Original

Effects of Sit-to-stand Exercise for Adults with Severe Intellectual Disabilities

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(Received: January 8, 2019)

Abstract

PURPOSE

In this study, we implemented sit-to-stand exercises for participants with severe intellectual disabilities, and investigated the effects on physical function and physical activity levels in two groups of movement ability.

PARTICIPANTS

We targeted 46 people who work at the workshop for intellectual disabilities. The mean ± standard deviation age at the time of study was 39.7 ± 10.1 years. There were 30 males and 16 females. 43 people were identified at the severe level and 3 were "other."

METHODS

The participants of this study conducted exercise programs at the workshop. Evaluation items were walking abilities, limb skeletal muscle mass, physical activity levels. The exercise program consisted of sit-to-stand exercises 20 times a day, 5 days a week. The subjects' intervention period was, on average, 59.5 (minimum 12, maximum 96) days. For the evaluation of walking abilities, the locomotion item of Functional Independence Measure was used. Before the intervention, the participants were classified into two groups. Scores of Functional Independence Measure 6–7 were classified as the Independent Group (IG) and 5 or less as the Supervision and Assist Group (SAG). Limb skeletal muscle mass was measured using a body composition analyzer immediately before and after the intervention. Physical activity levels were evaluated by using International Physical Activity Questionnaire. Statistical analyses were performed using paired *t*-tests corresponding to Wilcoxon signed-rank tests.

RESULTS

There were 29 participants in the IG and 17 participants in the SAG. The locomotion item of Functional Independence Measure showed no change before and after the intervention.

The limb skeletal muscle mass showed no significant difference before and after the intervention of IG. Compared to the start, a significant decrease was observed after the intervention for SAG ($p<0.05$). For International Physical Activity Questionnaire, there was no significant difference between at the beginning and end of the intervention for either group.

CONCLUSION

Although the level of exercise was too low (20 times a day) to improve the physical function of a person with severe intellectual disabilities, this study indicated that sit-to-stand exercise was a safe, practicable exercise for participants. It is necessary for the facilitation of physical activity level to use an approach involving family.

(JJOMT, 67: 436—441, 2019)

—Key words—
severe intellectual disabilities, sit-to-stand exercise, physical activity

Introduction

Physical inactivity is one of the leading risks for mortality in the world[1]. Physical inactivity levels are rising in many countries with major implications for the prevalence of noncommunicable diseases and the general health of the population[2]. In a survey of the physical activity of persons with intellectual disabilities (ID), the majority of adults with ID did not meet national physical activity guidelines[3], or participate in sufficient physical activity[4]. Decrease in physical activity is likely to cause a decrease in physical function and performance of activities of daily living.

Health promoting worksite interventions include the allocation of space for exercise equipment, purchase of new equipment for existing exercise room, training sessions on the use of the new equipment, and a measured distance line painted around the plant to promote lunch-time walking[5]. In Japan, where people with ID are engaged in work, and as with healthy subjects, if exercise can be implemented under the supervision of a leader within the workplace, improvement of physical function may be obtained.

However, in some cases, people with ID may not understand instruction, and reports on exercise for improving the physical function of people with severe ID are not currently available. One safe and simple exercise is the sit-to-stand exercise, and its effect is reported as strengthening the trunk and lower extremities and improving standing balance and walking ability[6)–8)]. If it is possible for those with severe ID to improve exercise, physical functioning and increase in physical activity by establishing exercise habits will lead to the necessity of exercise intervention.

In this study, we implemented sit-to-stand exercises for participants with severe ID, and investigated the effects on physical function and physical activity levels in two groups of movement ability.

Participants

Among 57 people who work at the DAINI SATSUKI Workshop For Disabilities, 46 whose measurements were available before and after the intervention were included. The mean ± standard deviation (SD) age at the time of study was 39.7 ± 10.1 years. There were 30 males and 16 females. DAINI SATSUKI Workshop For Disabilities is run by the Satsuki Welfare Association. Those who were absent on the measurement day and patients with difficulties in stopping the body at the time of measurement were excluded.

All of participants had been diagnosed with ID. The severity of the ID of the participants was quantified using the method prescribed by the Ministry of Health, Labor and Welfare of Japan. For reasons such as an IQ 35 or less, 43 people were identified at the severe level and 3 were “other.”

Respecting the purpose of the Declaration of Helsinki, we ensured that there was no disadvantage or danger to the participants. All participants including their family agreed to participate in this study. This study was conducted with the permission of the facility manager.

