

Physical Activity and Mental Health in Hong Kong

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Abstract

The Mental Health Association of Hong Kong and the Hong Kong Baptist University had jointly conducted a study on physical activity and mental health in Hong Kong. The major objective is to examine the association between physical activity (PA), body mass index (BMI), mental health, and Quality of Life (QoL) of participants in Hong Kong. A cross-sectional survey was conducted. Participants were recruited from four settings: primary schools, secondary schools, universities and community centers in Hong Kong. Data was collected by a set of self-reported questionnaire. Mental health was measured by General Health Questionnaire (GHQ) and Hospital Anxiety and Depression Rating Scale (HADS); QoL was measured using Personal Wellbeing Index (PWI); and PA was assessed using Physical Activity Questionnaire for Older Children (PAQC). Body Mass Index (BMI) was calculated on the self-reported weight and height by the participants. Totally 2050 questionnaires were distributed and 1899 completed questionnaires were received. Findings revealed that higher physical activity participation is positively associated with mental health and improves quality of life across all age groups in both sexes.

Keywords: physical activity, mental health, quality of life (QoL)

Introduction

Anxiety and depression were the major mental health diseases that crisis the public health (Zoeller, 2007). The prevalence of depression is accelerating in worldwide and expected to be persisting in the coming 20 years (WHO, 2007). Estimates also projected that depression will be the second leading cause of disability in 2020 (Murray & Lopez, 1996). In US, the major depression increases from 3.33% to 7.06% from 1991-1992 and 2001-2002 (Compton et al., 2006). In Hong Kong, 8.3 % of residents reported depressive symptom in last 12 months (Cheng, 2006). Depression is commonly onset at the age of 20-40. However, it may also occur in all course

of lifetime (WHO, 2007), even in childhood (Chan & Hung, 2006).

Anxiety is defined as the feelings that we experienced when under stress physically, socially, economically, and psychologically. It might lead to adverse effect to individual's health (i.e. feeling of impending doom, fear, shortness of breath, inability to carry out work, eat or sleep) (WHO, 2001). Individual with the symptoms of depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration was diagnosed as depression. These symptoms could be chronic or recurrent which may affect individual's ability to take care of his or her everyday

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responsibilities substantially (WHO, 2007).

Depression was found to be associated with cardiovascular disease and diabetes (Mykletun et al., 2007; Thakore, 2001), and may lead to suicide behavior and serious disruption in psychological function without appropriate treatment (Chan & Hung, 2006). In addition, depression is also associated with impairment and disabilities in role functioning, which result in reducing of overall quality of life (QoL) (Angermeyer et al., 2002; Strine et al., 2004). However, studies investigated anxiety and other factors were limited.

Traditional pharmacological treatment such as antidepressant reported a low success rate due to poor compliance of the treatment (Mitchell & Selmes, 2007). Meanwhile, physical activity (PA) was suggested as a protective factor of depression. Previous studies reported that greater PA was associated with reduced risk of prevalent depression (Dunn et al., 2001; Strawbridge et al., 2002a). Therefore, more and more studies adopted PA as a non-pharmacological treatment for depression. Dimeo and colleagues (2001a) reported that aerobic exercise may produce a short-term improvement in mood in patient with major depressive disorder. A recent review also provided evidence of the beneficial effects of both aerobic and non-aerobic exercise on depression in clinically and non-clinically depressed adults (Phillips et al., 2003). Recently, some studies suggested that higher body mass index (BMI) may increase prevalent depression, but no consensus has been reached in the literatures (Anderson et al., 2006b; Dragan & Akhtar-Danesh, 2007b). Therefore, understanding the association between PA, BMI, mental health and QoL is critical for recommending effective strategies and health service planning.

