Association between physical activity and mental health among high-school adolescents in Boushehr province: A population based study

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Objective: Mental health is one of the evaluating factors of community indicators, and physical activity is considered an important tool for the importance of public health. Previous studies have demonstrated associations between physical activity and mental health, but these studies did not include those populations in which training children have some traditional and religious aspects.

Methods: Multiple logistic regression analyses were used to compare the prevalence of mental health among those who had inactive, minimally and HEPA activity in a representative sample of adolescents aged 15-19 in South of Iran using data from the Mental Health Survey (n = 2584). The GHQ-28 and IPAQ-short forms were used to evaluate the mental health and physical activity, respectively.

Results: A total of 2584 adolescents (1401 male and 1178 female) participated in the study. The observed odds of psychological symptoms in boys compared to girls is 1.2 times (p=0.018). We observed that HEPA-activity decreases odds of somatic distress and social dysfunction compared with inactivity (p=0.031 and 0.001, respectively); minimally activity decreases odds of anxiety compared with inactivity (p=0.038); but physical activity rate was not affected on odds of adolescents' depression (p>0.05).

Conclusion: Physical activity decreases mental health subscales except for depression among adolescents in Boushehr, southern city of Iran.

Keywords: Adolescents, Iran, Mental health, Physical activity
depression in childhood and adolescence has increased (8, 9). Although in previous decades it was believed that depression did not occur in adolescents, recent prevalence studies have suggested that 2% to 8% of young people experience their first episode of major depression by age 16 (10-12,1). Also, American surgeon general assembly report in 1999 showed that 74 percent of adolescents suffer from mental disorder (13). Despite the increasing burden of common mental disorders (anxiety and depression) in society, few data are available on the relation between physical activity and mental health (14-20). The aim of this paper is to examine the association between physical activity and mental health using a population-based study among adolescents in a city in south of Iran (Boushehr), with a religious community.

Materials and Method

Mental Health Study

We used data from the Mental Health Study (MHS), a population-based study of adolescents in Boushehr Province (South of Iran) in 2005. The MHS was conducted on 2697 high-school students aged 15-19 years. Multi-stage random sampling technique was used in the MHS, where number of students was determined by proportion sampling method based on male and female students in counties and schools, and also by student grade. Data were collected by a questionnaire with four sections. Section one included demographic characteristics (e.g. age, sex, educational level, students' field) and some of socio-economic factors (e.g. parent educations, family income, parent job, visit relatives, hours watching TV); section two included 28-item of General Health Questions (GHQ-28); section three included questions of International Physical Activity Questionnaire; and section four included food consumption pattern questionnaire(21). Mental health was measured using the 28-item General Health Questionnaire (GHQ-28) that is a screening instrument for psychiatric disorders(22,23). The Iranian version of the GHQ-28 (24) was also used to estimate mental health state. GHQ-28 (25) is a 28-item self-rating questionnaire addressing a range of psychological symptoms, including anxiety, depression, somatic symptoms, and social dysfunction. The questionnaire determines whether respondents have experienced a particular symptom or behavior recently. The 28-items GHQ is scored on a four point Likert-type scale according to a 0-1-2-3 system (i.e., less than usual, no more than usual, rather more than usual, or much more than usual). Therefore, minimum and maximum score based on the Likert scale is zero and 84, respectively. In this study, the cut-point was 23 with reliability coefficient of 88 per cent(23). Before use, the GHQ-28 was translated into Persian based on Iranian culture by Tehran Psychiatric Institute. Multi-stage random sampling technique was used in MHS, and trained interviewers conducted face-to-face interviews using a questionnaire. Subjects were selected by proportional stratified sampling method in each stage based on number of students in counties, their sex and educational level. Questioners were educated in 2 three hour sessions. Questionnaires were supplemented by students. The MHS was conducted one month prior to the students' examinations or quizzes, and the 12th graders were excluded because of their final quizzes and examinations.

