Physical Activity and Depression

— Validity of Measures and Evidence of Psychosocial Correlates

by Liang Hu

中国体育
博士
双语文丛

身体活动和抑郁

量表效度和相关因素检验

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北京体育大学出版社

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Beijing sport University press

策划编辑：木　凡
责任编辑：李志诚
审稿编辑：梁　林
责任校对：春　芝
版式设计：相　林
责任印制：陈　莎

图书在版编目（CIP）数据

身体活动和抑郁：量表效度和相关因素检验 / 胡亮著.
-- 北京：北京体育大学出版社, 2011.9
ISBN 978-7-5644-0814-5

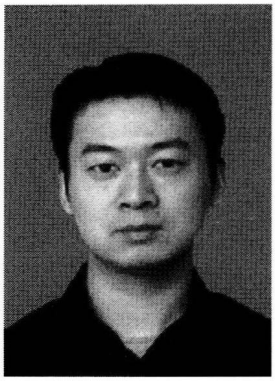
Ⅰ.①身… Ⅱ.①胡… Ⅲ.①体育锻炼—关系—抑郁—研究 Ⅳ.①G806②B842.6

中国版本图书馆CIP数据核字(2011)第194457号

身体活动和抑郁：量表效度和相关因素检验　　**胡亮　著**

出　　版：北京体育大学出版社
地　　址：北京市海淀区信息路48号
邮　　编：100084
邮 购 部：北京体育大学出版社读者服务部 010-62989432
发 行 部：010-62989320
网　　址：www.bsup.cn
印　　刷：北京昌联印刷有限公司
开　　本：787×960 毫米　1/16
印　　张：8.25

2011年9月第1版第1次印刷
定　　价：28.00元



Resume

Jun 28th, 1979	Born in Daye, Hubei Province, China
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Chapter One : Introduction

Depression is a major public health problem and is characterized by one or two major depressive episodes, such as lowered mood, loss of pleasure, increased sense of worthlessness, fatigue, and preoccupation with death and suicide (Strawbridge, Deleger, Roberts, & Kaplan, 2002). Data from several national surveys have confirmed that major depression have been a prevalent, recurrent disorder associated with high rates of morbidity and significant economic costs. For example, it has been reported that lifetime prevalence of major depressive episode was 16.2 % in the United States (Kessler et al., 2003) and 12.2% in Canada (Patten et al., 2006), with the annual prevalence of major depression disorder (MDD) being 6.6% in the US, 4.8% in Canada, and 3.9% in the Europe (Alonso et al., 2004). Depression has considerable debilitating effects and economic cost for both individuals and society. For example, in the Epidemiologic Catchment Area study (Johnson, Weissman, & Klerman, 1992) and Medical Outcomes Study (Wells et al., 1989), MDD was associated with increased use of general medical services, increased use of emergency departments for emotional problems, impaired physical and emotional health, decreased well-being and functioning, lost time at work, and increased rates of attempted suicide. Henk and colleagues (1996) also found that depression was associated with a significant increase in total health services costs. By contrast, improvement in depression has been associated with reductions in utilization and costs of general medical services. Simon et al (2000) found recovery from depression is associated with significant reductions in work disability and possible reductions in health care costs as compared to those with persistent depression.

The most frequently used treatment for major depression is antidepressant medication. However, although medication treatment has proven by many studies to be both necessary and effective for persons with major depressive symptoms, there are still as many as 30–35% of depressed patients that do not respond to antidepressant treatment (Baldessarini, 1989). Furthermore, depression medications may also cause both physiological (i.e., urinary,

retention, blurred vision, constipation, sleep disruption, nausea etc.) and psychological (i.e., agitation, anxiety etc.) side effects, which impair patient's quality of life and reduce their compliance to treatment (Silver & Yudofsky, 1988).

Exercise, as a non-invasive behavioral strategy, offers an alternative or complementary treatment for depression. Both cross-sectional and intervention studies have positively associated physical activity with better mental health (Blumenthal, Babyak, Moore, Craighead, Herman, & Khatri,, 1999; Brosse, Sheets, Lett, & Blumenthal, 2002; Camacho, Roberts, Lazarus, Kaplan, & Cohen, 1991; Paluska & Schwenk, 2000), suggesting that exercise therapy has promise as an new effective treatment for depression with minimal risk (Babyak, Blumenthal, Herman, Khatri, Doraiswamy, & Moore, 2000; Blumenthal et al., 1999; Herman et al., 2002).