Methods

The participants of this study conducted exercise programs at the workshop. The exercise program consisted of sit-to-stand exercises 20 times a day, 5 days a week. The subjects’ intervention period was, on average, 59.5 (minimum 12, maximum 96) days. Chairs with backrests and a front sitting height of 41 cm were used. Participants who were unstable in the sitting position used their personal wheelchairs. For participants who required assistance for the standing exercise, the care workers appropriately monitored and assisted using a stable handrail that the participants grasped for support.

Evaluation items were physical function, limb skeletal muscle mass, physical activity levels, and adverse events. Walking abilities were investigated as physical function. For the evaluation method, the locomotion item of Functional Independence Measure[9] (FIM) was used. Before the intervention, the participants were classified into two groups. Scores of FIM 6–7 were classified as the Independent Group (IG) and 5 or less as the

Table 1 Basic information of Independent Group and Supervision and Assist Group

	Independent Group (n = 29)	Supervision and Assist Group (n = 17)
Sex (male/female)	21/8	9/8
Age (years)	39.6 ± 9.0	39.8 ± 11.9
Height (cm)	160.7 ± 9.7	158.3 ± 12.5
Weight (kg)	59.9 ± 12.7	61.4 ± 17.9
Body Mass Index (kg/m^2)	23.1 ± 3.8	24.2 ± 5.0

mean ± SD

Table 2 Comparison of limb skeletal muscle mass and physical activity before and after intervention in Independent Group and Supervision and Assist Group

	Independent Group			Supervision and Assist Group		
Variable	Before	After	p value*	Before	After	p value**
LSMM (kg/m^2)	7.1 ± 1.1	6.9 ± 1.2	0.05	6.6 ± 1.5	6.3 ± 1.5	0.023
PA (kcal)	126.6 ± 108.5	432.3 ± 627.2	0.087	207.2 ± 488.3	191.6 ± 340.2	0.569

mean ± SD

*: Changes in limb skeletal muscle mass and physical activity before and after intervention for the Independent Group, **: Changes in limb skeletal muscle mass and physical activity before and after intervention for the Supervision and Assist Group

LSMM, limb skeletal muscle mass

PA, physical activity

Supervision and Assist Group (SAG). Limb skeletal muscle mass was measured using a body composition analyzer (In body S10, In body Co., Ltd.) immediately before and immediately after the intervention.

Self-reported physical activity levels were evaluated by using the short Japanese version of the International Physical Activity Questionnaire[10] (IPAQ). At the beginning and end of the intervention, these were measured by the care workers of the workshop supporting who knew the individual participants well. Evaluation of limb skeletal muscle mass and physical activity levels were measured at the beginning and end of the intervention. Adverse events were considered to be when joint pain or a fall occurred at the time of the intervention.

Statistical analyses, to determine changes between the IG and SAG from the start to the end for limb skeletal muscle mass and physical activity levels, were performed using paired *t*-tests corresponding to Wilcoxon signed-rank tests. Comparisons of exercise program implementation rates between the IG and SAG were made using the Mann-Whitney U test. SPSS software version 22.0 (IBM, Tokyo, Japan) was used to analyze the collected data, and differences were considered significant at a p-value <0.05.

Results

There were 29 participants in the IG and 17 participants in the SAG. Characteristics of both groups are presented in Table 1. The locomotion item of FIM showed no change before and after the intervention. Table 2 shows the results of the limb skeletal muscle mass and IPAQ of both groups at the start and end. The limb skeletal muscle mass showed no significant difference before and after the intervention of IG. Compared to the start, a significant decrease was observed after the intervention for SAG ($p<0.05$).

For IPAQ, there was no significant difference between at the beginning and end of the intervention for either group. The rate of exercise program implementation was 84.1 ± 23.5% in the IG and 69.4 ± 25.8% in the SAG, with a significant difference between the two groups ($p<0.05$). There were no adverse events associated with the trial.

Discussion

In this study, we conducted the sit-to-stand exercises for participants with severe ID and investigated the effects on physical function and physical activity levels. Limb skeletal muscle mass did not increase signifi-

cantly at the start and end for the IG; however, the SAG showed a significant decrease.