Assessment of Levels of Physical Activity

The short-form of the Iranian version of the International Physical Activity Questionnaire (IPAQ)(26) was used to estimate levels of physical activity. The IPAQ short form assesses physical activity about three specific types of activity (walking, moderate-intensity activities and vigorous-intensity activities performed for at least 10 minutes per session) undertaken in four domains including: a) leisure time physical activity; b) domestic and gardening activities; c) work related physical activity; d) transport related physical activity(2). Weekly minutes of walking, and moderate-intensity and vigorous intensity activities, were calculated separately by multiplying the number of days per week in which the activity took place by the duration of the activity in an average day. The three levels of physical activity used to classify populations were “inactive,” “minimally active,” and “HEPA-active”. These categories were based on standard scoring, as follows. “Moderate active” is more than the minimum level of activity recommended for adults in current public health recommendations. “HEPA-active” can be computed for people who exceed the minimum public health physical activity recommendations, and are accumulating enough activity for a healthy lifestyle.

Statistical Analysis

Statistical significance was set at 0.05, and the unit of analysis was students. All tests were two-sided. Frequency distributions, percents, confidence intervals and odds ratios were determinate to describe the data. Multiple logistic regression analyses were used to determine the association between physical activity and mental health subscales, adjusting for sex, subjects' educational level, parent education, and family income.

Results

A total of 2584 adolescents (1401 male and 1178 female) participated in the study. The study showed that the prevalence of psychological symptoms among girls was significantly higher than boys. In other words, the odds of psychological symptoms in girls compared to boys is 1.2 times (p=0.018; Table 1). Low, moderate and high physical activity was reported by 58.4%, 23.8% and 17.8% of adolescents aged 15-19 in Boushehr province, respectively (Table1). About 40 percent of adolescents had a monthly salary of 2000000 Iranian Rial (median of family income was equal to 2000000 Iranian Rial; Table 1).
Table 1: Socio-demographic characteristics associated with psychological symptoms prevalence in south of Iran

| Characteristic                  | N (%)               | Psychological symptoms prevalence (%) | Adjusted OR (95% C.I.) | P value |
|--------------------------------|---------------------|--------------------------------------|------------------------|---------|
| **Sex**                        |                     |                                      |                        |         |
| Male                           | 1406 (54.4)         | 37.9                                 | -                      | 0.018   |
| Female                         | 1178 (45.6)         | 44.1                                 | 1.217 (1.034,1.434)    |         |
| **Educational level**          |                     |                                      |                        |         |
| 9th grade                      | 806 (31.2)          | 37                                   | -                      | 1.136   |
| 10th grade                     | 901 (34.8)          | 40.4                                 | 1.162 (0.954,1.416)    |         |
| 11th grade                     | 677 (34)            | 44.5                                 | 1.384 (1.135,1.687)    |         |
| **Family income (Iranian Rial)** |                  |                                      |                        |         |
| < 2,500,000                    | 1775 (68.6)         | 41.3                                 | -                      | 0.061   |
| 2,500,000-5,000,000            | 684 (26.5)          | 28.2                                 | 0.821 (0.668,1.009)    |         |
| >= 5,000,000                   | 125 (4.8)           | 36.1                                 | 0.894 (0.601,1.331)    |         |
| **Physical activity status**   |                     |                                      |                        |         |
| inactive                       | 1507 (58.4)         | 42.6                                 | -                      | 0.231   |
| minimally active               | 616 (23.8)          | 38.3                                 | 0.890 (0.732,1.082)    |         |
| HEPA-active                     | 461 (17.8)          | 37.7                                 | 0.740 (0.615,1.012)    |         |
| ** Fathers’ education**        |                     |                                      |                        |         |
| < 8th grade                    | 2104 (81.4)         | 44.1                                 | -                      | 0.267   |
| 8th-11th grade                 | 248 (9.6)           | 41.1                                 | 1.158 (0.894,1.483)    |         |
| >= 12th grade                  | 232 (9)             | 40.3                                 | 1.163 (0.912,1.483)    |         |
| ** Mothers’ education**        |                     |                                      |                        |         |
| < 8th grade                    | 2001 (77.4)         | 40                                   | -                      | 0.075   |
| 9th-11th grade                 | 501 (19.4)          | 39.5                                 | 0.794 (0.616,1.024)    |         |
| >= 12th grade                  | 482 (18.6)          | 42                                   | 0.826 (0.646,1.058)    |         |

