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By Universitas Muhammadiyah Sidoarjo

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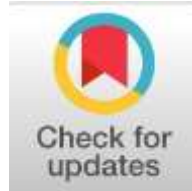
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Adaptive Physical Education Activity Modification For Physical Disability Student Independence: Modifikasi Aktivitas Pendidikan Jasmani Adaptif Bagi Kemandirian Siswa Disabilitas Fisik

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Abstract

General Background Inclusive physical education requires individualized pedagogical adaptations to ensure equitable participation and motor development for all learners. **Specific Background** Adolescents with upper-limb impairments face severe manipulative barriers during traditional sports without appropriate instructional accommodations, heavily restricting their autonomous learning. **Knowledge Gap** Current mainstream pedagogies rarely integrate STEP-based spatial adjustments alongside orthotic devices utilized strictly as educational aids rather than clinical interventions. **Aims** This Single-Subject Research investigates the application of customized motor tasks to foster autonomous participation for a physically marginalized eighth-grade adolescent. **Results** Following the intervention, the participant's autonomy scores progressed from a stable baseline mean of 25.00 to an intervention mean of 37.33. The visual analysis demonstrated a zero percent data overlap, confirming consistent behavioral improvements in grasping, throwing, catching, and equipment management. **Novelty** This study pioneers the combination of non-clinical orthotic supports with scaffolded environmental adjustments to prioritize functional autonomy over mere athletic performance. **Implications** Mainstream institutions must adopt customized pedagogical frameworks and functional tools to promote true autonomous learning and social integration for marginalized populations.

Highlights

- ♦ The STEP pedagogical framework significantly optimizes manipulative motor execution like grasping and throwing.
- ♦ Orthotic wrist supports function successfully as mainstream classroom aids rather than purely clinical tools.
- ♦ Scaffolded instructional strategies transition marginalized youth toward self-reliant participation in inclusive sports environments.

Keywords

Inclusive Education; Manipulative Motor Skills; STEP Framework; Single Subject Research; Wrist Support

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INTRODUCTION

Physical Education, Sports, and Health (Pendidikan Jasmani, Olahraga dan Kesehatan—PJOK) is an integral part of the education system that contributes to the development of students' physical fitness, motor competence, social skills and character. Physical education is expected to develop a proficiency in physical activities as well as independence, self-confidence, discipline, and responsibility while participating in the learning process. Therefore, physical education should be organized to meet the different characteristics of learners including students with special educational needs who are educated in inclusive classrooms. Inclusive education ensures that all learners have equal educational opportunities through the provision of instructional services that meet their individual characteristics, abilities and educational needs. Inclusive practices within physical education require teachers to implement adaptive instruction through the modification of learning goals, teaching strategies, activities, equipment, learning environments and assessment procedures. Adaptations like these allow all students to meaningfully and safely engage in learning activities based on their functional abilities. On the other hand, learning experiences that do not take into consideration the individual differences may limit participation and hinder the development of functional abilities and independent learning behaviors of students with disabilities.

There is a need for adaptive instructional services for a group of learners that includes students with upper limb physical impairments. Limitations to the hands or wrists may limit the ability of the student to perform manipulative motor skills such as gripping, throwing, catching and striking a ball. These skills are among the important learning outcomes of small-ball games, especially *kasti*, a traditional Indonesian striking-and-fielding game that requires adequate hand strength, wrist stability, eye-hand coordination, and controlled movement of the upper extremities. Students with upper-limb impairments experience significant difficulty with these activities without appropriate instructional accommodations, which may restrict participation and independence in physical education classes. Preliminary observations on the inclusive class of 8th grade at SMP Negeri 5 Sandaran found that there was one student with a physical impairment in the upper limbs who experienced great difficulty in carrying out manipulative motor activities in physical education. In the four observation sessions in the *kasti* lesson, the student always required help from the teacher in gripping, throwing, catching, and managing learning equipment. The observation results also showed that the student could do some of the learning activities independently while some others needed verbal guidance or direct physical assistance from the teacher.

