

Application of the health promotion model to predict stages of exercise behaviour in Iranian adolescents

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تطبيق نموذج لتعزيز الصحة للتنبؤ بمراحل ممارسة التمارين لدى المراهقين الإيرانيين
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الخلاصة: استكملت عينة عشوائية تتألف من 1073 تلميذاً في جمهورية إيران الإسلامية (ممن يبلغ متوسط العمر لديهم 14.37 عاماً) استبياناً ذاتي التقرير يتألف من قياس للتمارين وبنيات مختارة من نموذج بندر لتعزيز الصحة، ومراحل تقييم لتغيير السلوك في التمرينات. ونتيجة للتحليل التمييزي المتعدد المتغيرات وجد أن الكفاءة الذاتية في التمرين، والعوائق المدركة حول التمرين، والمنافع المدركة حول التمارين، وسلوك التمرين، جميعها منبئات هامة عن المراحل التي يمر بها تغير السلوك في التمرينات لدى كل من المراهقين والمراهقات. وتدعم هذه النتائج أهمية الكفاءة الذاتية للانخراط في الأنشطة البدنية لدى كل من المراهقين والمراهقات في إيران. وينبغي أن يؤخذ بالاعتبار العوائق التي تعترض الفتيات الإيرانيات في التدخل لزيادة معدلات الأنشطة البدنية.

ABSTRACT A cluster random sample of 1073 students in the Islamic Republic of Iran (mean age 14.37 years) completed a self-report questionnaire consisting of an exercise measure, selected constructs of Pender's health promotion model and an assessment of stages of behaviour change in exercise. In multivariate discriminant analysis, exercise self-efficacy, perceived barriers to exercise, perceived benefits of exercise and exercise behaviour were significant predictors of the stage of exercise behaviour change for both female and male adolescents. The findings support the importance of self-efficacy for engaging in physical activity for both sexes of Iranian adolescents. The barriers faced by Iranian girls should be considered in interventions to increase physical activity rates.

Application du modèle de promotion de la santé aux fins de la prédiction des étapes comportementales relatives à l'exercice chez les adolescents iraniens

RÉSUMÉ Un échantillon aléatoire de grappes de 1 073 jeunes scolarisés en République islamique d'Iran (moyenne d'âge : 14,37 ans) a complété un autoquestionnaire constitué d'une mesure de l'exercice, de plusieurs éléments du modèle de promotion de la santé de Pender et d'une évaluation des étapes du changement de comportement en matière d'exercice. Dans l'analyse discriminante multivariée, l'efficacité personnelle perçue vis-à-vis de l'exercice, les éléments considérés comme des obstacles à la pratique de l'exercice, les avantages de l'exercice ressentis par le sujet et le comportement en matière d'exercice étaient d'importants facteurs prédictifs de l'étape du changement de comportement en matière d'exercice, pour les adolescentes comme pour les adolescents. Les conclusions confirment l'importance de l'efficacité personnelle dans la pratique d'une activité physique chez les adolescents iraniens des deux sexes. Les obstacles rencontrés par les jeunes Iraniennes devraient être pris en compte dans les interventions destinées à augmenter les taux d'activité physique.

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Introduction

The benefits of regular physical activity have been well documented [1]. Nevertheless, many adolescents in developed countries are insufficiently active to obtain these health benefits [2,3]. This is a problem because the risk factors and health risk behaviours that contribute to chronic disease in adulthood are established in childhood and adolescence [1]. Little research has examined exercise behaviour in adolescents in the Islamic Republic of Iran. Such research is important so that effective physical activity interventions can be developed for Iranian youth and others from similar cultures and ethnic groups.

It is likely that physical activity rates of adolescents in the Islamic Republic of Iran are low when one considers activity rates in Iranian adults. Research has shown that no citizens over 55 years old achieved the minimum requirements of physical activity (at least 3 times per week for 20 minutes at moderate intensity or higher) [4]. Similarly, only 31.6% of Iranian women between the ages of 18 and 60 years had reached the adoption stage of behavioural change in physical activity [5]. Another study showed that only 6% of female nurses reported regular exercise at the required levels [6].