There were large amount of studies which examined either the association of physical activity (PA) and mental health (Dimeo et al., 2001b; Harris et al., 2006; Sjoten & Kivel, 2006; Strawbridge et al., 2002a) or PA and QoL (Abell et al., 2005; Jenkins et al., 2002;

Rejeski & Mihalko, 2001), but most of them were conducted in a special population (i.e. patient and elderly). This limited the ability of generalizing the result in general population. Therefore, the purpose of the present study is to investigate the association between PA participation, mental health and QoL in the Hong Kong general population.

Objectives

The objectives of the present study were:

- 1) to examine the association between PA, body mass index (BMI), and mental health in participants;
- 2) to identify the unique contribution of PA and BMI to participant's mental health;
- 3) to investigate the group differences in participant's gender and age in their PA, and mental health.

Methodology

Participants

Participants aged above 9 year-old were recruited from three primary schools, four secondary schools, five universities and three community centers in Hong Kong.

Study Design

A cross-sectional survey was conducted. Data was collected by a set of validated self-reported questionnaire.

Outcome Measures

Mental health was measured by General Health Questionnaire (GHQ) and Hospital Anxiety and Depression Rating Scale (HADS). QoL was measured using Personal Wellbeing Index (PWI). PA was assessed using Physical Activity Questionnaire for Older Children (PAQC). Body mass index (BMI) was calculated based on participants' self-reported weight and height.

Results

2050 questionnaires were distributed and 1899 completed questionnaires were received. The response rate is 92.6%. The mean score of the scales were showed in Table 1. The finding in the present study was found to be similar to the mean score of previous studies. Further comparison between previous studies and the present study were presented in Table 2 & 3.

Table 2 showed the distribution of the anxiety and depression categorized according to Snaith & Zigmond's manual (1994). Participants scored 8-10 were classified as

mild; 11-15 were moderate; and 16 or above were severe. The tendency of participants suffering from mental illness in Hong Kong is higher than the reference standard. Moreover, people categorized as mild depression were doubled, and moderate depression were tripled to Snaith & Zigmond's manual (1994).

Table 3 showed the distribution of the anxiety and depression categorized according to Leung et al (1993). The present findings also demonstrated a higher prevalence of depression compared to previous Hong Kong population.

Table 1
Mean score of HADS, GHQ and PWI scale

	Mean (SD)			
	HADS_anx	HADS_dep	GHQ	PWI
Previous study	7.32 (SD=3.43) (Leung et al., 1993)	4.92 (SD=3.07) (Leung et al., 1993)	11.20 (Goldberg et al., 2000)	57.05-72.0 (SD=14.4-18.9) (Lau et al., 2005)
Present study	6.80 (SD=3.76)	5.20 (SD=3.47)	12.02 (5.40)	63.639 (SD=15.46)

Table 2
Percent of participants in each HADS severity category compared with Snaith & Zigmond's manual(1994)

Severity	Percentage %			
	HADS_anx		HADS_dep	
	Snaith & Zigmond's	present	Snaith & Zigmond's	present
Mild	20.6%	25.6%	7.8%	15.5%
Moderate	10.0%	13%	2.9%	7.6%
Severe	2.6%	2.1%	0.7%	0.6%

Table 3
Percent of participants in each HADS severity category compared with previous Hong Kong study

Score	Percentage %			
	HADS_anx		HADS_dep	
	Leung et al	present	Leung et al	Present
≥ 8	41%	40.7%	21%	23.7%
≥ 10	20%	15.1%	6%	8.2%

Relationship Between PA, BMI, Mental Health and Quality of Life

The relationship between PA, BMI, mental health and QoL were investigated using Pearson product-moment correlation coefficient. The results were presented in Table 4. Physical activity was significantly and positively related to quality of life ($r=.26$, $p<.001$); and negatively related to mental health ($r= -.34$, $p<.001$), anxiety ($r= -.16$, $p<.001$) and depression ($r=-.12$, $p<.001$). No significant relationship was found between PA and BMI. No significant relationship was also found between BMI, the score of GHQ ($r=.07$, $p>.05$), anxiety ($r=.03$, $p>.05$), depression ($r=.05$, $p>.05$) and QoL ($r= -.06$, $p>.05$).