However, in the examination of physical activity and depression relationships, several important issues have received inadequate research attention. First, the accuracy of self-report measures of physical activity may be affected by cognitive dysfunction that is often observed among individuals with depression. It is critical to identify physical activity measures that are as valid for individuals with depression as for the general population, in order to achieve an accurate understanding of the complex relationship between physical activity and depressive symptoms.

Second, although a number of psychosocial correlates of physical activity behavior have been examined in the general population (Sallis, Prochaska, & Taylor, 2000), this has not been conducted in a systematic manner among the individuals with depression. Understanding the correlates/determinants of physical activity among individuals with depression, especially those factors that may be modifiable, is an important step towards the effective promotion of physical activity behavior.

The present study had several objectives relative to examining measures and psychosocial correlates of physical activity among depressed adults:

(1) To test the validity of both objective and subjective measures of physical activity in those individuals with depression and to reliably assess physical activity participation levels in this group.

(2) To determine the psychological correlates/determinants (e.g., social support, self-efficacy, self-esteem, enjoyment, etc) of physical activity among individuals with

depression. This will contribute to understanding how to effectively promote physical activity participation among individuals with depression.

Chapter Two : Literature Review

This chapter begins with a brief overview of the prevalence and cost of depression as well as the implications of identifying cost-effective means for depression prevention and management. Next, physical activity' s effects on depression will be reviewed to highlight the need for studies on the mechanisms underlying such effects. Issues relative to the lack of validity evidence for physical activity measures in depressed sample are then discussed. Finally studies of physical activity effects on psychological well-being are reviewed with emphasis placed on self-esteem and Quality of Life.

Part One : Prevalence and Effects of Depression

Depression is a mental health disease that affects a considerable number of individuals of all age and ethnic groups across the world. According to the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, APA, 1994), major depressive disorder (MDD) is defined by demonstrating at least one of the following symptoms: persistent depressed mood or loss of interest/pleasure; and three of the following symptoms: sleep disorder; change in weight or appetite; fatigue/loss of energy; psychomotor retardation/agitation; difficulty concentrating/indecisiveness; guilt/low self-esteem; recurrent thoughts of death or suicide. These symptoms must be present for most of the day, nearly every day for at least two weeks.

Depression has been one of the most prevalent psychological disorders and has placed enormous burden on both individuals and the whole societies across the world. For example, the lifetime prevalence of major depression disorder (MDD) was 16.2 % in the United States (Kessler et al., 2003), and 12.2% in Canada (Patten et al., 2006). The annual prevalence of MDD has also been similarly high across the western societies, being 6.6% in the US (Kessler et al., 2003), 4.8% in Canada (Patten et al., 2006), and 3.9% in the Europe, respectively (Alonso et al., 2004).

Although the symptoms of MDD need to persist for only two weeks for an official

diagnosis, in most cases, depressive episodes last an average period of six to eight month (Mueller & Leon, 1996) if no effective treatment is pursued. Moreover, the majority of patients that recover from MDD episodes will have a recurrence of MDD again.

In light of the significant prevalence of MDD and the important public health implications of depressive disorders, population based studies have been conducted to document the considerable debilitating effects and economic cost for both individuals and society. In the Epidemiologic Catchment Area study (Johnson et al., 1992), 18,571 adults were interviewed from a random sample in five US communities, and both MDD (lifetime prevalence, 6.1%) and depressive symptoms (lifetime prevalence, 23.1%) were associated with increased service utilization (e.g., use of psychoactive medications, general medical services or emergency departments for emotional problems), and social morbidity, as measured by outcome variables such as suicide attempts, self-reported emotional health, time lost from work. Even mild depressive symptoms that are less serious than those being diagnosed as a depressive disorder can still be associated with a number of population attributable risks such as: emergency department use (11.8%) or medical consultations for emotional problems (21.5%); use of tranquilizers (14.6%), sleeping pills (21.0%), or antidepressants (22.2%); and fair or poor self-reported emotional health (15.3%); days lost from work (17.8%).