Interviews with the physical education teacher revealed that classroom teaching generally used the same learning approaches for all students, despite individual needs. Consequently, no adaptive instructional strategies, activity modifications, or assistive devices were used to accommodate the student's physical limitations. This instructional condition restricted the student's opportunities to engage in learning activities independently and highlighted the need for more individualized instructional practices in inclusive physical education settings. The student was by no means free from physical limitations but nevertheless had positive self-acceptance, high self-confidence and a strong motivation to learn. The student participated in all instructional activities and interacted appropriately with peers without significant social barriers. The results show that the main problem was not psychological or social but rather functional limitations of the upper limb that hindered the student from independently performing manipulative motor activities. Thus, the student's positive self-confidence is an important personal resource that can facilitate successful intervention, when the learning activities are adequately adapted to the individual functional capacities.

The independence of the students is one of the main goals of physical education, and they are expected to understand instructions, prepare learning equipment, perform movement tasks within their capabilities, and complete the assigned activities with minimal dependence on teachers or classmates. Independence is the target behavior in the present study. It is operationalized as the student's active, responsible and independent participation in the entire learning process while performing the physical activities in accordance with his or her functional condition. An instructional approach deemed appropriate for solving this problem is adaptive physical education through activity modification. Adaptive physical education is the systematic modification of instructional activities, instructional methods, equipment, environmental conditions, and support strategies to meet the functional capabilities and educational needs of students with disabilities. In this study, activity modifications were developed with the STEP framework. This framework has four interrelated components: Space, Task, Equipment, and People. Learning activities are gradually available through alteration of learning space, task complexity, instructional equipment, and support given by teachers or peers, so that students can carry out motor tasks with increasing independence.

The present study employed a wrist support as an adaptive learning aid in the context of these instructional adaptations. The literature of biomechanical and occupational therapy suggests that wrist support improves stability of the radiocarpal joint, maintains a neutral wrist position and reduces compensatory movements and improves movement control during manipulative motor activities. In this study, wrist support was not used as a therapeutic or medical device but as an educational support device that can promote more stable and independent execution of gripping, throwing, catching and striking movements during *kasti* instruction. As an adaptive learning aid, the current study used a wrist support in conjunction with these instructional adaptations. The literature of biomechanical and occupational therapy suggests that wrist support improves stability of the radiocarpal joint, maintains a neutral wrist position and reduces compensatory movements and improves movement control during manipulative motor activities. In this study, wrist support was not used as a therapeutic/medical device, but as an educational support to enable a more stable and independent performance of gripping, throwing, catching and striking movements in *kasti* instruction. Thus, the Single-Subject Research (SSR) design was adopted for this study because the research was focused on the investigation of behavioral changes in one participant through repeated measurement of the behavior in the baseline and intervention phases. SSR enables researchers to systematically observe changes in behavior over time, which helps them establish a functional relation between the adaptive physical education intervention and improvements in student independence.

The present study has several important novelties. First, it integrates adaptive physical education and STEP-based activity modification for students with upper limb physical impairments. Second, it considers wrist support as an adaptive instructional tool in the context of physical education learning rather than as a therapeutic intervention. Third, the study stresses independence as the main target behavior rather than motor performance. Fourth, it uses a Single-Subject Research method to assess behavioral change through repeated observations. Lastly, the intervention is conducted within the context of kasti teaching in an inclusive classroom at junior secondary school. Therefore, the aim of this study is to investigate the use of adaptive physical education in terms of activity modification to improve the independence of a student with upper-limb physical impairment in kasti learning activities in an inclusive eighth-grade class at SMP Negeri 5 Sandaran. The results are expected to contribute to the theoretical and practical development of adaptive physical education by providing evidence-based instructional strategies that promote greater independence and meaningful participation of students with physical disabilities in inclusive educational settings.

