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Article

Enhancing Exercise Efficacy: An Assessment and Intervention Study for Students with Limited Mobility

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Abstract: This study aims to investigate the effect of exercise interventions on improving efficacy among college students with limited mobility. The study assessed the effectiveness of exercise programs tailored to participants' health profiles and preferences. The study group consisted of college students with various pre-existing health conditions, including asthma, injury, and scoliosis, with asthma being the most frequently reported condition. Participants were profiled based on demographic and performance-related factors, revealing a predominantly younger population, with 67% aged 18–20. The intervention included modification and adaptation exercises, such as yoga, stair steps, and chair exercises. However, despite these adaptations, no significant improvements were observed in the post-test scores of the participants' Functional Movement Screen (FMS). Statistical analysis showed no significant relationship between adaptation exercises and FMS outcomes ($p = 0.393$), nor between pre-test and post-test FMS scores ($Z = -1.604$, $p = 0.109$), suggesting that other factors, beyond exercise modifications, might have influenced functional movement performance. Additionally, no significant effect was found on exercise self-efficacy ($\chi^2 = 32.75$, $p = 0.205$). The findings highlighted the need to consider individual preferences, health conditions, and other influencing factors, such as available space, facilities, and modern equipment, when designing exercise programs for students with limited mobility. These factors might have played a role in the effectiveness of the program, suggesting that more tailored approaches and improvements in the environment could have enhanced the program's overall impact.

Keywords: Exercise efficacy, Functional movement screen (FMS), Intervention, Mobility

1. Introduction

Physical Education (P.E.) is an essential component of learning. It not only allows students to participate in sports but also fosters the discovery and development of exceptional sports talents (Zhang and Liu, 2007; Zhang, 2009). As a result, the idea that regular exercise is an essential component of a healthy lifestyle has been promoted in schools. However, if you have limited mobility due to a disorder, accident, or physical impairment, engaging in physical activity can be challenging, if not risky. One medical condition that prevents students from participating in Physical Education exercises is asthma. Then, students who have asthma, health issues, have recently undergone surgery, or have been injured might need to be temporarily modified, perhaps by altering the activity's nature, intensity, frequency, or duration. Thus, the participation of students with limited mobility in activities should always be prioritized.

Encouraging students to participate in Physical Education classes can be challenging, particularly for those dealing with health issues. The nature of physical activities in P.E. classes requires students to become vulnerable and expose themselves in front of their peers, which can be intimidating and cause embarrassment. Consequently, many students tend to withdraw and avoid participating when sweat and fear are involved.

To add to this, statistics from the Centers for Disease Control and Prevention (CDC) reveal that asthma affects around 8.4% of students in the United States, meaning that in a typical class of 25 students, there may be as many as two students with asthma. This can pose additional challenges for physical education teachers in creating an inclusive environment and ensuring the safety and well-being of all students during physical activity. However, by providing adaptations, modifications, and accommodations, physical education teachers can work to create an inclusive and supportive environment where all students can participate in physical activity and reap the benefits of a healthy lifestyle.

1.1 Intervention Workout

A fitness intervention program is a comprehensive strategy intended to encourage physical activity and enhance overall health and wellness. These programs frequently include a variety of strategies, including exercise regimens, nutritional guidance, and lifestyle modifications, all of which are designed to assist individuals in achieving their fitness objectives. These programs can be implemented in various contexts, including schools, workplaces, and community centers, and can be tailored to specific populations, such as infants, seniors, and individuals with disabilities. Numerous benefits have been associated with fitness intervention programs, including weight loss, increased strength and endurance, decreased risk of chronic diseases, and enhanced mental health. Moreover, these programs are a valuable resource for those seeking a healthier, more active lifestyle.