Mental health was negatively correlated with quality of life ($r= -.53$, $p<.001$). Likewise, quality of life also correlated inversely to anxiety ($r=-.47$, $p<.001$) and depression ($r=-.55$, $p<.001$). A partial correlation was performed to explore the relationship between these variables while controlling for gender and age group. The correlation between these variables remained constant and significant. This suggested that controlling gender and age group had very little effect on the strength of the relationship between PA, BMI, mental health and QoL.

Table 4

Pearson Product-Moment Correlations between PA, BMI, mental health and QoL

Measures	1	2	3	4	5	6
(1) BMI	1.0	.01	.07	.02	.47	-.6
(2) PAQC (mean)	.00	1.0	-.34**	-.16**	-.12**	.26**
(3) GHQ (mean)	.07	-.34	1.0	.56**	.50**	-.53**
(4) HADS_anx (mean)	.02	-.16	.56**	1.0	.54**	-.47**
(5) HADS_dep (mean)	.05	-.12	.50**	.54**	1.0	-.55**
(6) PWI	-.06	.26	-.53**	-.47**	-.55**	1.0

* $p<.05$

** $p<.01$

Gender Difference Between PA, BMI, Mental Health and QoL

An independent-sample t-test was conducted to compare the score of PAQC, GHQ, HADS and PWI for male and female. There was a significant difference in the overall score of PAQC ($t(1046)=8.83$, $p<.001$), GHQ ($t(1817)=-6.36$, $p<.001$); HADS depression ($t(1808)=2.68$, $p=.01$) and PWI ($t(1838)=3.19$, $p<.001$) for male and female. No significant gender difference was found for the score of HADS anxiety ($t(1802)=-1.53$, $p=.13$).

Gender Difference Between PA, Mental Health and QoL by Age Group

Separate analyses were also conducted to examine if there were any gender differences in the relationship between PA, mental health and QoL within different age groups. Significant gender differences were detected within secondary school students in the score of PAQC ($t(449)=6.39$, $p<.001$), GHQ ($t(520)=-5.66$, $p<.001$), and HADS anxiety ($t(516)=-3.07$, $p<.05$). Significant gender differences ($t(305)=2.82$, $p=.005$) were also found in the

score of PAQC in adult group (male: 1.63 (SD=.61; female:1.45 (SD=.50)).

The Impact of Age on PA, Mental Health and QoL

A one-way between-groups analysis of variance was conducted to explore the impact of age on participants' physical activity, mental health and QoL. Participants were divided into four groups according to their age (Group 1: primary school students; Group 2: secondary school students; Group 3: university students; and Group 4: adults). There was a statistically significant difference at the $p<.05$ level in the score of PAQC [$F(2,1049)=56.69$, $p<.001$], GHQ [$F(3,1845)=26.81$, $p<.001$], HADS anxiety [$F(3,1824)=19.60$, $p<.001$], HADS depression [$F(3,1832)=10.34$, $p<.001$], and PWI [$F(3, 1866)=24.41$, $p<.001$] for the four age group.

Post-hoc Scheffe test was conducted to compare the mean score for different groups. The results indicated that Group 1 has a significantly lower mean score of GHQ, HADS anxiety, but higher mean score of PAQC and PWI than other groups. The GHQ mean score for Group 3 was significantly higher than Group 4. Group 2 has a significantly higher level of anxiety than Group 4. The HADS depression mean score for Group 2 was significantly higher than the other groups. These indicated that secondary and university students might have a higher chance to suffer from mental ill health compared to primary school students and adults.

The Contribution of Physical Activity and Demographics Characteristics to Explain Mental Health and Quality of Life

Multiple hierarchical regression analyses were performed to investigate whether demographic characteristics (age, sex, father's and mother's educational level) had any utility

in explaining participant's mental health and QoL. Participants' GHQ, HADS anxiety, HADS depression and PWI mean score were entered as dependent variable. Age, sex and father's and mother's education level were entered as predictor variable in Block 1. PAQC mean score and BMI were entered as predictor variable in Block 2.