Table 2. Distribution of sex ratio in different levels of physical activity and mental health subscales among southern adolescent of Iran

| Physical Activity: | Male n (%) | Female n (%) | Total n (%) | \( \chi^2 \), df, P value |
|--------------------|------------|--------------|-------------|--------------------------|
| inactive           | 695 (49.4) | 812 (68.9)   | 1507 (58.3) | Chi-square=9.084, df=1, p=0.003 |
| minimally active   | 398 (28.3) | 218 (18.5)   | 616 (23.8)  | Chi-square=52.597, df=1, p<0.001 |
| HEPA-active         | 313 (22.3) | 148 (12.6)   | 461 (17.8)  | Chi-square=59.056, df=1, p<0.001 |

| Mental Health:     | Male n (%) | Female n (%) | Total n (%) | \( \chi^2 \), df, P value |
|--------------------|------------|--------------|-------------|--------------------------|
| Somatic distress   | 478 (34)   | 552 (46.9)   | 1030 (39.9) | Chi-square=44.233, df=1, p<0.001 |
| Anxiety            | 648 (48.1) | 643 (54.8)   | 1291 (50)   | Chi-square=18.506, df=1, p<0.001 |
| Social dysfunctions| 961 (68.3) | 739 (62.7)   | 1700 (65.8) | Chi-square=0.121, df=1, p=0.728 |

Table 3. Association between physical activity levels and mental health subscales among southern adolescent of Iran (Logistic regression analysis)

| Mental Health Subscales | Physical Activity | Inactive n (%) | Minimally active n (%) | HEPA-active n (%) | O.R. | CI 95% | p | O.R. | CI 95% | p | O.R. | CI 95% | p |
|-------------------------|-------------------|----------------|------------------------|------------------|------|--------|---|------|--------|---|------|--------|---|
| Somatic distress        |                   | 635 (42.1)     | 239 (38.8)             | 156 (33.8)       | 0.63 | 0.63-   | 0.98 | 0.031|
| Anxiety                 |                   | 778 (51.6)     | 278 (45.1)             | 235 (51)         | 0.91 | 0.85-   | 1.29 | 0.68 |
| Social dysfunction      |                   | 1013 (67.2)    | 410 (66.6)             | 277 (60.1)       | 0.69 | 0.55-   | 0.86 | 0.001|
| Depression/Suicide      |                   | 527 (35)       | 208 (33.8)             | 145 (31.5)       | 0.84 | 0.67-   | 1.06 | 0.14 |

Few parents held an education level of high school diploma or higher (9% fathers and 18.6 % mothers; Table1). Table 1 shows that prevalence of psychological symptoms has a positive association with education level of individuals, so that adolescents with 11th grade compared with 9th grade are two times at risk, approximately (OR=1.384, CI95%= (1.135,1.687), p=0.001;Table1). Overall, family income and parent education were not associated with the subjects' mental health (p>0.05; Table 1)

In the population studied, we observed that high physical activity (HEPA-activity) decreases odds of somatic distress and social dysfunction compared with inactivity (p=0.031 and 0.001, respectively; Table3); minimally activity decreases odds of anxiety compared with inactivity (p=0.038; Table3).
In this study, inactivity was reported more often by females (p=0.003; Table2). However, proportion of boys was more than girls in the other levels of physical activity (p=0.001; Table2). The results showed that adolescent boys only in one of the mental health subscales, social dysfunction, had more problem than girls (p=0.003; Table2). Somatic distress and anxiety prevalence in girls were larger than boys (p=0.001; Table2). Depression prevalence in girls and boys was not different (p=0.728; Table2).

Discussion
The results of this study on young people 15 to 19 years was conducted in the city of Boushehr in south of Iran. The fact that they were brought up in religious families, indicate that the proportion of the adolescents with a high GHQ-28 score was high (40.7%), although we applied a highly conservative cut-off point, suggesting the existence of really serious mental problems. Although the percentage of psychological symptoms obtained in this study is less compared with some other studies (12, 27, 28), still it is larger than many studies (29). One of the reasons for the high prevalence of psychological symptoms among young people in this study compared with other studies may be that the subjects completed the questionnaire by themselves. Another reason for these high GHQ-28 scores could be the particular age group of the study sample. Adolescence is a stressful period of life. This period imposes many challenges to adolescents such as finding personality and values, and respect for self and others (29). In addition, the impact of the pressure of university entrance exam should also be considered. Adolescents in Iran are placed under the additional pressure of preparing themselves for the national university entrance exam.