Adapted Physical Activity (APA) is an intervention designed to increase physical activity as a way to promote the well-being and health of individuals with limited mobility. The program is customized to cater to the distinct requirements of every participant, considering their particular physical aptitudes, cognitive proficiencies, and personal interests. According to Auxter, Pyfer, and Huettig (2001), APA is both an art and a science, encompassing the development and implementation of a customized instructional program for individuals with limited mobility. This program is carefully designed based on a thorough evaluation, with the ultimate goal of equipping the individual with the skills necessary to enjoy a rich and fulfilling life full of leisure, recreation, and sports experiences. APA programs are tailored to meet the unique needs of each individual, taking into account their physical abilities, cognitive capabilities, and personal interests. Through APA, individuals with limited mobility can benefit from increased physical activity, improved health and fitness, enhanced self-esteem, and expanded socialization opportunities. In general, the APA program assumes a vital role in promoting inclusivity and accessibility, as well as enhancing the standard of living for persons with disabilities. Moreover, Block (2021) implied that students who receive high-quality physical education can significantly increase their level of physical activity, enhance their body awareness, and acquire the knowledge and passion to continue being physically active throughout their lives. Furthermore, inadequate frequent exercise increases the risk of heart disease, stroke, obesity, diabetes, and cancer. It also improves mood. Individuals who have disabilities are highly susceptible due to difficulties in remaining active.

Therefore, adaptive sports give learners with limited mobility the chance to engage in physical activity and sports, which can enhance their social skills, self-esteem, and physical and mental health. Thus, it is typically run in parallel to typical activities but is tailored to people's specific physical abilities. Based on (PE Central), the assessment process is the initial stage in designing an Individual Education Program (IEP) for a disabled student. It focuses on identifying an individual's exercise demands and is the interpretation of measurements received through testing.

Similar to conventional exercise, exercising with limited mobility requires warming up before beginning. Light arm swings, shoulder rolls, and stretches can help your heart beat faster, improve circulation, and loosen up tight muscles. According to Coates (2012), intervention fosters personal development in both disabled and non-disabled students by providing them with opportunities to demonstrate leadership qualities. (Lieberman, Arndt, & Daggett, 2007). High-quality physical education can lead to numerous advantages for students, including increased physical activity levels, improved body awareness, and a lasting passion for maintaining an active lifestyle Block, 2021).

1.2 Self-Efficacy

The self-efficacy theory in 1977 states that self-efficacy refers to an individual's confidence or belief in his or her ability to achieve behavioral goals in a specific field (Bandura (Albert, 1978; Bandura, 1997). Physical activity level and exercise self-efficacy were associated with, according to research. It influences an individual's behavior and fosters positive action commitment due to positive self-efficacy, which determines how much effort an individual will make and how long he will persist in the face of obstacles (Eric et al., 2016; Sosan and Siamak, 2016; Sum et al., 2018). Moreover, Self-efficacy is thought to be an important internal motivator for students to engage in physical activity. Likewise, among college students, self-efficacy can be a significant factor in predicting physical activity levels (Yu et al., 2013). Therefore, students who have a strong sense of self-efficacy are more motivated to exercise and persevere in order to achieve their goals. However, individuals with a low sense of self-efficacy, on the other hand, are more likely to have doubts about their abilities, to be concerned when they face failures and setbacks, and to be content with mediocre results (Milne, 1999). Consequently, attempting to increase self-efficacy in interventions may be advantageous. Some factors that boost self-efficacy include receiving feedback on one's performance, changing one's behavior gradually, and experiencing success through others. College students with higher PF have higher overall self-evaluation and evaluation of specific body aspects. In other words, higher P.E. college students have higher body self-esteem (Xie, 2012). Meanwhile, individuals must overcome their difficulties with the activity to change their behavior. Low self-efficacy and controlled motivation can be barriers to physical activity.

Self-efficacy is a major indicator of our chances for achievement; in fact, some psychologists consider self-efficacy to be more important than skill in the formula for success. Whereas defining goals, as noted by Maddux (2005), it was essential to carefully consider self-efficacy to ensure that efficacy beliefs were aligned with objectives, rather than undermining them. Additionally,

Akhtar (2005) defined exercise efficacy as the degree to which an exercise program achieved desired outcomes, such as improved physical fitness, health, and well-being. Several factors, including the type, intensity, duration, and frequency of exercise, along with individual variables such as age, health status, and fitness level, influenced the effectiveness of an exercise program.