When undertaking physical activity research it is important to recognize that theory-based physical activity promotions that take account of the determinants of health-related behaviour have proven to be the most effective [7,8]. Pender's health promotion model, derived from social cognitive theory, includes 3 groups of factors that are proposed to influence health behaviour: individual characteristics, behaviour-specific cognitions and affect and immediate behavioural contingencies [9]. The model shows how these 3 groups of factors can have both direct and indirect

influences on health promoting behaviour [10,11]. Another model that can be applied to this research area is the stages of change model. This framework proposes that when adopting a behaviour, individuals move through a temporal sequence of 5 stages: precontemplation, contemplation, preparation, action and maintenance [12]. Physical activity researchers have applied the stages of change model to understand better the adoption and maintenance of exercise behaviour change and to apply interventions that are tailored to the individual's stage of motivational readiness [13,14].

Both these models offer unique theoretical strengths for studying adolescent physical activity. Because no researchers have conducted theoretically based studies of Iranian adolescents' participation in physical activity, the present study, conducted in 2006, was designed to test: individual characteristics, behaviour-specific cognitions and immediate behavioural contingencies with the stages of change for exercise behaviour among a cluster random sample of Iranian adolescents; the proportion of adolescents in each of the stages of change; and the efficacy of behaviour-specific cognition in predicting the stage of exercise behaviour change.

Method

Sample

Adolescents were selected from 233 junior high and high schools in Sanandaj, Islamic Republic of Iran. Based on the results of our pilot study and using a 0.95 confidence level, it was concluded that a sample size of 1272 would give adequate power (80%). Using cluster random sampling, 4 female junior high schools, 4 male junior high schools, 4 female high schools and 4 male high schools were randomly selected from

233 schools located in the city. At the junior high schools, 3 classes from each of grades 7–9 were selected for inclusion, and at each high school, 3 classes from each of grades 10–12 were selected for inclusion.

The study was approved by the education authorities and by the institutional human participants committee. The study investigator sent a written information sheet and consent form for the parents and participants to sign.

There were 1132 respondents. The data from 30 of these participants were not used due to missing information, and the data from an additional 29 were discarded because they did not complete the activity log, leaving 1073 participants in the final data set. The mean age of participants was 14.4 years [standard deviation (SD) 1.6; range 12–17 years]. About half the participants (52%) were female.

Data collection

All the instruments were translated into Farsi by a bilingual researcher and then validated using the standard back translation technique by a native Farsi health promotion specialist who was also fluent in English. The questionnaires were backward translated into English by a native English speaker living in the Islamic Republic of Iran. Five bilingual Iranian health behaviour, health education, exercise psychology and instrument development experts were asked to evaluate the pilot instrument for appropriateness and relevance of the items. The instruments were then revised and modified. The questionnaire was pilot tested on 115 participants who were students from randomly selected junior high and high schools in Sanandaj (57 females and 58 males; age range 12–17 years). This was a separate pool of participants from those who participated in the larger study and their data were not included in

the analyses. Revisions in wording and presentation were made based on empirical findings and recommendations from pilot study participants.

The questionnaires were administered to students in their classrooms. The investigator remained in the room during questionnaire administration and answered any questions. For each of the next 6 consecutive days (Saturday through Thursday) each participant completed an exercise activity log.

Instruments

The participants completed a stages of change questionnaire, a questionnaire with 9 subscales concerning psychosocial factors, and a physical activity log.