According to the results, young girls are more prone to mental health problems than young boys (OR=1.217, p=0.018; Table1). We observed that distribution of mental health subscales among boys and girls are not the same except for symptoms of depression. The higher risk of mental health problems among girls has been found in many investigations (29 -30). One of the reasons for the gender difference may be varying between societies with different cultures (31). In Iran, more limitations are exerted by society and families on girls compared with boys. As expected, boys reported higher physical activity than girls in the study. Sex ratios were not similar at different levels of physical activity (Table2), so most adolescent girls had low physical activity level (e.g. walking) in Boushehr. A number of studies have demonstrated similar gender differences in physical activity (32, 33). Female exercising is very important as in menopause age, women could experience osteoporosis and many other diseases; so, it may lead to increased incidence of chronic diseases (e.g. mental disorders, cardiovascular disease, diabetes and Etc.) in the following years.

In this study, we observed that high physical activity (HEPA-activity) only decreases odds of somatic distress and social dysfunction compared with inactivity (p<0.05); and also, minimally activity decreases odds of only anxiety subscale compared with inactivity (p>0.05; Table3). In this study, such as Sadeghian’s study (34), it was observed that increased levels of education will cause GHQ-28 score to increase.

Conclusions
This study shows that mental health problems are very serious in adolescents in the religious and traditional southern community/ city of Iran (Boushehr province). This study also indicates that physical activity decreases mental health subscales rates, except for depression. Furthermore, this study reveals that sport programs could help adolescents to improve their problem-solving skills and enhance their coping strategies with mental health problems, and even to prevent the onset of psychological symptoms.

References
1. Bolognini M, Plancherel B, Nunez R, Bettschart W. [Assessment of the effects of age at start of puberty on mental health in pre-adolescence: results of a longitudinal study (1989-1991)]. Rev Epidemiol Sante Publique 1993; 41: 337-345.
2. Pate RR, Pratt M, Blair SN, Haskell WL, Macera CA, Bouchard C, et al. Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. JAMA 1995; 273: 402-407.
3. Leon AS, Connett J, Jacobs DR, Jr, Rauramaa R. Leisure-time physical activity levels and risk of coronary heart disease and death. The Multiple Risk Factor Intervention Trial. JAMA 1987; 258: 2388-2395.
4. Morris JN, Chave SP, Adam C, Sirey C, Epstein L, Sheehan DJ. Vigorous exercise in leisure-time and the incidence of coronary heart-disease. Lancet 1973; 1: 333-339.
5. Carter ND, Khan KM, McKay HA, Petit MA, Waterman C, Heinonen A, et al. Community-based exercise program reduces risk factors for falls in 65- to 75-year-old women with osteoporosis: randomized controlled trial. CMAJ 2002; 167: 997-1004.
6. Manson JE, Rimm EB, Stampfer MJ, Colditz GA, Willett WC, Krolewski AS, et al. Physical activity and incidence of non-insulin-dependent diabetes mellitus in women. Lancet 1991; 338: 774-778.
7. American College of Sports Medicine. Position Stand. Physical activity, physical fitness, and hypertension. Med Sci Sports Exerc 1993; 25: i-x.
8. Cicchetti D, Toth SL. The development of depression in children and adolescents. Am Psychol 1998; 53: 221-241.

9. Lewinsohn PM, Rohde P, Seeley JR. Major depressive disorder in older adolescents: prevalence, risk factors, and clinical implications. Clin Psychol Rev 1998; 18: 765-794.

10. Cohen P, Cohen J, Kasen S, Velez CN, Hartmark C, Johnson J, et al. An epidemiological study of disorders in late childhood and adolescence--I. Age- and gender-specific prevalence. J Child Psychol Psychiatry 1993; 34: 851-867.

11. Hankin BL, Abramson LY, Moffitt TE, Silva PA, McGee R, Angell KE. Development of depression from preadolescence to young adulthood: emerging gender differences in a 10-year longitudinal study. J Abnorm Psychol 1998; 107: 126-140.

12. Fergusson DM, Woodward LJ. Mental health, educational, and social role outcomes of adolescents with depression. Arch Gen Psychiatry 2002; 59: 225-231.