METHOD

This study used a Single Subject Research (SSR) design to determine the effectiveness of adaptive Physical Education, Sports and Health (PJOK) learning through activity modification in improving the independence of students with upper limb physical impairment. The choice of an SSR is because the study was designed to observe behavioral change of one participant over repeated measurements under controlled conditions, allowing for the identification of a functional relation between the intervention and the target behavior. The research employed an A–B design, comprising of a baseline phase (A) and intervention phase (B). In the baseline phase, the student was involved in regular PJOK instruction, without activity modification or use of adaptive equipment. The intervention phase was the application of adaptive PJOK instruction using the STEP model (Space, Task, Equipment, and People) and the utilization of a wrist support in helping with manipulative motor skills. The research was conducted at SMP Negeri 5 Sandaran, East Kutai Regency, East Kalimantan, Indonesia. The participant was an eighth-grade student in an inclusive classroom with a congenital upper limb physical impairment. The participant was purposefully selected from school identification records indicating difficulty in performing manipulative motor skills such as gripping, throwing, catching, and striking a ball. In spite of the physical limitations, the student had enough cognitive ability, good communication, positive social interaction, and high learning motivation. The participant was suitable for evaluating the changes in independent participation in adaptive physical education.

The intervention was delivered across 10 instructional sessions, comprising 4 baseline sessions and 6 intervention sessions, each 80 minutes long. During the intervention phase, the learning activities were systematically adapted based on the STEP framework by adapting the learning space, the difficulty of the tasks, the instructional equipment and the level of assistance provided to the student. An adaptive learning aid, wrist support, was included to enhance wrist stability during manipulative motor tasks. Support was given according to the principle of scaffolding where the teacher's support was gradually removed as the student improved independence. Data were collected through structured observation of the student's independence using ten behavioral indicators, supplemented by teacher and student interviews, field notes, and documentation to increase the credibility of the findings. The main dependent variable was the independence of students in following adaptive PJOK lessons. The independent variable was the implementation of adaptive PJOK based on STEP activity modification combined with wrist support. Independence was measured with the observation checklist by rating on a four-point scale from 1 (cannot do activity even with full assistance) to 4 (can do activity independently without assistance). The indicators were: preparing learning equipment, responding to teacher directions, performing manipulative motor activities, using learning equipment independently, completing learning tasks, and transitioning between activities without continuous guidance. The collected data were analyzed by visual analysis, which is the common analytical procedure in Single-Subject Research. The analysis included between-condition analysis including changes in trend, stability, mean level, level change, and percentage of overlap between the baseline and intervention phases, and within-condition analysis including trend, stability, data path, range, level change, and mean level. Visual analysis indicated a successful intervention when there was an increase in independence, higher mean scores, consistent intervention data, positive level shifts, and a low percentage of overlap between phases.

RESULT AND DISCUSSION

Research Setting and Participant Description

This research was conducted at SMP Negeri 5 Sandaran, East Kutai Regency, East Kalimantan Province, Indonesia in the second semester of the 2025/2026 academic year. The school is an inclusive education provider which caters for students with a range of learning characteristics including students with special educational needs. Inclusive education implementation means that all students have equal opportunities to participate in learning activities according to their abilities and needs. SMP Negeri 5 Sandaran in the academic year 2025/2026 received 146 students in grades VII, VIII and IX. The present research was conducted in a class of eighth grade Physical Education, Sports, and Health (PJOK). The school has several facilities to support the teaching of physical education, including a sports field, kasti balls, plastic balls, cones, bats and other instructional equipment. This study also employed a wrist support as an adaptive learning aid to promote wrist stability during manipulative motor activities in support of the intervention. The research was a Single-Subject Research (SSR) study using an A–B design, with four baseline sessions and six intervention sessions. All instructional sessions were conducted during the regular PJOK class hours by considering the physical condition, readiness to learn, and the characteristics of the participant.