Stage of change measure

Each participant's stage of exercise change was assessed by an adapted 2-question measure [15]. In the first question, participants were asked whether they believed they did sufficient sports or physical activity (at least 30 minutes most days per week) on a 2-point scale (yes/no). In the second question, participants who answered "yes" were asked to select 1 of the following 2 options: I'm currently doing enough, but I have been for less than 6 months (action); or I'm currently doing enough and I have been for more than 6 months (maintenance). Those who answered "no" were asked to select 1 of the following 3 options: I'm not sufficiently physically active, and I have no intention to start (precontemplation); I'm not sufficiently physically active, but I intend to start in the next 6 months (contemplation); or I'm not sufficiently physically active, but I intend to start in the next month (preparation). Test-retest reliability of this staging algorithm was $k = 0.85$ [15]. The kappa index of reliability for stage of change over a 2-week period was 0.90 ($n = 50$).

Psychosocial factors measures

Perceived self-efficacy was adapted from an existing exercise self-efficacy scale [16]. This scale included 8 items which were rated on a 4-point Likert scale ranging from 1 (not at all confident) to 4 (very confident). Cronbach alpha value for the self-efficacy score was 0.90.

Perceived benefits/barriers to exercise were measured on a modified scale (1 item was deleted from the original scale based on recommendations from the Iranian experts) which included 18 items and was measured on a 4-point Likert scale ranging from 1 (not at all true) to 4 (very true) [16]. The mean score from each subscale was used. Cronbach alpha reliability coefficient for the benefit subscale was 0.83 and for the barrier subscale it was 0.78.

Interpersonal influences on physical activity were measured using 3 subscales developed by Garcia et al. [16]: social support, exposure to model and interpersonal norms. A 24-item physical activity and social support questionnaire was used to measure the frequency with which adolescents' family members or friends encouraged them to engage in physical activity. Items were rated on a 3-point scale (never/sometimes/often). The interpersonal norms of physical activity subscale included 4 items rated on a similar 3-point scale. The exposure to model variable was assessed by a 12-item scale rated on a similar 3-point scale. The total score for the social support, norms and modelling variables were determined by summing the items for each subscale. Test-retest reliability on support, norms and modelling subscale was 0.84, 0.75 and 0.80 respectively. Internal consistency for the separate social support subscales for different family members and peers in this study ranged from 0.81 to 0.79.

Enjoyment of physical activity was measured by 6 items based on a scale devel-

oped by Robbins et al. [17]. This subscale was scored on a 4-point Likert scale ranging from 1 (not at all sure) to 4 (very true). A subscale score was calculated by deriving the means of all the items. Test-retest reliability coefficient for this subscale was 0.84.

Competing preferences for activities were measured by a scale based on Pender's instrument [18]. The 9-item scale contained 2 choices: A (non-physical activity); B (physical activity). The higher the score on the preferences measure, the more likely preferences for other activities will interfere with physical activity. Cronbach alpha coefficient for the preferences subscale was 0.83.

Commitment to plan for exercise was measured by an 11-item instrument [18] and was scored from 1 (never) to 3 (often). The reliability coefficient was 0.86.

Physical activity measure

Physical activity was assessed using a modified version of the child/adolescent activity log (CAAL) [19], which asked participants to recall the activities they participated in the previous day and the number of minutes of each activity. Minor changes in questions were made for Iranian adolescents. For example, some activities in the CAAL such as ice hockey and ice/roller skating were inappropriate for Iranian adolescents and were replaced with mountaineering, skateboarding, *vasat-vasat* and *khat-khat* (ball games) and "seven-stone" (similar to hopscotch). An average daily physical activity score was obtained by summing the total minutes of all the activities performed by the adolescent. A mean score was derived across the 6 days. The final version of the CAAL used in this study included 23 items. Reported test-retest reliability coefficients for the CAAL ranged from 0.73 to 0.94 [19]. When the CAAL was pilot tested with

Iranian adolescents the test–retest reliability coefficient was 0.98.