In the Medical Outcomes Study (Wells et al., 1989), the functioning and well-being of patients with depression were compared relative to patients with chronic medical conditions or no chronic conditions. In 11,242 outpatients in three health care provision systems, it was found that patients with depressive symptoms are more likely to have worse physical and social functioning, worse perceived health, and greater bodily pain than patients with no chronic conditions (i.e., hypertension, diabetes, and arthritis etc.). The poor functioning associated with depressive symptoms, regardless of depressive disorder, was comparable with or worse than that associated with eight major chronic medical conditions. It was concluded that depression and chronic medical conditions had unique and additive effects on patient functioning.

From an economic view, Henk et al. (1996) determined whether a positive screen for depression is predictive of continued high medical expenditures. Medical utilization data on 50,000 patients enrolled in the DeanCare health maintenance organization for 2 consecutive

years were obtained. They assessed depression in 786 high utilizers, and found that depressed high utilizers were more likely than non-depressed high utilizers to have higher medical costs in the year of 1994 ($5764 vs $4227; $p < .001$).

Simon and colleagues (2000) conducted a secondary data analysis based on a randomized trial, which involved 290 adults with major depression who completed structured interviews at multiple timepoints after beginning antidepressant treatment. Based on the 12-month assessment, patients were classified as remitted (41%), improved but not remitted (47%), and persistently depressed (12%). After adjusting for depression severity and medical comorbidity at baseline, it was revealed that patients with greater clinical improvement were more likely to maintain paid employment and reported fewer days missed from work due to illness. Patients with better 12-month clinical outcomes had marginally lower health care costs during the second year of follow-up. It was concluded that recovery from depression is associated with significant reductions in work disability and possible reductions in health care costs. Later, Simon (2003) reviewed studies that examined social and economic effects of mood disorders, including functional impairment, disability or lost work productivity, and increased use of health services. Both cross-sectional and longitudinal evidence supported that depression was associated with greater disability and higher costs and that improvement in depression was associated with reduced disability and lower health costs. All of these findings seem as consistent in the subgroup of patients with comorbid chronic medical illness as in the total group of individuals with depressive disorders.

Thus, strong evidence has demonstrated that depressive symptoms, regardless of existence of major depressive disorders, are prevalent and associated with high morbidity rates, greater disability and tremendous economic cost, whereas effective treatment helps to relieve human suffering, restore function and brings economic benefits.

Part Two : Effects of Physical Activity on Symptoms of Depression

Numerous cross-sectional studies have repeatedly shown that higher levels of physical activity are inversely associated with symptoms of anxiety and depression. For example, Stephens (1988) reported that individuals with depression who engaged in moderate amounts of physical activity reported a decrease in depressive symptoms,

particularly for women and older populations. A study of 1536 German adults (Weyerer, 1992) revealed that those did not exercise were 3.15 times more likely to have moderate to severe depression. Studies on older adults in Finland (Kivelä & Pahkala, 1991; Ruuskanen & Ruoppila, 1995) have also resulted similar findings.

However, in spite of the generally consistent results, the nature of cross-sectional studies precludes the possibility of answering whether physical inactivity leads to depressive symptoms, or whether depressive symptoms lead to inactivity, or whether it is a third factor such as social support that might mediate this relationship. In this regard, prospective studies are advantageous in that they help determine the direction of this relation by examining whether low levels of physical activity leads to the development of depressive symptoms or whether increasing physical activity can reduce depressive symptoms. There is prospective evidence from epidemiological studies to show that those who become or remain active or fit are less likely to suffer clinical depression. Camacho and colleagues (1991) reported the odds ratio of depression over a period of 9 years for those who remained low in activity was 1.22 and for those who became inactive was 1.61 against a baseline of high activity on both occasions. Similarly, Farmer and colleagues (1988) found low levels of leisure activity at baseline predicted depression 8 yrs later in white women despite depressive symptoms being low at the time of the baseline examination. These findings remained after adjusting for age, other chronic illness, education, employment, and income. Other prospective studies have reported similar findings. For example, the Iowa Rural Health Study involving 2084 men and women (Mobily, Rubenstein, Lemke, O' Hara, & Wallace, 1996) reported that those with depressive symptoms at baseline and who walked every day were over one third as likely to report higher depressive symptoms at follow-up compared with those who did not walk. In the group who reported no depressive symptoms at baseline and who walked every day, there was no change in depressive symptoms (e.g., their depressive symptoms remained low). Paffenbarger et al. (1994) also found an inverse relation between physical activity and subsequent risk of depression in the Harvard Alumni study. Men who expended 1000 - 2499 kcal/wk in walking, stair climbing, and sports play were at 17% less risk of developing clinical depression than their less active peers. Men who expended 2500 or more kcal/wk were 28% less likely to develop clinical depression.