During the study, the PJOK teacher worked together in the implementation of the Individualized Learning Program (RPPI) according to the Individualized Learning Program (RPPI). Adaptive instruction was delivered using the STEP model (Space,

Task, Equipment and People) and the researcher observed changes in the participant's independence across each instructional session. The research environment was conducive and support was provided by the school principal, teachers and the school community as a whole, which made it possible for the intervention to be implemented systematically and according to the planned research procedures. The study participant was one eighth grade student. The participant was given the pseudonym S to preserve confidentiality according to research ethics. The participant was purposively selected for the study based on preliminary observations, teacher interviews and school assessment records which suggested an upper-limb physical impairment that impacted manipulative motor performance during physical education activities. Information from the physical education teacher and the student's parents indicated that the impairment was present from early childhood and resulted in limitations in the use of the hands that affected the performance of tasks involving gripping, throwing, catching, and striking movements. The participant was physically limited, but had age appropriate cognitive ability, effective verbal communication, positive social interaction with peers and strong motivation to participate in classroom learning.

The further initial observation showed that despite the persistent display of enthusiasm and willingness to participate in all activities of PJOK, the independent performance is still limited during manipulative motor tasks. The participant frequently needed verbal prompts or direct physical assistance from the teacher to complete multiple learning activities. These characteristics suggested that the participant had a great deal of potential for successful participation in inclusive physical education, but would require appropriate instructional modifications to maximize independence. Hence, the participant was considered suitable to study the effectiveness of adaptive physical education through STEP activity modification with wrist support in improving independent participation during kasti learning activities.

Results During the Baseline Phase (A)

The baseline phase (A) was conducted to determine the initial level of independence of the participant before the implementation of adaptive Physical Education, Sports, and Health (PJOK) instruction based on the STEP (Space, Task, Equipment, and People) activity modification with the use of wrist support. During this phase, the participant was provided with traditional PJOK instruction without adaptive modifications or specialized instructional supports. Baseline data were employed as the reference condition to evaluate any changes during the intervention phase. Baseline consisted of four observation sessions. The participant's independence was assessed in each session by a structured observation checklist of the predefined behavioral indicators. The total score per session was the participant's level of independence during regular PJOK instruction.

Table 1. *Independence Scores During the Baseline Phase (A)*

Session	Score
Baseline 1 (A1)	24
Baseline 2 (A2)	25
Baseline 3 (A3)	25
Baseline 4 (A4)	26
Mean Level	25.00

As seen in Table 1, the participant's independence scores were only slightly different across the 4 baseline sessions. The score went up from 24 in the first session to 25 in the second session, remained unchanged at 25 in the third session and increased slightly to 26 in the fourth session. The baseline phase mean score was 25.00, indicating the relatively stable level of performance prior to the intervention. The small change in scores indicates that the participant's level of independence was relatively unchanged during the baseline condition. In the traditional PJOK instruction, the participant still needed teacher's help in several manipulative motor activities especially the activities of gripping, throwing, catching, and striking the ball. Minor improvements were observed across the sessions, but the changes were not sufficient to suggest any meaningful behavioral gains. Rather, these improvements were more likely due to normal day-to-day fluctuations in performance than any systematic instructional impact.

Visual analysis of the baseline data also suggested a slightly increasing trend across the four sessions but a relatively stable pattern. Four observation sessions made up the baseline condition and scores ranged from 24 to 26 with a mean level of 25.00. The small range of variation indicates that the participant's independence remained stable prior to the implementation of the adaptive intervention. In conclusion, the baseline results showed that the independence of the participant in PJOK learning was at the initial level before the intervention. The participant still needed help from the teacher to finish some learning activities, particularly manipulative motor tasks. These results established a stable baseline against which the effectiveness of the adaptive PJOK intervention based on STEP activity modification and wrist support could be subsequently evaluated.