The discriminant validity of the activity log in this study was supported by the stages of change. As expected, those adolescents who were in later stages (action, maintenance) reported more minutes of physical activity [mean 62.88 (SD 27.05) min] than those in earlier stages (precontemplation, contemplation and preparation [mean 23.32 min (SD 9.75) min] (Mann–Whitney $z = -24.02$, $P < 0.001$). Furthermore, the stage of change and mean number of minutes of activity per week on the CAAL were significantly correlated as indicated by the Spearman rank correlation ($r = 0.77$, $P < 0.001$).

Statistical analyses

SPSS, version 11.5, was used for all statistical analyses. Descriptive statistics and chi-squared analyses were computed to describe the distribution across the stages of change for the total group and 2 age groups. Univariate analyses of variance (ANOVA) with *post hoc* Scheffe tests were used to identify stage differences of the independent variables. Multiple discriminant analysis with a stepwise approach was performed to determine the extent to which predictor variables were related to stage of physical activity behaviour change. With this proce-

dure, a significant difference among groups indicates that, given a score, we can predict which group it comes from [20].

A stepwise approach was adopted because theoretically the predictor variables should have equal priority, and so a sequential approach, in which the researcher chooses importance, would not be appropriate. One of the advantages of discriminant function analysis for the current research is that unequal sample sizes do not cause statistical problems [20]. For the probability of group assignment to reflect the unequal sample sizes, the discriminant functions were calculated from existing group sizes. Differences were considered to be statically significant at $P < 0.01$.

Results

The participants differed significantly across stages by sex ($\chi^2 = 72.03$, $df = 4$, $P < 0.001$) and age ($\chi^2 = 37.92$, $df = 4$, $P < 0.001$) (Table 1); older adolescents and girls were more prevalent in the preadoption stages (precontemplation, contemplation and preparation).

Differences between stages of change were found for all the psychosocial factors measured (all $P < 0.001$). The ANOVA results are presented in Table 2.

Table 1 Distribution of participants by age and sex across the 5 stages of behavioural change

Group	No.	Pre-contemplation %	Contemplation %	Preparation %	Action %	Maintenance %
Sex						
Female	558	14.2	21.1	28.9	14.9	21.0
Male	515	10.1	13.0	15.5	23.1	38.3
Age (years)						
12–14	586	13.8	15.0	16.6	21.3	33.3
15–17	487	10.3	19.9	29.6	15.8	24.4
Total	1073	12.2	17.2	22.5	18.8	29.3

Table 2 Mean (standard deviation) scores of the participants on the psychosocial factors and physical activity across the 5 stages of behavioural change

Psychosocial factors/ physical activity	PC (n = 131)	C (n = 185)	P (n = 241)	A (n = 202)	M (n = 314)	ANOVA-F Scheffe post hoc test ^a
<i>Psychosocial factors</i>						
Perceived benefits	2.51 (0.57)	2.90 (0.56)	3.13 (0.43)	3.48 (0.35)	3.68 (0.26)	229.58***
Perceived barriers	2.91 (0.62)	2.76 (0.61)	2.34 (0.54)	1.82 (0.32)	1.58 (0.31)	300.70***
Self-efficacy	1.51 (0.45)	1.42 (0.42)	1.50 (0.27)	2.37 (0.33)	2.85 (0.37)	743.08***
Social support	42.09 (8.50)	42.22 (8.96)	45.55 (6.97)	50.19 (5.49)	52.14 (5.96)	91.13***
Exposure to model	10.03 (5.09)	9.51 (4.66)	10.08 (3.96)	12.83 (4.02)	14.21 (3.92)	57.14***
Interpersonal norms	3.58 (2.35)	3.38 (2.13)	4.28 (1.93)	5.46 (1.69)	6.27 (1.36)	102.70***
Enjoyment	2.64 (0.84)	2.95 (0.72)	3.21 (0.54)	3.66 (0.24)	3.79 (0.22)	166.40***
Preferences	5.19 (2.94)	5.20 (3.01)	3.84 (2.70)	2.55 (2.14)	1.99 (2.81)	73.35***
Planning	1.55 (0.40)	1.66 (0.45)	1.77 (0.42)	2.14 (0.34)	2.31 (0.35)	146.37***
Physical activity (min/day)	16.15 (5.79)	21.67 (8.99)	28.48 (9.11)	53.57 (24.51)	68.86 (26.94)	318.14***

^aMeans with different indices are significantly different in Scheffe post hoc tests: $P < 0.001-0.03$.