Results of the multiple hierarchical regression were showed in Table 5. After the variables of Block 1 have been entered, the overall demographic characteristics significantly explained 8.3% of the variance in GHQ [$F(4,847)=19.08$, $p<.001$], 2.5% of the variance in HADS anxiety [$F(4,837)=5.29$, $p<.001$], 4.0% of variance in HADS depression [$F(6,836)=8.62$, $p<.001$]. Demographic characteristic variables also contributed significant 6.4% explanatory power of QoL [$F(4,848)=14.54$, $p<.001$]. When the relationship between individual demographic characteristics, mental health and QoL was examined, age significantly explained their anxiety ($\beta = -.16$, $t=-3.90$, $p<.001$). Mother's education contributed significantly in explaining depression ($\beta = 1.19$, $t=3.32$, $p=.001$). Mothers with low education might increase the risk of depression of their children. Father's education level was failed to provide any significant additional utility in explaining mental health and QoL.

After the variables of Block 2 have been entered, the overall model significantly explained an additional 13.5% of the variance in GHQ [$F(6,865)=21.94$, $p<.001$], 3.0 % of the variance in HADS anxiety [$F(6,835)=4.31$, $p<.001$], 5.3% of variance in HADS depression [$F(6,834)=7.74$, $p<.001$]; and 10.4 % of the variance in PWI [$F(6,846)=16.42$, $p<.001$]. Only PAQC significantly explained their scores of GHQ ($\beta = -.25$, $t=-6.97$, $p<.001$), anxiety ($\beta = -.08$, $t=-2.14$, $p<.05$), depression ($\beta = -.12$, $t=-3.3$, $p=.001$) and QoL ($\beta = .22$, $t=6.0$, $p<.001$).

Table 5

Hierarchical Regression of the demographic characteristics, mental health and QoL

Model and Predictor Variables	R ²	F	Beta 1	Beta 2
Model 1	.045	12.05		
Age			.00	
Gender			.15*	
Father Education Level			.01	
Mother Education Level			.05	
Model 2	.33	35.32		
Age				-.00
Gender				.11*
Father Education level				.00
Mother Education level				-.04
Body Mass Index (BMI)				.00
PAQC (mean)				-.18*

Note. Beta 1 and Beta 2 are standardized regression coefficients for the linear equations represented by blocks 1 and 2 respectively. Degrees of freedom for Equation 1 are (4, 1010) and for Equation 2 are (2, 1016).

N = 1899.

*p < .01

Discussion

The present study investigated the association between PA, BMI, anxiety, depression and QoL of participants in Hong Kong. Four main findings was demonstrated in the present study:

- 1) Higher PA is associated positively with mental health and improves quality of life;
- 2) No significant relationship was found between BMI, PA, mental health and quality of life in all age groups and both sexes;
- 3) Secondary school students and university students had poorer mental health than children and adults; and
- 4) Mother's education level was found to be significant in predicting depression across all age groups in both sexes.

Firstly, higher physical activity participation have a positive impact on mental

health and improve quality of life across all age group in both sex, which is consistent with western findings (De Moor et al., 2006; Lane & Lovejoy, 2001; Strawbridge et al., 2002a). PA was suggested as a protective factor to mental illness, which was perceived as a potential mode for mood changing (Faulkner & Biddle, 2001) and to alleviate the secondary symptoms of depression (e.g. low self-esteem and social withdrawal) (Richardson et al., 2005). Previous studies indicated that changing exercise habit (Camacho et al., 1991) and early PA habit formation (Hallal et al., 2006) may alter the risk of suffering of mental illness. In light of the positive impact of PA on mental health, recent studies (Phillips et al., 2003; Strawbridge et al., 2002b) that adopted PA as non-pharmacological treatment demonstrated positive impact on depression relief. Likewise, Teychenne et al (2008) reported that increased leisure-time PA was strongly associated with reduction in depression likelihood.