Results During the Intervention Phase (B)

The intervention phase (B) was carried out after the baseline phase and consisted of implementation of adaptive Physical Education, Sports, and Health (PJOK) instruction based on activity modification using the STEP model (Space, Task, Equipment, and People) together with the use of a wrist support. The main objective of the intervention was to improve the participant's independence in the kasti (small-ball game) learning activities. Instruction during this phase was based on an Individualized Learning Program (RPPI) with learning experiences moving from simple to more complex motor tasks through systematic modifications of the learning environment, task demands, instructional equipment and level of assistance provided. The intervention included six instructional sessions. In each session, the teacher provided support using a scaffolding method where the support was systematically reduced as the participant gained competence and confidence in manipulative motor activities. The wrist support acted as an adaptive learning tool, increasing wrist stability, so the participant could perform gripping, throwing, catching, and striking actions more effectively and independently.

Table 2. *Independence Scores During the Intervention Phase (B)*

Session	Score
Intervention 1 (B1)	33
Intervention 2 (B2)	35
Intervention 3 (B3)	37
Intervention 4 (B4)	39
Intervention 5 (B5)	40
Intervention 6 (B6)	40
Mean Level	37.33

As shown in Table 2, the participant's independence steadily increased during the intervention phase. The score increased from 33 in the first intervention session to 35 in the second session, 37 in the third session and 39 in the fourth session. The participant's score was 40 in the fifth and sixth sessions, which means that the highest level of independence was maintained in the last two observations. The average score of independence during the intervention phase was 37.33, which was significantly higher than the average at baseline. The gradual increase in independence suggests that the adaptive PJOK intervention was successful in enabling the participant to engage in learning activities with less dependence on teacher support. The STEP framework provided the opportunity to adapt learning tasks to the participant's functional abilities, and the wrist support added stability during manipulative motor movements. Moreover, the incremental elimination of instructional aid through scaffolding prompted the participant to perform learning tasks with greater independence.

Visual analysis of the intervention data revealed an upward trend for all six observation sessions. The intervention phase consisted of 6 sessions and the scores ranged from 33 to 40 with an average score of 37.33. The positive trend in the intervention data was more prominent, and there was more consistency as well, than the baseline data, which indicated that the participant's independent performance during adaptive physical education activities was improving over time. In conclusion, the results of the intervention phase show that adaptive PJOK learning based on the modification of STEP activities combined with the use of wrist support can bring positive changes to the independence of the participants. The improvement of the scores that were always obtained from one session to another indicated that the participant was slowly developing a better ability to carry out manipulative motor activities and participate in PJOK lessons with little assistance. This shows that the intervention was successful in promoting independent learning behavior.

Between-Condition Analysis

A between-condition analysis was conducted to compare the change in the participant's independence from the baseline phase (A) to the intervention phase (B). The aims of this study were to analyze the effect of implementation of adaptive Physical Education, Sports and Health (PJOK) instruction based on STEP (Space, Task, Equipment and People) activity modification assisted with the use of a wrist support on the participant's independence. The comparison was based on the principles of Single-Subject Research (SSR) regarding condition length, data range, trend, stability, mean level, level change, and percentage of overlap.

Table 3. *Comparison of Baseline and Intervention Conditions*

Component	Baseline (A)	Intervention (B)
Condition Length	4 sessions	6 sessions
Data Range	24–26	33–40
Trend	Increasing	Increasing
Stability	Stable	Stable
Mean Level	25.00	37.33

The baseline phase consisted of four observation sessions and the intervention phase consisted of six sessions (see Table 3). In the baseline phase, independence scores ranged from 24 to 26 with a mean level of 25.00. The participant's scores increased significantly with the implementation of the adaptive PJOK intervention from 33 to 40 with a mean score of 37.33. The large increase in the mean level indicates that the participant had significantly higher level of independence after receiving adaptive instruction based on STEP activity modification and wrist support. The intervention phase showed a stronger and consistent trend of improvement compared to the baseline phase, indicating a more robust positive behavioral change. To further evaluate the effectiveness of the intervention, a visual analysis between conditions was conducted by analyzing the change in trend, stability, level, and overlap of the two phases.