Self-efficacy, defined as individuals' "beliefs in one's capabilities to organize and execute the courses of action required to generate certain skills and abilities," is one of the most powerful determinants of good attitudes and intentions toward responsible actions (Bandura, 1997).

An individual's positive or negative appraisal of an attitude object or target action is commonly defined as their attitude (Ajzen, 1991; Eagly & Chaiken, 1993). It implies that self-efficacy is vital for starting and maintaining a routine of consistent physical exercise and behavioral social cognitive theories (Bandura, 1986).

One of the fundamental ideas behind this idea is that you are more likely to engage in activities and take on challenges for which you have high self-efficacy and less likely to do so for which you do not (Lunenburg, 2011). The favorable impacts of social support on exercise behavior and commitment were found in more tailored research where participants had greater contact with the researchers (Litt et al., 2002; Poole, 2001).

Physical activity engagement has been shown to increase with an individual's degree of happiness and satisfaction when exercising (Motl, 2001; Salmon, Owen, Crawford, Bauman, & Sallis, 2003). For example, in a 2003 study, Salmon and coworkers used a battery of questionnaires to determine whether or not people who reported enjoying physical activity were more likely to engage in PA. The results showed that people who reported enjoying PA were more likely to engage in PA.

2. Materials and Methods

This study employed a quasi-experimental one-group pre-test–post-test design to assess the outcomes of a modified exercise intervention among college students with limited mobility. Participants were selected through purposive sampling, focusing on individuals who met the criteria of having physical limitations but were capable of performing low to moderate-intensity physical activities. Informed consent was obtained from all participants prior to the implementation of the intervention.

The intervention involved a six-week modified exercise program, which was developed based on the participants' health conditions, physical capacities, and preferences. Exercises included low-impact activities such as yoga, stair steps, and chair-based movements, designed to promote movement without exacerbating any existing physical conditions.

Although a control group was not included, the pre-test and post-test comparison allowed for the evaluation of the program's effects over time. The dependent variables in the study were the Functional Movement Screen (FMS) scores and exercise self-efficacy outcomes. The FMS scores were collected using a standardized assessment tool to examine changes in movement quality, while self-efficacy was measured through a validated questionnaire assessing participants' confidence in their ability to engage in physical activity.

Data were analyzed using descriptive statistics and appropriate inferential tests. The Wilcoxon Signed Rank Test was used to compare pre- and post-test FMS scores, while chi-square tests were applied to determine any associations between adaptation preferences and self-efficacy outcomes. This design allowed for the evaluation of intervention outcomes despite the absence of a control group, taking into consideration the practical and ethical constraints associated with research involving individuals with limited mobility.

3. Results

The participants were thoroughly profiled based on demographic and performance-related factors. The age distribution revealed that the majority of participants (67%) fell within the age range of 18–20, with 32% aged 21–23, and only 2% within the 24–26 age group. This indicates a predominantly younger demographic among the respondents. The height distribution showed that the most common height was 157.48 cm, representing 18.6% of participants, followed closely by heights of 165.10 cm, 162.56 cm, and 160.02 cm, each accounting for 8.8%. Conversely, the least common heights were 147.32 cm and 158.75 cm, at only 1%. In terms of weight, the largest proportion of respondents (27%) fell within the 101–120 pounds range, while the heavier weight categories of 201–220 pounds, 221–240 pounds, and 241–260 pounds had minimal representation, each at 1%.

The Body Mass Index (BMI) highlighted that most participants (42%) fell within the 16–21 pounds/inches² range, while higher BMI categories, such as 31–35 and 36–40 pounds/inches², accounted for only 5%. In the gender distribution, female respondents constituted 67.6% of the sample, with male participants comprising 32.4%. The performance of participants in their respective PE courses revealed that PE 4 had the highest proficiency rate at 52.9%, followed by PE 2 at 47.1%. This distribution suggests potential challenges or lower performance in PE 2, which may affect the intervention program's effectiveness.

3.1 Baseline Characteristics of Participants

Table 1. Frequency Distribution and Ranking of Pre-Existing Health Issues.

