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Observational Motor Skill Learning in Individuals with Intellectual Disabilities

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지적장애인의 관찰적 운동기술 학습

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Abstract The purpose of this study was to determine the influence of video modeling observational learning intervention on the learning and performance of a bowling skill in adolescents with intellectual disabilities. Thirty special middle school students whose ages ranged from 14 to 16 years were recruited from Daegu, Korea. Intellectual disabilities of the participants were assessed by Korean version of the Wechsler intelligence scale for adolescent and a social maturity scale. During the experiment, participants repeatedly watched the one-minute action observation film for three minutes before beginning each frame and played 60 frames. Statistical comparisons were performed using a 2 (groups) × 6 (trials) ANOVA, with repeated measures on the last factor of the acquisition stage ($p<0.05$). Factors of the retention stage scores were analyzed by one-way ANOVA. The sources of any significant main effects were tested using a Tukey's HSD (honest significant difference) approach. SPSS 21.0 was used for statistical analyses. The performance scores of the action observation group were significantly higher than those of the control group. The findings showed that observational learning in the form video modeling has the potential to enhance acquisition and learning of a bowling sport skill in intellectual disability individuals; however, these findings are limited to adolescents with moderate intellectual disabilities.

Key Words : Observational learning, Intellectual disabilities, Motor Skill, Bowling, Ecological Validity

요 약 본 연구의 목적은 활동관찰이 지적장애청소년의 볼링수행에 미치는 영향을 알아보는데 있다. 본 연구에 선정된 피험자들은 D시 소재 특수학교에 재원 중인 14-16세의 경도지적장애청소년을 연구대상으로 선정하였다. 대상자들은 모두 사회성숙도(SQ) 지수가 60-70사이를 나타내었으며 이는 IQ(K-WISC)가 55-69 사이에 포함되는 것으로 경도지적장애로 판별된다. 실험에 참여하는 동안 피험자들은 볼링의 각 프레임이 시작하기 전에 1분간의 활동관찰 내용을 3분 동안 반복적으로 시청을 하고, 볼링 60프레임을 수행하였다. 이 연구의 실험설계는 2(집단)× 6(회기)에 대해 반복측정 이원분산분석과 파지단계 점수는 one-way ANOVA로 분석했다. 종속변수는 볼링점수이다. 연구문제와 관련된 통계적 유의수준은 α=.05로 하였으며, 사후분석에는 Turkey's HSD를 사용하였다. 통계적 자료 분석은 SPSS 21.0 프로그램을 사용하였다. 본 연구결과 활동관찰집단이 통제집단보다 볼링점수가 유의하게 높게 나타났다. 이러한 결과는 비디오 형태의 모델링에서 관찰학습이 지적장애인의 볼링기술 습득 및 학습을 향상시킬 수 있는 가능성이 있다는 것을 보여주었다고 판단된다.

주제어 : 관찰학습, 지적장애, 운동기술, 볼링, 생태적 타당도

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1. Introduction

Adolescents with intellectual disabilities (ID) are generally thought to have decreased opportunities for learning movement skills due to their physical and mental diseases. Studies have shown that lack of physical fitness and a lower level of movement experience[1], as well as deficits in motor ability and cognitive functions[2] are associated with ID. Research suggests that deficits in intellectual abilities may hinder learning of movement skills and performance[3]. It appears that the development of movement skills is positively correlated with sports participation[4]. In addition, increased sports participation is found to decrease physical and psychiatric disorders in adolescents with ID[5]. These findings suggest that identifying ways that can improve the acquisition of motor skills in adolescents with ID conditions is very important for the promotion of health and well-being in this population. Observational learning has been thought to be an effective means to facilitate the learning of various tasks in people with intellectual disabilities[6] . In the motor task domain, studies have indicated that observational learning may improve swimming skills[7], baseball skills[8], and bowling in cricket[9] . However, evidence for the beneficial effects of observational learning for activities such as these has been limited to individuals with normal intellectual abilities. Studies examining the advantages of observational learning for individuals with ID in the motor learning context are lacking. The answer to whether individuals with ID could benefit from observational learning in order to improve the development and performance of a sport skill (e.g., bowling) remains elusive. Thus, there is a need for further studies with different study designs, larger sample sizes, and analysis of tasks having higher ecological validity. Therefore, the purpose of this study was to determine the influence of video modeling observational learning intervention on the learning and performance of a bowling skill in Adolescents with ID. It is anticipated that the actions of the observation group would be better retained compared to the control group.

2. Methods

2.1 Subjects

Thirty special middle school students (26 male, 4 female) whose ages ranged from 14 to 16 years (M: 14.45, SD: 0.48), mean height of 156.69cm (SD: 2.76), mean weight of 57.14 kg (SD: 3.32) were recruited from Daegu, Korea. Intellectual disabilities of the participants were assessed by an IQ test (Korean version of the Wechsler Intelligence Scale for Children: K-WISC) and a social maturity scale (SQ). Fifteen subjects were randomly assigned to each of the experimental and control groups. All subjects were found to have mild intellectual disabilities according to the results of the IQ testing, which showed scores ranging between 55 and 69, with social maturity scores (SQ) that were between 60 and 70[10]. All participants gave informed consent prior to the experiment in accordance with the ethical standard of the Declaration of Helsinki.

2.2 Measurement tools and tasks

A one-minute action observation film contained an expert bowler's verbal explanations about the throwing action (approach, push away, down swing, forward swing, release, and follow throw) and an actual demonstration of the entire process. Participants played bowling games with a spare shooting. If participants did not strike any of the pins, they receive 0 points. If participants knock down all 10 pins (a strike), they receive a score of 100 points. These experimental procedures were conducted for six days, where each participant played 60 frames (6 games) and watched the action observation film a total of 18 viewings.