Table 4. *Between-Condition Analysis*

Component	Analysis Result
Trend Change	Increasing
Stability Change	Stable
Level Change	Increased (+7)
Percentage of Overlap	0%

The analysis of between-condition showed robust positive change after the intervention. The trend was upward in both phases, but the improvement during the intervention phase was more consistent than during the baseline phase. In both phases data stability was high, suggesting that the observed changes were systematic and not random variation. A gain of +7 levels suggests a direct gain in independence following the introduction of the adaptive intervention. Furthermore, the 0% overlap indicates that all the intervention data points lie outside the range of the baseline scores. The finding provides strong evidence that the improvement of the participant's independence was associated with the implementation of the adaptive PJOK program and not due to natural variation in performance. The SSR graph also provides visual support for these findings, showing a clear distinction between the baseline and intervention phases. Independence scores were in the narrow range of 24–26 during the baseline phase and increased to 33–40 during the intervention phase. The absence of

overlapping data from the two phases and a consistent upward trend across intervention sessions suggest a clear functional relation between the intervention and the participant's increased independence. The progressive increase from the first to the final intervention session indicates that the combination of STEP-based activity modification, wrist support, and gradually decreased teacher assistance was effective in fostering independent participation in physical education learning.

Overall, the SSR results demonstrate that the participant's independence improved significantly following the adaptive PJOK intervention. Specifically, (1) baseline independence scores were between 24 and 26 with a mean level of 25.00; (2) intervention scores increased to 33–40 with a mean level of 37.33; (3) independence increased progressively across successive intervention sessions; and (4) the 0% overlap between baseline and intervention data strongly supports the effectiveness of the intervention. The results of this study indicate that adaptive physical education based on STEP activity modification with wrist support has a positive effect on improving the independence of a student with an upper-limb physical impairment in kasti instruction in an inclusive classroom.

Discussion

The results of this study indicate that the application of adaptive Physical Education, Sports, and Health (PJOK) with activity modification affects the independence of a student with a physical impairment of the upper limb in the inclusive classroom. This is demonstrated with the participant's independence score increasing from a mean baseline score of 25.00 to a mean intervention score of 37.33. The participant's independence score showed a consistent upward trend throughout the intervention phase with 0% overlap of data between baseline and intervention conditions. The absence of overlap suggests a strong functional relation between the intervention and the observed behavioral change, consistent with the principles of Single-Subject Research (SSR). These results suggest that the improvement in independence was not due to natural variation in performance, but rather the result of the systematic implementation of adaptive instructional strategies. The participant's increased independence could be explained by combining multiple complementary instructional components during the intervention. The first, is that the adaptive PJOK approach can facilitate the adjustment of learning activities to the functional ability of the participant, not vice versa, the participant is forced to be able to adapt to standardized physical education activities. This personalized adaptation allowed the participant to be actively involved in the learning tasks and to reduce the physical barriers related to manipulative motor skills. This finding is consistent with the perspective of Hutzler (2007) that adapted physical education is designed to offer equitable learning opportunities by modifying activities, environments, and instructional resources based on individual characteristics of learners. Likewise, Lieberman and Houston-Wilson (2018) contend that adaptive physical education provides meaningful participation by providing students with disabilities opportunities for learning experiences that are appropriate to their abilities and developmental needs.

One of the main factors in the participant's progress was the use of the STEP model to systematically change the learning environment by adjusting the Space, Task, Equipment, and People. These changes were to reduce unnecessary physical demands and not to facilitate the achievement of instructional objectives. The participant was able to perform manipulative motor activities with increasing success by adapting the movement space, gradually increasing the complexity of the task, using appropriate instructional equipment, and providing individualized teacher support. The systematic move from easier to more difficult activities also created repeated opportunities for successful performance, thus promoting active participation and continued engagement throughout the intervention. These results are consistent with the results of Kresnapati, Nugroho and Wicaksono (2025) who stated that the modification of motor activities in adaptive physical education has a positive impact on the participation and motor competence of students with special educational needs and Maraya, Yusuf and Sari (2025) who stated that adaptive instruction gives more opportunities for students with disabilities to participate in accordance with their individual capacities.

