

## DEVELOPMENT OF AN INTERVENTIONAL PACKAGE FOR CHILDREN WITH CEREBRAL PALSY TO IMPROVE THEIR FINE MOTOR SKILLS

**Abdul Basit**

PhD Scholar, Institute of Special Education University of Punjab, Lahore, Pakistan

Email Id: [basit.phd.ise@pu.edu.pk](mailto:basit.phd.ise@pu.edu.pk)

**Dr. Maria Sohaib Qureshi**

Assistant Professor, Institute of Special Education, University of the Punjab, Lahore.

Email: [maria\\_sohaib@hotmail.com](mailto:maria_sohaib@hotmail.com)

**Dr. Muhammad Irfan Arif**

University of Education, Lahore, Pakistan

Email Id: [drmifanarifphd@gmail.com](mailto:drmifanarifphd@gmail.com)

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### Abstract:

Research on an intervention programme to improve fine motor Skills (FMS) in kids with cerebral palsy was the subject of this study. The study's primary objective was to conduct real-world applied research. A qualitative and quantitative strategy was employed in conjunction with a mixed-methods approach. Teaching professionals, physical and occupational therapists, and parents all those working closely to help children with cerebral palsy comprised the study's intended audience. A total (240) of 120 teachers, 50 physiotherapists, 50 occupational therapists, and 20 parents of children with cerebral palsy were included in the study's data gathering sample. Teachers, physiotherapists, occupational therapists, and parents were recruited using a basic random selection technique, purposive sampling, and convenient sampling, respectively. Package development, package validation, and package efficacy were all examined empirically. Package validation Scale (PVS) and Package effectiveness Scale (PES) were created by the researcher for data gathering (PES). Pilot testing and the opinions of experts were used to verify the scales' validity and reliability. Experts i.e., such as physiotherapists (PTs), occupational therapists (OTs), and teachers, contributed to the development of FMS among CWCP by suggesting and recommending a number of exercises, activities, and practices. Using the PVS Scale, experts confirmed the package's validity, usefulness, and feasibility. Teachers, physiotherapists, and occupational therapists were polled about the package's effectiveness, too, using tools like the PES survey. The programme was designed for students in special education programmes aged 5 to 10 years old from a variety of public and private institutions. Descriptive statistics, such as mean scores, were used to assess the quantitative data. The hypothesis was tested using inferential statistical techniques like ANOVA. Thematic analysis was used to analyze the qualitative data in this study. The researcher was inspired to create an interventional package for instructors to help them improve their students' FMS in the C.W.C.P. Data analysis using statistics like mean scores and ANOVA were used. The package prepared by the researcher was considered to be valuable, practicable, and practical for

instructors to implement for the development of FMS in the C.W.C.P. For future research, the study's findings and results have significant consequences.

**Keywords:** *Cerebral Palsy, Fine motor Skills, Interventional Package, Development*

## Introduction

Cerebral palsy, a group of non-progressive movement disabilities, can be caused by lesions or anomalies in the brain during early development. The term may be used to describe a series of abnormalities that present themselves in abnormal motions and postures, which may result in activity restriction or even disability, depending on the context. Children with CP often have difficulties with their senses, perception, cognition, and communication, as well as their motor skills. People with physical disabilities are more likely than others to get CP. In most cases, it is widely believed that cerebral palsy is not caused by a single incident, but rather a succession of events that affect the neurological system as it develops in infancy. Due to the fact that CP is still a mystery in the vast majority of cases (Powers., 2019). Some of the most important developmental challenges confront children with cerebral palsy (CWCP), both in their day-to-day lives and at school. One of the most important issues is a delay in FMS. Many studies have indicated that children's general well-being depends on their ability to develop fine motor skills. FMS include handwriting, cutting, painting, sketching, and tracing. There is still a need to learn how to print and produce letters and other written communications, notwithstanding the influence of modern technologies. The authors (Sutapa and Suharjana, 2019).

Tuber (2018) explains that the ability to manipulate objects in various ways with

one's hands and fingers is part of one's fine motor skills. These abilities require a delicate and accurate synchronization of small hand muscles. Finer motor skills development in a child is dependent on many factors, including the child's age and level of exposure to various activities. The fetus's development followed cephalo-caudal and proximal-distal patterns. In order to help babies, develop strong shoulders and hip muscles, tummy time is necessary. That's the gist of it. Strength in the upper arms and shoulders is required for cutting with scissors, self-feeding, and writing. It is possible to build a strong foundation for later fine motor skills by utilizing the talents and milestones that were already established in childhood. Fine motor skills that are advanced include the ability to write fluently while concentrating on content writing (such as explaining things, ideas, and concepts) rather than writing mechanics (such as pencil grasp, letter formation and sizing).