Pre-existing Health Condition	Frequency	Percentage	Ranking
Asthma	44	40%	1
Injury	21	19%	2
Scoliosis	20	18%	3
Skin allergy	7	6%	4
Surgery	6	6%	5
Heart problem	4	4%	6
Low blood	2	2%	7
Rhinitis	1	1%	10
Sprained ankle	1	1%	10
Anemia	1	1%	10
Knee problem	1	1%	10
Pregnant	1	1%	10
Total	**109**	**100%**	—

Table 1 presents the frequency distribution and ranking of pre-existing health conditions reported by the respondents. The most frequently reported conditions were asthma, injury, and scoliosis, with frequencies of 44 (40%), 21 (19%), and 20 (18%), ranking 1st, 2nd, and 3rd, respectively. Other notable conditions included skin allergy (6%), surgery (6%), and heart problems (4%). Meanwhile, the least reported health issues—rhinitis, sprained ankle, anemia, knee problem, and pregnancy—each had a frequency of 1 (1%), sharing the 10th rank. These results suggest that respiratory and musculoskeletal issues were the most prevalent among the participants.

3.2 Association Between Health Conditions and Pre-test FMS Scores

Table 2. Fisher exact test on the association between pre-existing health issues and pre-test fms.

Associated Variables	Test Statistics	Value	*p-value*	Effect Size
Health Issues and FMS Pre-test	Fisher Exact	11.667	0.03	Cramer's V (0.265)

Fisher's Exact Test was conducted to examine the association between pre-existing health issues and pre-test Functional Movement Screen (FMS) scores. Results showed a statistically significant association ($p = 0.03$), indicating that pre-existing health conditions are related to FMS pre-test scores. The strength of this association was small, with Cramer's $V = 0.265$, suggesting a small to moderate effect size. This implies that the presence of health issues has a modest impact on respondents' pre-test FMS performance.

3.3 Effect of Adaptation Exercises on Functional Movement

Table 3. Frequency distribution and ranking of the potential modification and adaptation exercise survey.

Potential Modification & Adaptation Exercise	Frequency	Percentage	Ranking
Yoga	45	12.9%	1
Stair steps	41	11.8%	2
Chair exercise	39	11.2%	3.5
Low-impact body weight exercise	39	11.2%	3.5
Hula-Hoops	37	10.6%	5
Resistance band	33	9.5%	6
Dumbbells	32	9.2%	7
Balls	28	8.0%	8
Water aerobics	23	6.6%	9

Table 3 reflected the frequency distribution and the ranking of responses to the subscribed potential modification and adaptation exercises of the respondents. The top three espoused were yoga, stair steps, chair exercise, and low-impact body weight, with counts of (45, 41, and 39) and their corresponding percentages (12.9, 11.8, and 11.2), which ranked 1st, 2nd, and 3rd, respectively. Whereas the least were battle ropes, cones and ladders, and water aerobics with counts of (13, 18, and 23) and its corresponding percentages (3.7, 5.2, and 6.6) which ranked 11th, 12th, and 13th respectively from the roster of potential modification and adaptation exercises that the students had subscribed to as treatments.

3.4 Changes in Exercise Self-Efficacy

Table 4. Fisher's exact test on the association between adaptation exercises and post-test FMS.

Associated Variables	Test Statistics	Value	*p-value*	Effect Size
Adaptation Exercise and FMS Post-test	Fisher Exact	27.476	0.393	Cramer's V (0.284)

Table 4, Fisher's Exact Test was used to determine if there was a significant association between adaptation exercise and post-test FMS. There was not a statistically significant association between adaptation exercise and posttest FMS ($p = 0.393$). The potential modification and adaptation exercises were completely independent of participants' post-test FMS. The potential modification and adaptation exercises did not affect the post-test FMS scores of the respondents.

3.5 Analysis of Post-test Functional Movement Scores

Table 5. Wilcoxon signed rank test on the comparison between the FMS pre-test and FMS post-test.

Compared Variables	Test Statistics	Value	p-value
FMS Pre-Test vs FMS Post-test	Wilcoxon Signed Ranks Test	Z -1.604	0.109

In table 5, the Wilcoxon signed rank test showed that there was no significant difference ($Z = -1.604$, $p = 0.109$) between scores given for the FMS pre-test compared to the FMS post-test. This suggests that the intervention did not lead to a measurable change in participants' performance on the FMS.

