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Original Article

Relationship between depression and movement quality in normal young adults

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Abstract. [Purpose] Somatic symptoms, such as hyposomnia and anorexia, can affect depression and result in decreased movement quality; however, the relationship between movement quality and somatic symptoms is unclear. The present study investigated the characteristics of this relationship using observable posture and movements. [Participants and Methods] Twenty healthy young adults (mean age 20.9 ± 0.4 years) participated in the study. First, we administered the Self-rating Depression Scale questionnaire to the participants. Second, a qualified physical therapist assessed the movement quality of the volunteers using the Body Awareness Rating Scale-Movement Quality and Experience. We classified the participants into high- and low-score groups based on their Self-rating Depression Scale scores and then analyzed the Body Awareness Rating Scale-Movement Quality and Experience scores in both groups. [Results] There was a significant difference in the movement quality between the Self-rating Depression Scale high- and low-score groups. The Self-rating Depression Scale total score ranged from 20 to 80, with higher scores indicating a greater severity of depression. The low-score group had higher scores for the Body Awareness Rating Scale-Movement Quality and Experience than the high-score group in all items. [Conclusion] The present study showed that movement quality was related to symptoms of depression, thereby suggesting that early detection and treatment interventions for depression are possible by an assessment of movement quality.
Key words: Depressive state, Movement quality, Body Awareness Rating Scale-Movement Quality and Experience (BARS-MQE)

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INTRODUCTION

Depression has been reported to coexist with many physical disorders such as stroke[1)], coronary heart disease[2)], diabetes mellitus[3)], respiratory disease[4)], and cancer[5)]. Physical therapists (PTs) often encounter patients with such psychological symptoms during the course of their clinical work. Depending on the comorbidity of depression, patients may present with somatic symptoms different from those resultant from the underlying disease, such as hyposomnia, malaise, appetite decreased (anorexia) and depressive, anxiety, irritability, and other psychological symptoms. As a result, a patient with depression may experience a delay in medical recovery[6)] and delay in achieving rehabilitation goals. Early detection of and intervention for depression thus become important factors in promoting the rehabilitation of the patients.

The diagnosis of depression and assessment of its severity are conducted by consultation with a psychiatrist using criteria for "mood (feelings) symptom" provided by the International Statistical Classification of Diseases and Related Health Problems, version-10 (ICD-10) or for "depression/major depressive disorder" provided by the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5). However, at the first visit to the hospital, differentiating the patient's symptom form his or her personality is difficult, because the daily life, habits, and characteristics of the subject remain unknown[7)]. In

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addition, the patients might not express any psychiatric symptoms or might appeal to the medical departments other than those pertaining to psychiatry or psychosomatic medicine, such as the general internal medicine department to address physical symptoms[8]. Therefore, it is challenging for medical staff to find objective indications for depressive states[9].

Many patients present with somatic symptoms, such as lower back pain, headache, or heaviness of the head, that induce the patient to develop a depressive state and poor movement coordination; regarding the latter, even though the patients' condition does not directly involve decreases in or disorders of motor function, such as the range of motion (ROM) of body joints, muscle strength, and endurance, they often are observed to exhibit dysfunctional movement. Indeed, functional movement is the result of the states of mind and body being expressed as movement quality; therefore, depressive state and observed movement quality might be strongly related.

The role of the PT is to promote and recover functional movement of the patients through enhancing their movement quality, and a well-trained PT is an expert in observing and evaluating functional limitations of the patient's movements. It is therefore expected that a PT will be able to find any dysfunctional movements induced by the development of a depressive state, rendering early treatment possible. The purpose of this study is to clarify the characteristics of the relationship between depressive symptoms and movement quality from the assessment of observable posture and functional movement.

PARTICIPANTS AND METHODS

Twenty healthy undergraduate students (10 males; mean age, 20.9 ± 0.4 years) from Kobe Gakuin University (Kobe, Japan) participated in the study. We recruited undergraduate students who volunteered to participate. The study was approved by the ethics committee of Kobe Gakuin University (approval code: 1715013). This study included only adults and written informed consents were provided by all the participants prior to their participation in the present study.