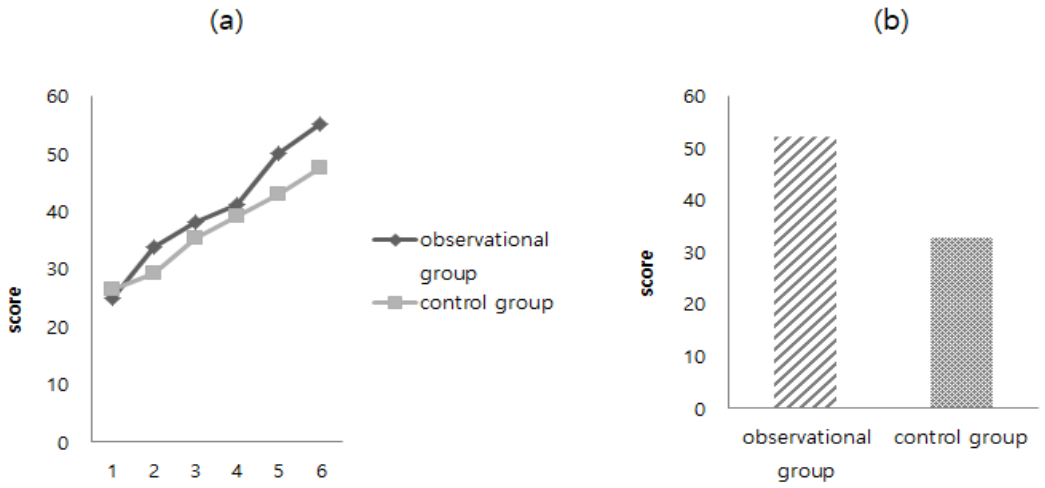

Fig. 1. (a) Bowling score differences across the trial block between observational and control groups. (b) Performance differences between two groups.

2.3 Statisical analysis

Statistical comparisons were performed using a 2 (groups) × 6 (trials) ANOVA, with repeated measures on the last factor of the acquisition stage (p<0.05). Factors of the retention stage scores were analyzed by one-way ANOVA. The sources of any significant main effects were tested using a Tukey's HSD (honest significant difference) approach. SPSS 21.0 was used for statistical analyses.

3. Results

The analysis on acquisition stage yielded a significant main effect for group [F(1, 28) = 26.20, p < .000, $\eta^2\rho$ =. 998] The performance scores of the action observation group were significantly higher than those of the control group. As the violation of Mauchly's sphericity assumption occurred in the trial blocks, the degrees of freedom were corrected with Greenhouse-Geisser Epsilon(ε). In the analysis on the trial blocks, there was a significant main effect [F(2.313, 140) = 324.98, p < .000, $\eta^2\rho$ = .921]. The post-hoc analysis indicated that differences occurred between all six trials. There was a significant interaction between groups and trial blocks [F(2.313, 140) = 10.74, p < .000, $\eta^2\rho$ = .277]. Post-hoc tests indicated that, as shown in Figure 1, the action observation group showed higher performance scores across Trials 5 and 6 than those of the control group. In the analysis of the retention stage, a significant main effect was identified between groups [F(1, 28) = 56.313, p < .000]. The retention scores of the action observation group were significantly higher than those of the control group.

4. Discussion

The purpose of this experiment was to determine the effect of observational learning, through video modeling, on learning and performance of the sport of ten-pin bowling in adolescents with mild intellectual disability. Our findings indicated that participants who were provided with observational learning in the form of video modeling, achieved better acquisition and learning of the bowling task relative to the control subjects. Analysis of the acquisition and retention tests showed that the video modeling intervention group performed significantly better than the control group on the bowling task. This indicates that adolescents with

mild intellectual disabilities can benefit from video modeling in order to learn how to bowl in a real-world setting. This suggests that video modeling can be introduced in a special education setting to teach bowling which may result in increased physical activity as well as health and well-being in adolescents with mild intellectual disabilities. This findings seem congruent with the results of a study conducted by Mechling and Gustafson[11], which demonstrated that presenting learning materials (in this case, cooking tasks) to individuals with disabilities through video rather than static pictures led to a better performance. This aligns with the findings of the present study, that using video as a means of learning motor skills can be beneficial for learners with intellectual disabilities.

The most efficient way to acquire motor skills may be through extensive motor training. Motor performance via motor skill training relies on the creation of internal motor representations, which enable us to repeat and, thereby, strengthen learned motor skills and improve performance[12]. The motor representation comprises the entire movement, including the plan for the movement as well as the intended result[13].

Moreover, the motor representation is suggested to precede the execution, and could, therefore, be detached from the actual execution and exist on its own[14].

It has been suggested that video modeling helps to focus attention on important features of a target skill and enhances motivation toward the task being practiced[15], which is thought to improve the effectiveness of visual information[16]. It has also been suggested that observational learning not only attracts the leaner's attention towards important aspects of the model performers but also highlights significant features of the task at hand[17]. Collectively, these mechanisms of video modeling might serve to better facilitate skill acquisition in an observational treatment condition compared to a non-video approach[18].

Therefore, action observation can be applied to improve the motor learning of adolescent with intellectual disability as an effective cognitive intervention strategy. It is evident that observational learning in the form video modeling has the potential to enhance acquisition and learning of a bowling sport skill in ID individuals; however, these findings are limited to adolescents with moderate intellectual disabilities. In addition, these findings cannot be generalized to other sports tasks having variation in task characteristics in terms of discrete vs. continuous tasks, open vs. closed tasks, cognitive versus motor component related tasks, and fine versus gross motor tasks. Further research could focus on assessing the relationship between video modeling and task characteristics.

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