13. Public Health Service. Report of the surgeon general's conference on children's mental health: a national action agenda. Washington: Department of Health and Human Services; 2000.

14. Wiles NJ, Haase AM, Gallacher J, Lawlor DA, Lewis G. Physical activity and common mental disorder: results from the Caerphilly study. Am J Epidemiol 2007; 165: 946-954.

15. Goodwin RD. Association between physical activity and mental disorders among adults in the United States. Prev Med 2003; 36: 698-703.

16. Dunn AL, Trivedi MH, O'Neal HA. Physical activity dose-response effects on outcomes of depression and anxiety. Med Sci Sports Exerc 2001; 33: S587-597; discussion 609-510.

17. Abramson JL, Vaccarino V. Relationship between physical activity and inflammation among apparently healthy middle-aged and older US adults. Arch Intern Med 2002; 162: 1286-1292.

18. De Moor MH, Boomsma DI, Stubbe JH, Willemsen G, de Geus EJ. Testing causality in the association between regular exercise and symptoms of anxiety and depression. Arch Gen Psychiatry 2008; 65: 897-905.

19. Lampinen P, Heikkinen RL, Ruoppila I. Changes in intensity of physical exercise as predictors of depressive symptoms among older adults: an eight-year follow-up. Prev Med 2000; 30: 371-380.

20. Peluso MA, Guerra de Andrade LH. Physical activity and mental health: the association between exercise and mood. Clinics (Sao Paulo) 2005; 60: 61-70.

21. Soltanian AR, Bahreyni F, Namazi S, Amiri M, Ghaedi H, Kohan GHR, Mental Health of high school students and its effective factors in Bushehr Province. Iranian South Medical Journal 2005. 7(2): p. 173-182.

22. Goldberg D, Williams P. A User’s Guide to the General Health Questionnaire. Windsor, UK: NFER-Nelson; 1988.

23. Yaghoubi N, Nasr M, Shahmohammadi D. [Epidemiological study of mental disorders in urban and rural areas of SoumaahSara city-Gilan]. Andisheh and Raftar Journal 1995; 4: 55-65.

24. Besharat MA. Reliability and Validity of the Mental Health Inventory. Daneshvar Raftar 2006; 16: 11-16.

25. Besharat MA. Reliability and Validity of a short form of the Mental Health Inventory in an Iranian population. Scientific Journal of Forensic Medicine 2009; 15: 87-91.

26. Hazavehei MM, Asadi Z, Hasanzadeh A, Shekarchizadeh P. A Study on the Effect of Physical Education 2 Curriculum Based on BASNEF Model on Female Students’ Regular Physical Activity in Isfahan University of Medical Sciences. The Scientific Journal of Zanjan University of Medical Sciences 2009; 17: 70-83.

27. Hacker K, Drainoni ML. Mental health and illness in Boston's children and adolescents: one city's experience and its implications for mental health policy makers. Public Health Rep 2001; 116: 317-326.

28. Harrington R and Clark A. Prevention and early intervention for depression in adolescence and early adult life. Eur Arch Psychiatry Clin Neurosci 1998; 248: 32-45.

29. Emami H, Ghazinour M, Rezaeihiraz H, Richter J. Mental health of adolescents in Tehran, Iran. J Adolesc Health 2007; 41: 571-576.

30. Masoodzadeh A, Khalillian AR, Ashrafi M, Kimiaibakyi K. Mental health student in Sari city. Mazandaran Medical University Journal 2005; 15: 74-82.

31. Sorensen M. Motivation for physical activity of psychiatric patients when physical activity was offered as part of treatment. Scand J Med Sci Sports 2006; 16: 391-398.

32. Duncan SC, Duncan TE, Strycker LA, Chaumeton NR. A cohort-sequential latent growth model of physical activity from ages 12 to 17 years. Ann Behav Med 2007; 33: 80-89.

33. Kahn JA, Huang B, Gillman MW, Field AE, Austin SB, Colditz GA, et al. Patterns and determinants of physical activity in U.S. adolescents. J Adolesc Health 2008; 42: 369-377.

34. Sadeghian E, Heidarian pour A. [ Stressors and Mental Health Status among Students of Hamadan University of Medical Sciences ]. Hayat 2009; 15: 71-81.