*** $P < 0.001$.

PC = precontemplation, C = contemplation, P = preparation, A = action, M = maintenance.
n = number of participants.

All predictor variables are shown in Table 3. Three of the 4 possible functions were statistically significant. Exercise self-efficacy, planning, perceived social support, preferences and modelling significantly loaded onto the first function (Wilk's $\lambda = 0.143$, $\chi^2 = 2074.57$, $df = 20$, $P < 0.001$; eigen value = 4.44, canonical correlation = 0.904). The greatest separation between the stages of change for the first function was between the preparation and action stages. Perceived benefits and enjoyment of physical activity significantly loaded onto the second function (Wilk's $\lambda = 0.780$, $\chi^2 = 265.75$, $df = 12$, $P < 0.001$; eigen value = 0.259, canonical correlation = 0.453). The third function accounted for the remaining 0.4% of variability combined. Perceived barriers significantly loaded onto the third function and was statistically significant ($\chi^2 = 20.16$, $df = 6$, $P < 0.003$). Overall, 63.4% of cases were correctly classified.

Because sex was a significant univariate predictor of stage of change, and the first discriminant function was significant, separate multiple discriminate analyses were performed for females and males to determine differences in social cognitive characteristics. For females, self-efficacy (0.833), exercise behaviour (0.496) and perceived barriers (-0.183) were the most important discriminating variables (Wilk's $\lambda = 0.86$, $\chi^2 = 1355.84$, $df = 24$, $P < 0.001$). The proportion of between-group variability accounted for by this function was 91.3% (canonical

Table 3 Multiple discriminant analysis to predict stage of exercise behaviour change for the total sample (n = 1073)

Psychosocial factors/ physical activity	Structure coefficient			
	Discriminant function 1 ^a	Discriminant function 2 ^b	Discriminant function 3 ^c	Discriminant function 4 ^d
<i>Psychosocial factors</i>				
Self-efficacy	0.786*	0.361	-0.001	-0.494
Social support	0.262*	-0.167	-0.149	-0.197
Enjoyment of physical activity	0.309	-0.324***	-0.144	-0.235
Perceived barriers	-0.486	0.488	0.671**	0.266
Preferences	-0.229***	0.162	0.100	0.130
Perceived benefits	0.412	-0.632***	0.411	-0.395
Planning	0.288***	-0.206	-0.142	-0.174
Interpersonal norms	0.226	-0.171	-0.120	-0.234***
Exposure to model	-0.218***	0.000	-0.190	-0.164***
<i>Physical activity (min per day)</i>	0.516	-0.131	-0.164	0.830***

^aDiscriminant function 1 was statistically significant and accounted for 94.1% of between-group variability.

^bDiscriminant function 2 was statistically significant and accounted for 5.5% of between-group variability.

^cDiscriminant function 3 was statistically significant and accounted for 4% of between-group variability.

^dDiscriminant function 4 was not statistically significant.

***P < 0.001 between function and variable; **P < 0.01 between function and variable.

correlation coefficient = 0.928). Scheffe *post hoc* tests revealed a significant increase in exercise self-efficacy, exercise behaviour and perceived barriers to physical activity from contemplation through to maintenance ($P < 0.001$). Among males, exercise behaviour (0.610), self-efficacy (0.410) and enjoyment of physical activity (0.290) were the best predictors of stage of change (Wilk's $\lambda = 0.016$, $\chi^2 = 927.51$, $df = 24$, $P < 0.001$). The proportion of between-group variability accounted for by this function was 93.5% (canonical correlation coefficient = 0.891). Scheffe *post hoc* tests revealed a significant increase in exercise behaviour, self-efficacy and enjoyment of physical activity from contemplation through to maintenance ($P < 0.001$). For females the first function presented the largest separation between preparation and action and between action and maintenance, and for males the largest separation was between the preparation and action stages.