3.6 Variations in Exercise Self-Efficacy Outcomes

Table 6. Chi-square test on the association of adaptation exercises with exercise self-efficacy.

Associated Variables	Test Statistics	Value	df	p-value	Effect Size
Adaptation Exercise and Exercise Self-Efficacy	Chi-square	32.75	27	0.205	*Cramers' V* = 0.327

A Chi-square test of independence was performed to examine the relation between adaptation exercise and exercise self-efficacy. The relation between these variables was not significant, $X2 (27, N = 102) = 32.75$, $p = 0.205$. The potential modification and adaptation exercises were completely independent of someone's exercise self-efficacy. The potential modification and adaptation exercises did not affect the exercise self-efficacy of the respondents.

4. Discussion

The findings of this study offer valuable insights into the interplay between health status, exercise intervention design, and functional outcomes among students with mobility limitations. Drawing from the data, five key areas of discussion are identified.

1. Health Status and Functional Performance:
   The study revealed a statistically significant association between participants' pre-existing health conditions and their pre-test Functional Movement Screen (FMS) scores. This finding aligns with existing research that suggests individuals with underlying health issues often exhibit compromised physical function and mobility (Smith et al., 2019).
2. Limited Impact of the Intervention:
   Despite tailoring the adapted exercise intervention to individual health profiles, no significant improvements were observed in post-test FMS scores or exercise self-efficacy outcomes. This supports prior studies indicating that short-term, low-intensity programs may have limited effectiveness for populations with mobility restrictions (Lee & Kim, 2021).
3. Preference for Low-Impact Exercises:
   Participants showed a marked preference for low-impact modalities such as yoga and chair-based exercises. This emphasizes the need for safe, accessible program designs that minimize injury risk while promoting participation. Comfort and safety appear to be central to engagement and adherence, especially among individuals with physical limitations.
4. Program Duration and Support Structure:
   The limited effectiveness of the intervention may be attributed to its short duration and lack of progressive intensity. Research

suggests that longer-term interventions, especially those incorporating progressive overload and behavioral support, are more effective in improving functional outcomes and self-efficacy (Garcia et al., 2020).

5. Program Modification and Environmental Considerations:
   The study contributes practical insights on tailoring exercise programs to individual needs. It underscores the importance of considering psychological readiness, motivation, and environmental resources (e.g., facility accessibility, equipment availability) when designing interventions for students with limited mobility.

5. Conclusions

This study identified asthma, injuries, and scoliosis as the most prevalent pre-existing health conditions among the participants. Less common conditions included rhinitis, sprained ankles, anemia, knee issues, and pregnancy. These findings emphasize the importance of understanding the specific health profiles of students when designing physical activity interventions.

Participants demonstrated a clear preference for low-impact exercises, such as yoga and chair-based activities. This preference highlights the need to consider students' physical capabilities and comfort levels to ensure program accessibility, safety, and engagement.

Although the adapted intervention did not result in statistically significant improvements in post-test Functional Movement Screen (FMS) scores, the findings underscored the influence of external factors—such as the availability of equipment and conducive facilities—on program outcomes. These contextual elements are critical to the effectiveness of exercise interventions.

In light of these results, future programs should adopt a more comprehensive approach by adjusting key components such as session duration, intensity, facility resources, and individualized support. Refining these aspects may enhance functional outcomes, increase exercise self-efficacy, and promote sustained participation among students with limited mobility.

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Appendix A

The results suggested that while pre-existing health conditions were associated with pre-test FMS outcomes, the adaptation exercises had no statistically significant impact on post-test FMS scores or exercise self-efficacy. The participants' preference for low-impact exercises, such as yoga and chair exercises, underscores the importance of designing interventions tailored to participants' needs and feasible for individuals with pre-existing health issues. The lack of significant improvements suggests that factors such as exercise duration, program intensity, or external influences may need to be addressed to enhance functional movement outcomes and exercise confidence among participants.

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