
Ethical approval of the this study was obtained from the Ministry of Health Research Committee. All participants provided informed consent before being included in the study.

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Competing interests

None.

Conflict of interest

Authors declare that this research does not have any conflict of interest.

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