Overall, 73.3% of females and 64.7% of males were correctly classified. Differences between stages were further characterized by comparing group centroids (Figure 1). The group means of exercise predictors for each respective stage for the first function were: precontemplation stage, -2.34; contemplation, -2.16; preparation, -1.57; action, 1.17 and maintenance, 2.70. The distances between precontemplation and contemplation were low (≈ 0.15). The greatest distance was between the preparation and action stages (≈ 2.75) indicating that psychosocial and cognitive variables differed in each stage of exercise behaviour.

Discussion

This study provides the first evidence of the rates of physical activity and the validity of the stages of change in exercise behaviour in adolescents in the Islamic Republic of Iran.

These findings are a necessary starting point for further research into theoretically based interventions designed to increase physical activity in Iranian youth. Such interventions would appear to be necessary as more than half of the adolescents in the present study were in the precontemplation, contemplation and preparation stages of exercise behaviour change. These results are similar to statistics reported for Korean adolescents [21] but inconsistent with reported rates for North American or European adolescents where fewer adolescents were found to be in the pre-adoption stages [22–24]. In our study,, the number of adolescents in the maintenance phase of physical activity decreased from 33% for the 12–14-year-olds to 24% for the 15–17-year-olds. This finding supports the contention that adolescence is a period where youth tend to drop out from sports rather than pick up new activities [24].

The stages of exercise behaviour were supported by discriminant analysis and, as suggested by theory, the group centroids for adolescents in the precontemplation stage

had the lowest value and the group centroids in the maintenance stage were highest. The greatest distance was between the preparation and the action stages, indicating that progression from preparation to action may be more difficult for these adolescents. Furthermore, females in the preparation and action stages may be harder groups to move to the action and maintenance stages respectively. These results are inconsistent with those of Wallace who reported approximately equal distances between precontemplation and contemplation, contemplation and preparation, and preparation and action stages and the largest distance between action and the maintenance [23].

Several determinants of exercise stage based on Pender's health promotion model were identified [9]. Exercise self-efficacy, exercise behaviour, perceived barriers and perceived benefits were the best determinants of stage of exercise behaviour change. Psychosocial and cognitive constructs differed from the precontemplation through to the maintenance stage. Similar

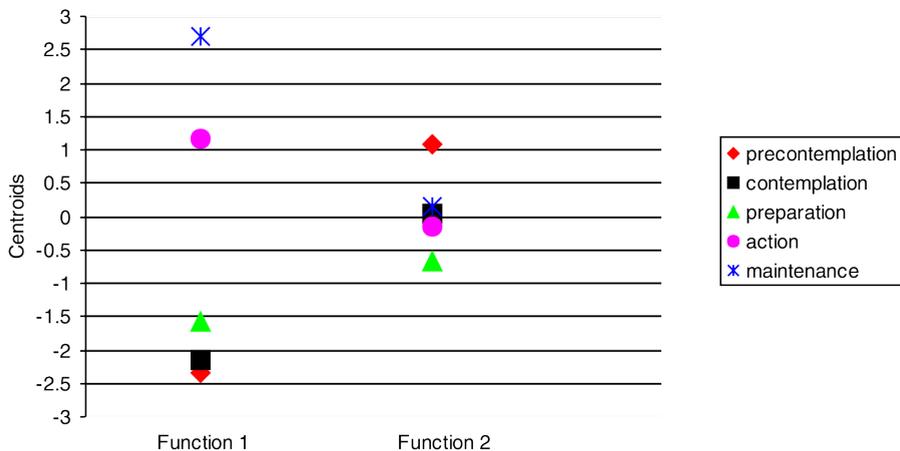


Figure 1 Group centroids (means) for exercise stage of change of functions 1 and 2 for the total sample (n = 1073)

to other researchers who have reported self-efficacy to be the best predictor of stage of change [22,23], self-efficacy was a significant predictor of exercise stage for both females and males in our study. Self-efficacy distinguished between those in the precontemplation, contemplation, action and maintenance stages.