Recent reviews (Teychenne et al., 2008) indicated that 20-30 minutes PA for 2-3 times/

week was strongly associated with reduction in depression likelihood than undertaking lower or higher doses of physical activity. Although conflicting result was found regarding the PA intensity, light to moderate intensity PA were suggested. It is because even a low level of PA may be beneficial to health (Warburton et al., 2006). In terms of the type of exercise, leisure-time PA and aerobic exercise were suggested, such as brisk walking, dancing and swimming. Dimeo et al (2001a) reported a significant reduction in patients' depression score (p<.002) after an interval walking training. Recent review also indicated that walking was one of the most effective structured interventions for relief of depression (Teychenne et al., 2008).

Secondly, no relationship was found between BMI, PA, mental health, and quality of life, which is contrasted with previous studies (Stevens et al., 2007). Underestimate of BMI and over report of PA were the common problems in self-reported questionnaire (Sallis & Saelens, 2000). Moreover, previous study also indicated that overweight people were less likely to aware their PA level was lower than their normal weight counterparts (Gillis et al., 2006). These factors may attribute to inconsistent findings with previous studies. This result is not surprising, because conflicting results were also showed in the literatures. Dragons et al (Dragan & Akhtar-Danesh, 2007a) studied the relationship between BMI and depression. The results indicated that higher BMI is associated with more severe form of depression. At the same time, less weight gain may result from more severe form of depression. Therefore, further investigation was suggested to clarify this reciprocal relationship between BMI and depression.

Thirdly, the findings of the present study indicated that secondary school students and university students had poorer mental health than children and adults. Secondary school students reported significantly higher score in anxiety and depression, and significantly higher GHQ score was reported by university

students compared to children and adults. Similar results were found in previous studies. A study conducted on a nationwide sample of adolescents and young adults indicated that adolescents in the age of 15-18 has a higher risk of depression than young adult aged between 19-24 (Haarasilta et al., 2004). Lewinsohn and colleagues (1994) reported that the risk of depression was low in childhood, but increase substantially with adolescence, and the mean age of onset of first episode was 14.9 (SD=2.8), which matched with the results of the present study.

This phenomenon could be explained by several attributions. Overemphasis on academic achievement might be one of the reasons. Hong Kong has been a typical Chinese society where superior education level was highly glorified. Great emphasis on grade and academic attainment was conveyed to offspring unobtrusively since they were young. Therefore, examination pressure and fear of failure to fulfill the parent's expectation might contribute to depression in Hong Kong adolescents. Recent study indicated that the level of depression of Hong Kong adolescents was positively associated with their perceived parents' dissatisfaction in their academic performance (Lee et al., 2006).

Also, lack of stress coping strategies may attribute to adolescence depression. Adolescence is a critical period of growth and development, at which adolescents have to face rapid change of universal aspect (e.g. sexual maturation, establish identity individually and within a social group, and become socioeconomic independence etc) (Bennette & Reed, 1997). Besides, adolescents also have to cope with increased conflict with family and peers throughout this period of time. Poor conflict coping was associated with development of sense of hopeless and may drive for increased tendency of depression (Lee et al., 2006; Sun & Hui, 2007). Unfortunately, previous studies reported that depressed adolescents were weak in stress coping. They

tended to acquire avoidant strategies (e.g. avoid being with people, escape from reality) (Chan, 1995). Moreover, they may seek help on internet, online chat room and friends instead of health professionals, which may even worsen the condition (MetroHK, 2007). Therefore, more emphasis should be put on helping adolescents to develop and acquire skill in coping stress and overcoming different life events.