However, evidence from prospective studies has not been always consistent. The

German study by Weyerer (1992) did not find low baseline physical activity to be a risk factor for developing depression 2 yrs beyond baseline. A later study of medical students also failed to find an increased risk of depression attributable to being inactive at baseline or becoming inactive at a 15-yr follow-up (Cooper-Patrick, Ford, Mead, Chang, & Klag, 1997).

Exercise training has often been shown to relieve depressive symptoms in healthy, non-depressed samples. For example, DiLorenzo, Stucky-Ropp, Vaner Wal, & Gotham (1999) randomly assigned 111 healthy adults to a varying intensity exercise training program, a fixed-intensity exercise training program, or a wait-list control group. Compared with controls, participants in the exercise groups reported larger decreases in depressive symptomatology over time. However, such improvements have not necessarily been replicated by other randomized studies when comparing exercisers with sedentary counterparts (Gitlin et al., 1992; Palmer, 1995). These results may be explained by a floor effect: that is, there was not much room for improvement in these healthy participants without depression. Therefore, clinical samples (i.e. patients who initially report more severe symptomatology) allow for greater change between baseline and post-treatment depression scores.

Greist and colleagues (1979) randomly assigned 28 patients with minor depression to one of three treatment conditions: (1) a running group; (2) ten sessions of time-limited psychotherapy; or (3) ten sessions of time-unlimited psychotherapy. After 12 weeks, significant reductions in depression scores were reported in all groups, with no significant differences between the treatment groups. Klein et al (1985) similarly found aerobic exercise to be as effective in reducing depressive symptoms as psychotherapy. Seventy-four participants with major or minor depression were randomly assigned to one of three treatment conditions: (1) running therapy; (2) group psychotherapy that included components of cognitive and interpersonal therapies; or (3) meditation-relaxation therapy. All treatment groups reported significantly reduced symptoms after 12 weeks of treatment, although no significant statistical differences were found between groups. Patients in all groups continued to report symptom reductions at 3- and 9-month follow-up. Fremont and Craighead (1987) also found exercise to be as effective as psychotherapy in treating individuals with depression, but failed to find an additive effect.

In another large-scale study (Blumenthal et al., 1999), 156 adult volunteers (age >

50 yrs) with major depressive disorder were randomly assigned to a 4-month program of aerobic exercise, sertraline therapy, or a combination of exercise and sertraline. It was found that all the groups exhibited statistically and clinically significant reduction in depression scores, however, there were no significant difference across experimental conditions (p = .67). Although, growth curve models indicated that patients in the medication group showed the fastest initial response to the treatment, it was suggested that exercise was equally effective in reducing depression among older adults.

Six months after completion of this study, the status of the participants was assessed by clinical interview (Babyak et al., 2000). The analyses indicated that in most instances the improvements from the previous program persisted for at least 6 months after the termination of treatment. Exercising on one' s own during the follow-up period was associated with a reduced probability of depression diagnosis at the end of that period (odds ratio = 0.49, $p < .001$). Additionally, remitted subjects in the exercise group were less likely to relapse than participants in the other two groups receiving medication ($p = .01$). Apparently, among individuals with MDD, exercise therapy is feasible and is associated with significant therapeutic benefit, especially if exercise is continued over time. However, interestingly and unexpectedly, combining exercise with medication appears to confer no additional advantage over either treatment alone.

In summary, the reviewed research suggests that exercise treatment is more effective in treating depression than no treatment. Although the additional effect of exercise therapy over traditional medication treatment has not been established, it is at least as effective as psychotherapy and medication therapy for depression reduction, and therefore can be considered an alternative strategy for treating depression.