Data on depressive state and observable movement quality were obtained with a questionnaire for the Self-rating Depression Scale (SDS) and the Body Awareness Rating Scale-Movement Quality and Experience (BARS-MQE), respectively.

Devised by Zung at Duke University in 1965, the SDS is a self-assessment scale developed to evaluate the degrees of depression symptoms. The SDS consists of 20 items classified as depressed emotion (2 items), physical symptoms (8 items), psychological symptoms (10 items). Each item is assessed on a 4-point Likert scale according to the frequency of symptoms: "none or rarely" is scored as 1, while "almost or always" is scored as 4. The total score ranges from 20 to 80, with higher scores indicating a more severe depression state: <40 points is considered normal; 40–50 points, mild; and >50 points, moderate to severe[10].

The BARS-MQE is a physiotherapeutic evaluation tool for patients suffering from a condition affecting mental health[11]. It consists of 12 movements that emulate movements used in everyday life, including lying, sitting, standing, relational movements, and walking. The BARS-MQE items are scored from 1 to 7, and the scale includes half (0.5) points. The sum score of all items ranges from 12 to 84; a score of 7 is defined as the most healthy and functional movement quality and indicates a well-balanced, stable, and undisturbed body axis with a high degree of freedom, and a score of 1 is defined as the most pathological, dysfunctional movement quality and indicates an unstable, mechanical, stiff, un-rhythmical body axis with a lack of movement[12]. The reliability and validity of the BARS-MQE have been reported to be satisfactory by Skjaerven et al[13].

The experiment began with the completion of the SDS questionnaire, after which movement quality was assessed by a qualified PT using the BARS-MQE. The participants wore clothes that allowed them to move freely. All procedures were completed only in the experimental room with enough floor space for the performance of all movements as well as a mat and a round chair as experimental instruments. For the BARS-MQE assessment, each participant performed around ten repetitions of each movement; the score for the most functional movement was retained. The evaluations of the SDS and BARS-MQE were conducted separately, and the results of either evaluation were not shared between the assessors. After the experiment, a cutoff value of 40 points on the SDS survey was used to group the participants: participants with a score of <40 points were classified into the high-score group; and those with a score of <40 points, the low-score group. Independent samples t-tests were used to detect differences in the 13 items, including the 12 BARS-MQE movements scores and BARS-MQE sum score, between high- and low-score groups. This study considered whether the movement quality observed by depression symptom embossed different state of depression. The level of significance was set at $p<0.05$. All statistical analyses were conducted using R 3.4.4.

RESULTS

Based on the results of the SDS questionnaire, nine (seven men; mean age, 20.9 years; mean score, 44.3 ± 2.1 points) and 11 (three men; mean age, 20.8 ± 0.7 years; mean score, 36.0 points) participants were sorted into the high- and low-score groups, respectively.

The statistical analysis revealed no significant differences between the SDS high- and low-score groups in eight movement quality scores: BARS-MQE No. 1, No. 2, No. 4–8, and No. 10. However, significant differences were identified between the two groups in five movement quality scores: BARS-MQE No. 3 ($p=0.032$), No. 9 ($p=0.036$), No. 11 ($p=0.0052$), No. 12 ($p=0.00067$), and total score ($p=0.0029$). The low-score group achieved high scores on all BARS-MQE items, while the

Table 1. Body Awareness Rating Scale-Movement Quality and Experience (BARS-MQE) results and comparison between high-score and low-score groups of Self-rating Depression Scale (SDS)