Perceived benefits and barriers were found to be significant predictors of stage of exercise behaviour change for both males and females in our findings. This is similar to other research showing that perceived benefits and barriers predicted the stage of behaviour change for exercise [25]. Youths spend their time in ways that they see as beneficial both in the short term and long term, and they need to be convinced of the benefits of being physically active. The findings regarding perceived barriers are particularly important in the light of research showing that cross-cultural differences were important barriers for physical activity among youth in Taiwan and the United States [11]. However, this finding regarding cultural differences in the impact of barriers on physical activity needs to be explored further before definitive conclusions can be drawn.

Enjoyment of physical activity was higher across more advanced stages of behaviour change for males in our study. Therefore, providing an enjoyable atmosphere may be important for adolescent Iranian males. These findings are similar to those of Robbins et al. who also reported a relationship between self-efficacy and enjoyment of physical activity in middle and late adolescence [17]. Therefore, to increase exercise behaviour in boys it might be necessary to use the feelings associated with individual bouts of exercise and the cumulative emotional changes associated with exercise over time to improve adherence. For example, a plan could be developed around a participant's like and dislikes.

For females, exercise self-efficacy and perceived barriers were significant predictors of stage of exercise behaviour change. The finding regarding perceived barriers is important when one considers the unique challenges that exist when trying to promote physical activity in female Iranian adolescents where specific cultural barriers may be particularly salient. These barriers include greater family responsibilities, restrictions on exercising in separate facilities, lower cultural expectation that they should exercise and fewer sports opportunities. Therefore, it is important to recognize that in the Iranian context, the creation and promotion of expectations and standards for adopting physical activity should be emphasized. The identification of such gender-specific determinants of exercise behaviour is critical to developing intervention strategies that can be tailored to the specific needs of different adolescent groups.

To develop effective physical activity interventions, activity levels need to be understood: unrealistic self-assessment could be a barrier to people moving forward to adoption stages if they see no need to change. In the present study, for the first time results from the CAAL were assessed with the stage of exercise behaviour change. The results are promising, as differences across stages of change were not only found for exercise participation but also for total physical activity. Thus, we can conclude that Iranian adolescents in the pre-adoption stages of physical activity not only differ in intention, but also in behaviours. These findings are consistent with other studies in which level of physical activity was found to increase as individuals moved to higher stages of change [24,26].

There were several limitations to the present study. First, the data were measured by a self-report questionnaire. Another limitation is the cross-sectional nature of

the study which makes it impossible to draw conclusions about the antecedents of successful exercise behaviour change. Adolescents may make behavioural choices during this developmental period that contribute to lifelong behavioural patterns; however, longitudinal studies are needed to research this area. Finally, further assessment of the validity of the CAAL with an objective measure in Iranian adolescents is recommended. It should be noted however that the test–retest reliability of the CAAL in this study was high (0.98).

Conclusion

This study investigated Iranian adolescent physical activity using the proposed frame-

work adapted from Pender's revised health promotion model [9] to predict the stage of exercise behaviour change. We found support for the health promotion model constructs as predictors of stage of change. The findings of this study highlight the importance of self-efficacy for engaging in physical activity for both sexes of Iranian adolescents. In particular, the barriers faced by Iranian girls should be considered and appropriate interventions developed to increase physical activity rates. Further, the findings of this study have provided important information that could be used to develop physical activity interventions in this and other similar populations.

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