As depression has both somatic (e.g., chronic pain, fatigue) and cognitive components (e.g., feelings worthless, anxiety, agitation), a number of potential mechanisms have been hypothesized to understand the antidepressant effect of physical activity from physiological and psychological perspectives (for a review, see (Brosse et al., 2002). From a physiological perspective, it has been proposed that physical activity may alleviate depressive symptoms by leading to increases in brain neurotransmitters after exercise, such as monoamines and endorphins (Phillips, Kiernan, & King, 2001; Thor é n, Floras, Hoffmann, & Seals, 1990); or by attenuating the hypothalamic-pituitary-adrenal (HPA) axis response to stress. From

a psychological standpoint, exercise has been shown to improve self-evaluations such as self-esteem (Ossip-Klein et al., 1989), self-efficacy (Craft, 2005), and body image (Stice, Hayward, Cameron, Killen, & Taylor, 2000) among individuals with depression, and thus reduces depression incidence and symptoms among these individuals. Other psychological mechanisms propose that exercise might buffer depression by acting as an effective distraction from negative emotion (Just, 1997) or as a form of behavioral activation (Hollon, 2001), which is critical to psychotherapies for depression. However, despite that collective evidence has demonstrated that exercise represents a promising new approach in the treatment of depression, the specific pathways from improvements in physical activity participation to reductions in depression have not been adequately determined. Well-designed studies with good quality controls in clinical populations are warranted to examine the somatic, cognitive, and psychological mechanisms of exercise' s antidepressant effect on depression.

Part Three : Validation of Physical Activity Measures among Individuals with Depression

Accurately measuring physical activity is undoubtedly a fundamental step towards clearly understanding research issues in physical activity and health in any given population. Traditionally, providing subjects with questionnaires to subjectively report physical activity patterns has been the most widely used assessment tool given the convenience and easiness of collecting physical activity data. However, the accuracy of surveys can be easily influenced by a variety of factors such as length of time being recalled, individuals' motivation to accurately recall, the complexity or regularity of individual habitual activity patterns (Dishman, Washburn, & Schoeller, 2001). In this regard, advancements in modern technology have offered an alternative and objective means to assessing ones' levels of physical activity participation through activity monitors.

Most of the empirical studies revealed only low to moderate between subjective measures and objective measures using activity monitors (Dishman et al., 2001). For example, Welk et al. (2000) examined the utility of the Digi-Walker step counter to assess daily physical activity patterns. Only modest correlations were found between step counts and estimated energy expenditure as measured by the Physical Activity Recall

questionnaire in two separate conditions (r = 0.34 & 0.49, respectively). Schimdt and colleagues (2003) measured levels of physical activity over a 7-day period in 59 women using the physical activity logs (PAL) and the Computer Science and Applications, Inc. (CSA) accelerometers, an accelerometer product preceding the MTI accelerometer units used in the current study. CSA data were classified into resting/light, moderate, and vigorous intensity categories based on three previously published cut points. It was reported that the rank-order correlations between each of the three CSA measures and the PAL measure of total activity were fair to modest, ranging from 0.15 to 0.24. In a sample 196 individuals with multiple sclerosis, Gosney et al. (2007) also examined the validity of four measures of physical activity, two self-reported questionnaire measures and two activity monitors. Similarly, the correlations across measurement methods were moderate-to-large in magnitude (range of r = 0.32 ~ 0.53).

Several reasons might be offered to potentially explain the lack of high correspondence between the two types of activity measures. For example, activity monitors can not capture certain activities such as aquatic activities given that they are not water-proof, or activities which involve movements in the upper body (e.g., some gardening activities), whereas such activities might be reported in physical activity questionnaires. In addition, social desirability might cause participants to over-report their physical activity levels and lead to disagreements between activity levels reported in surveys and those recorded by activity monitors.

Previous evidence in various populations has revealed only fair to moderate correlations between different types of physical activity measure. Such observations highlight the need for empirical studies establishing the validity of physical activity measures in specific populations.

Relative to individuals with depression, collective evidence has provided support for the beneficial effects of physical activity on reducing depressive symptoms, increasing research efforts have been devoted to increasing physical activity participation as an effective primary and secondary prevention treatment. However, valid assessment of physical activity is critical but, ironically, has been often ignored in this sample. Little evidence exists to suggest that the physical activity measures that are typically developed in healthy populations are equally valid in those with depression.