		High-score group (n=9)	Low-score group (n=11)	p-value
BARS-MQE	No. 1	4.2 ± 1.0	4.8 ± 0.8	0.139
	No. 2	3.6 ± 0.8	4.1 ± 0.6	0.195
	No. 3	3.4 ± 0.7*	4.1 ± 0.6*	<0.032
	No. 4	3.3 ± 0.9	3.9 ± 0.7	0.109
	No. 5	3.8 ± 0.7	4.2 ± 0.6	0.182
	No. 6	3.7 ± 1.0	4.3 ± 0.7	0.163
	No. 7	3.7 ± 0.8	4.1 ± 0.8	0.261
	No. 8	3.3 ± 0.8	3.8 ± 0.9	0.177
	No. 9	3.4 ± 0.7*	4.3 ± 1.1*	<0.036
	No. 10	3.2 ± 0.6	3.6 ± 0.6	0.117
	No. 11	3.4 ± 0.4*	4.1 ± 0.6*	<0.005
	No. 12	3.3 ± 0.5*	4.3 ± 0.5*	<0.001
	Total	42.3 ± 3.4*	49.6 ± 5.5*	<0.003

Values are presented as mean ± SD. *p<0.05.
High-score group: SDS score of ≥40 points.
Low-score group: SDS score of <40 points.

high-score group had low scores for each item as well as the total BARS-MQE score (Table 1).

DISCUSSION

The present study examined how depressive states affect movement: specifically, the relationship between depressive symptoms and the movement quality. The participants were healthy undergraduate students who presented with no notable disorders and were not in need of any medical treatment, including physical therapy. Therefore, it was unlikely that major changes would be observed in movement functions. The comparison between the SDS high- and low-score groups revealed significant differences in the BARS-MQE No. 3, No. 9, No. 11, No. 12 items, as well as the BARS-MQE total score. This study indicates that depressive symptoms induce a decrease in movement quality decreases and affect the physical function of the participants.

Skjaerven et al.[12] identified four main perspectives on human movement to explain movement quality as supported by phenomenological research[12, 14, 15]: physical, physiological, psycho-socio-cultural, and existential. The psycho-socio-cultural theme is connected to awareness, which is crucial to promoting intention, emotion and socio-cultural in movement[12]. Movement is expressed regardless of whether both its quantity and quality, which is determined by flow, rhythm, and elasticity, are functional or whether the physical functions, such as ROM, muscular strength, endurance, and balance, can be performed sufficiently well. The entire movements of humans are generated as a result of the commentary expression of the movement's quantity and quality. Therefore, when movement quality is assessed using the BARS-MQE, the PT directs attention to the whole movements of the person rather than the separate actions of the body's parts[14].

The results of this study prompt a hypothesis based on the relationship between emotional states and the motor system. Research has provided empirical support for a bidirectional influence of the motoric system and emotional processes, and studies on the effects of mood on the motor system have shown that experimentally induced mood states, such as sadness, happiness, and pride, affect posture[16]. Moreover, previous studies have shown that depression and sadness might possibly change posture and induce mild dissatisfaction with body image[17, 18]. Furthermore, psychological factors unconsciously degrade movement quality and reduce an individual's interest in or awareness of his or her own body[19]. When the intention necessary for movement diminishes, movement quality declines, and guiding attention to movement or awareness of how the self is behaving in the environment becomes difficult[20]. Consequently, as was suggested by this study, depressed states can cause changes in the posture as seen from the frontal plane, sagittal plane, and transverse plane, and lower the movement components of attention, intention, and emotion (energy); the latter changes are thought to underlie the inhibition of functional movement. The relationships among emotional states, the motor system, and posture might explain the findings of the present study.

This study was limited by its recruitment of only healthy persons. However, as many patients have motor dysfunctions induced by physical disorders, it may be difficult to observe depression-induced decreases in the quality of their movements. Second, the participants were ambulatory without the need of assistive devices and were able to complete the test, which entailed the performance of movements such as lying, sitting, standing, and walking for 30 min. This would increase the

fatigue of patients with motor dysfunctions. In researching patient populations, future experimental designs should account for these problems.

In conclusion, the present study suggests that movement quality decreases when an individual presents with depressive symptom; specifically, the BARS-MQE reflects important aspects of depressive symptoms. This finding indicates that the early detection and treatment of depressive states might be possible through the assessment of observable movement quality. Moreover, this study suggests that physiotherapy intervention may effectively address depressive symptoms, and that increasing movement quality may improve depressive symptoms.

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Conflict of interest

The authors declare no competing interest.

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