Lastly, mother's education level was found to be significant in predicting depression in all ages and both sexes in this study. Fergusson and Woodward (2002) reported that low level of maternal education was a significant socioeconomic factor associated with depression in adolescents. Adolescents with depression were tended to be reared by a mother with education underachievement ($p < .02$). However, few studies have confirmed the direct association between maternal education level and adolescent depression. On the other hand, there was indirect evidence indicating that maternal education level may be an important factor to predict children and adolescent depression. First of all, studies indicated that mother with lower education were more likely to report lower income, lower perceived health knowledge and less likely to seek for medical assistance (Anderson et al., 2006a; Bere et al., 2008; Sriraman, 2006). These factors might contribute to maternal depression. Meanwhile, maternal depression was significantly associated with depression in adolescence (Spence et al., 2002). Previous study reported depressed mother have higher tendency of poor parenting practice, such as using harsh punishment, slapping the child on the face (Eamon & Zuehi, 2001; McLearn et al., 2006). Children and adolescent depression was associated with exposure to maternal depression either in short-term or chronically (Garber, 2003). In addition, poor parenting practice may create parent-child discord. Research indicated that presence of family discord may increase the rate of depression in adolescents (Nomura et al., 2002). The above

evidences explained the indirect association between maternal education level and depression in children and adolescents.

More importantly, depression in childhood and adolescents may persist to adults. Pine et al (1999) conducted a study to identify the predictor of major depression in the transition to adulthood. The result showed that symptom of major depression in adulthood was strongly predicted by major depression symptom in adolescents. This underscored the importance of early diagnosis of depression to both children and mothers. However, Swartz (2005) found that many mothers who bring their children for psychiatric treatment were actually suffering from depression and anxiety, but were not receiving any treatment. Furthermore, maternal mental health status was found to be associated with the treatment response of depressed children. Rishel (2006) reported that children with mother suffering from mental health problem demonstrated significantly less improvement compared to children of mentally healthy mother.

In summary, depression in adolescents and children was influenced by multi factors (environmental, social, familial and individual). Among them, individual and familial factors (e.g. mother education level) play an imperative role on depression prevention and treatment. The results in the present study pointed out the needs for establishing effective strategy on helping adolescents to acquire stress coping and problem solving skills and provide education and early diagnosis on maternal depression.

Conclusion / Implications

In conclusion, physical activity had a positive impact on mental health and quality of life. PA might be an effective strategy on improving and enhancing mental health and quality of life for residents in Hong Kong. Given this, some PA recommendations were suggested:

Table 6

PA recommendation for preventing mental health disorder
(AHA, 2007; Corbin & Pangrazi, 1998; U.S. Department of Health and Human Services, 1996)

Population	Frequency (times/ week)	Intensity	Time (minutes)	Type
Adults	2-3	Light- moderate continuously	~ 20-30 accumulated	Leisure-time physical activity • brisk walking • gardening • dancing • swimming
Adolescents	3-5	Moderate continuously	≥ 20 accumulated	Sports & recreation activity • Badminton • cycling • Folk dance • Football
Children	5	Moderate Intermittent	30-60 10-15 per bout	• Fun games • Play

The recommendations above were based on the results of present study and standard guideline (World Health Organization, 2007), targeted to relatively healthy population for prevention purpose only. More intensive PA is needed for achieving specific health benefits. For instance, 30 minutes of moderate to vigorous physical activity per day are recommended to prevent chronic disease and at least 60 minutes per day is needed for weight maintenance (AHA, 2007).

The present study also indicated that secondary school students and university students were the at risk group that may prone to mental illness. Unfortunately, most of the Hong Kong primary schools offer only approximately 70 minutes of physical education class per week due to limited space and tight school schedule. The time of physical education is far less than Australia, US and China. Therefore, more effort should be put on promoting early formation of exercise habit both in school and community in Hong Kong.

摘要

體育活動參與及精神健康的調查

香港心理衛生會與香港浸會大學合辦了一項名為「體育活動參與及精神健康」的調查，主要目的為研究運動、體重、精神健康及生活質素之間的關係。調查以問卷方式進行，分別就小學學生、中學學生、大學學生及社區成人四個組群進行訪問，合共發出了2050份問卷而收回1899份有效問卷。調查結果顯示積極參與運動對精神健康及生活質素有正面作用，而且男女老幼皆可藉此提升生活質素。

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