An important feature of the intervention was the use of the wrist support as an adaptive instructional aid. In this study, the wrist support was an educational tool for facilitating wrist stability in manipulative motor activities, as opposed to a therapeutic device in clinical rehabilitation. Increased stability at the wrist allowed the participant to grip, throw, catch and strike the ball more effectively while decreasing compensatory movements and discomfort during performance. As he gained more control over his movement, the participant became more confident in completing the learning tasks independently. This finding is consistent with the finding of Pendleton and Schultz-Krohn (2023) who stated that upper-extremity orthotic devices increase joint stability and promote functional task performance, and Cooper, Ohnabe, and Hobson (2007) who stated that assistive technologies are vital in promoting functional independence for individuals with physical disabilities by compensating for physical limitations. Thus, in this study the wrist support should not only be seen as a physical support but also as a key aspect of adaptive instructional practice that allowed more independence in learning activities.

The increase in independence observed can also be explained by Vygotsky's Scaffolding Theory and Bandura's Self-Efficacy Theory. During the intervention, the teacher modeled, provided verbal cues, physically assisted when necessary and provided constant feedback while gradually fading assistance as the participant became more competent. This teaching process is rooted in Vygotsky's idea of scaffolding, in which learners are provided with temporary support to accomplish tasks that are beyond their current level of independent functioning and then the accountability is slowly passed onto the learner (Vygotsky, 1978). At the same time, repeated successful experiences in learning activities that gradually became more difficult probably enhanced the participant's sense of self-efficacy. Mastery experiences are the most influential source of self-efficacy belief because the successful accomplishment of a task reinforces individuals' beliefs in their own capabilities (Bandura, 1997). In the current study, the participant's repeated successful completion of modified motor activities appeared to increase confidence, decrease reliance on teacher assistance, and promote greater independence of participation over the course of the intervention.

Overall, these results suggest that the participant's increased independence cannot be attributed to use of adaptive equipment alone. It was not only due to the adaptive PJOK instruction, but due to the synergistic interaction of adaptive PJOK instruction, STEP-based activity modification, use of wrist support and systematic implementation of scaffolding

strategies. This integrated instructional approach enabled the participant to engage in learning activities within his or her functional ability, experience repeated success, and gradually develop confidence and independence. Thus, the current study provides empirical evidence on the effectiveness of adaptive physical education in inclusive settings, stressing the importance of individual pedagogical adjustments in fostering independent participation in students with upper-limb physical disability.

CONCLUSION

Based on the results of the Single-Subject Research (SSR) with an A-B design, it can be concluded that the implementation of adaptive Physical Education, Sports, and Health (PJOK) based on activity modification by using the STEP model (Space, Task, Equipment, and People) and the use of a wrist support was effective in improving the independence of a student with an upper-limb physical impairment during kasti learning activities in an inclusive classroom at SMP Negeri 5 Sandaran. The intervention was effective as indicated by the large increase in the participant's independence from a baseline mean score of 25.00 to an intervention mean score of 37.33, a steady upward trend, and 0% overlap between the baseline and intervention phases, indicating a strong functional relationship between the intervention and behavioral improvement. The participant showed increasing independence in the preparation of learning equipment, understanding and following teacher instructions, proper use of the wrist support, performance of manipulative motor tasks such as gripping, throwing, catching and striking the ball, and the completion of learning activities with gradually reduced teacher assistance. These findings suggest that adaptive PJOK instruction including STEP-based activity modification, adaptive equipment, and systematic scaffolding may be an effective instructional approach to promote independent participation of students with physical disabilities in inclusive physical education. Furthermore, the study contributes theoretically by extending evidence to support adaptive physical education, the application of Single-Subject Research in inclusive educational settings, and the relevance of Vygotsky's Scaffolding Theory and Bandura's Self-Efficacy Theory to explain the development of learner independence. Practically, the findings provide guidance for physical education teachers and inclusive schools to design individualized, accessible and evidence-based instructional programs to accommodate the functional characteristics of students with physical disabilities, and to foster greater participation, confidence and independence in physical education learning.

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