Repetitive sit-to-stand exercises have been proposed as a lower limb muscle strengthening method that can be safely performed as preparation for gait training[6]. Previous studies that showed improvement in physical function during sit-to-stand exercises showed its effect mainly in rehabilitation after stroke[11]. Kwakkel et al.[8] reported that walking ability improved more in the group with lower limb training conducted 5 times a week for 45 minutes than in the 15-minute training group, and a greater intensity of leg rehabilitation improves functional recovery and health-related functional status in stroke patients. Susan[12] reported that sit-to-stand practice 3 times a week for 45 minutes led stroke survivors, who were able to stand independently, to express greater satisfaction with their quality of life and physical mobility. Britton et al.[13] reported on practiced sit-to-stand and leg strengthening exercises for 30 minutes (on weekdays for 2 weeks) for a stroke patient who needed assistance for sit-to-stand. As the intervention progressed, the number of times of standing increased, showing a mean of 50 extra stands per day, and the ability to perform the standing motion also improved.

Although the frequency of this intervention was comparable to previous studies, no improvement in limb skeletal muscle mass was observed. For this reason, the amount of one intervention (20 times a day) was small. It was stated to the participants of this study that the amount of exercise was insufficient in this intervention method.

It is reported that people with ID have difficulty attaining independent access to community exercise[14]. Many individuals with ID do not meet physical activity guidelines and have a sedentary lifestyles[14].

To increase the physical activity level of people with ID, strategies are needed to engage caregivers, paid caregivers, and social care supports[15][16].

IPAQ was conducted to evaluate physical activity levels; however, there were no significant differences in the IG and SAG at the beginning and the end of this intervention. In this study, at the workplace, sit-to-stand exercises with encouragement or assistance were carried out by the care workers.

It was presumed that this intervention did not affect exercise behavior in leisure time, but it did establish exercise habits by implementing exercise for the participants. To facilitate physical activity in people with ID, the direct involvement of a care provider is needed[15][17]. In this approach, it is important to consider that caregivers may have limited knowledge of healthy lifestyles and, therefore, require information and support to effectively support participants[17]. Therefore, for the participants of this study, to facilitate physical activity levels outside the workplace, involving their families and resident caregivers could be an effective approach.

The limit of this study is that there was no control group. Also, since there are limits to the measurement of physical activity level not using the pedometer, further investigation is required.

Conclusion

Although the level of exercise was too low (20 times a day) to improve the physical function of a person with severe ID, this study indicated that sit-to-stand exercise was a safe, practicable exercise for participants. In addition, because it is difficult to facilitate physical activity level including behavior in leisure time by exercising only inside the workplace, it is necessary to use an approach involving family and regional social resources in future study.

Conflicts of Interest: The authors declare that there are no conflicts of interest.

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重度の知的障がいを有する者への起立・着座運動の効果

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―キーワード―
重度知的障がい，起立・着座運動，身体活動

目的
本研究では，主に重度の知的障がいを有する者に起立・着座運動を実施し，移動能力別で身体機能および身体活動量への効果を検討した．
対象
対象者は，障がい者作業所（以下，作業所）に通所している知的障がいを有する 46 名とした．対象者の平均年齢は 39.7（±10.1）歳で男性 30 名，女性 16 名，知的障がいの重症度は，43 名が重度であり，3 名がその他に該当した．
方法
本研究の対象者には，作業所にて運動プログラムを実施した．調査項目は，歩行能力，四肢骨格筋量，身体活動量とした．運動プログラムは，週に 5 日，1 日につき 20 回の反復した起立・着座運動を行った．介入期間は平均 59.5（12～96）日であった．歩行能力は，Functional Independence Measure（FIM）の移動の項目を使用した．開始時において，FIM6～7 点を自立群，5 点以下を監視・介助群に分類した．四肢骨格筋量は，介入直前と終了時に体成分分析装置で測定した．身体活動量は，国際標準化身体活動質問票（IPAQ）で測定した．統計解析は，調査項目の開始時から終了時までの変化は Wilcoxon の符号付き順位検定と対応のある t 検定を用いて分析した．
結果
自立群は 29 名，監視・介助群は 17 名であった．FIM の移動項目は，介入前後で変化は認めなかった．四肢骨格筋量は，自立群では，開始時と終了時で有意差を認めず，監視・介助群では，開始時と比較して終了時には有意な低下を認めた（$p<0.05$）．IPAQ では，両群ともに，開始時と終了時で有意差を認めなかった．
結論
身体機能の改善を目的とした重度知的障がいのある者への起立・着座運動の回数は，1 日 20 回では少ないことが示されたが，安全に実施可能な運動であることが示唆された．身体活動量の改善は，今後，家族を含めた検討が必要である．

利益相反：利益相反基準に該当無し

（日職災医誌，67：436―441，2019）

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