Developing children's FMS has a significant impact on their academic success, particularly in the areas of arithmetic and reading comprehension (Dineheart & Manfra, 2013). Having the capacity to write and read with a real pencil is a good indicator of future academic success in elementary school, according to Dinehart and Manfra (2013). One possibility is that children are creating "internal representations of the sign system." In order to write well, everyone involved must take an active role. Son and

Meisels (2006) used kindergarten data to find a link between fine motor abilities and academic achievement in FMS first grade students, including reading and math skills. The age of a child has a significant bearing on their ability to master fine motor skills and excel in school. First-year students are more aware of how important fine motor skills are for academic performance as the year develops (Hamilton and Liu, 2018). Academic success and interpersonal effectiveness are intertwined with mastery of fine motor abilities. The development of children's fine motor skills appears to be linked to their social and emotional well-being, according to numerous research. To be successful in school, students must be able to pay attention and keep their concentration. Cameron and colleagues (2012) established a link between FMS and the ability of a child to concentrate and pay attention in their investigation. Elcombe (2017) observed a correlation between a student's impression of academic performance and a lack of fine motor abilities. Those with delayed fine motor abilities were found to have lower self-esteem and less confidence in their siblings than their peers. A child's intellectual and social/emotional development are positively influenced by early childhood education, according to research. It has been observed that the improvement of students' fine motor skills has a significant impact on their academic performance (Ramey, 2004). They were also more likely to have social and emotional difficulties among children with low fine motor abilities. According to one study, those with low fine motor abilities may have difficulty in school and in daily life.

For this reason, instructors and parents should pay attention to how well their children's fine motor skills compare to those of their classmates. The child's behaviour at school could also be affected as a result of this. For the majority of children, mature skill levels in a number of key fine motor functions must be attained through personalized, developmentally appropriate practices. It was a concern to the researchers that things were not going according to plan. Physiotherapists and occupational therapists are uniquely qualified to help children with cerebral palsy improve their fine motor skills through rehabilitative treatment. Physiotherapists and occupational therapists are commonly found in special education facilities. Many of Pakistan's institutes for children with cerebral palsy, whether public, private, semi-government, or non-governmental, are short on physiotherapists and occupational therapists. Teachers dealing with CWCP are frequently noted to be unable to enhance the fine motor abilities of these children on their own. CWCP fine motor skills can't be taught without some help from supportive or assistive materials. There is an increasing national awareness of the need to improve the development of children with FMS. An intervention for instructors was developed in this study to help them encourage the FMS of CWCP and therefore improve their academic efforts.

#### **Objectives of the study:**

1. To improve the FMS of CWCP so that it can better support their academic pursuits by developing an interventional package.
2. To test the CWCP's FMS-enhancing interventional package to help their academic skills.

3. To check the effectiveness of an interventional package to improve their fine motor skills.

### Significance of the Study

For this reason, instructors and parents should pay attention to how well their children's fine motor skills compare to those of their classmates. The child's behaviour at school could also be affected as a result of this. As the author puts it: "For the majority of children, mature skill levels in a number of key fine motor functions must be attained through personalized, developmentally appropriate practices. It was a concern to the researchers that things were not going according to plan." Physiotherapists and occupational therapists are uniquely qualified to help children with cerebral palsy improve their fine motor skills through rehabilitative treatment. Physiotherapists and occupational therapists are commonly found in special education facilities. Many of Pakistan's institutes for children with cerebral palsy, whether public, private, semi-government, or non-governmental, are short on physiotherapists and occupational therapists. Teachers dealing with CWCP are frequently noted to be unable to enhance the fine motor

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### Methodology & Procedure

Almost all previous studies on cerebral palsy are descriptive in nature. An interventional package to improve fine motor skills in CWCP has received very little research attention. Extensive research into FMS and CWCP development reveals these abilities can be developed through a well-designed instructional or interventional programme. The research conducted in this study was applied in nature. For this study, the researchers used both quantitative and qualitative methods to conduct their research and development (R&D) project. Participants in the study included CWCP stakeholders from Lahore division of Punjab province of Pakistan: teachers and therapists in physiotherapy and occupational therapy.

**Table 1:** *Sampling System*

Sr. No	Names	N0	Type of Sampling
1.	Teachers	120	Simple Random Sampling
2.	Physiotherapists	50	Purposive Sampling
3.	Occupational therapists	50	Purposive Sampling
4.	Parents	20	Convenient Sampling
<b>Total Sample Size</b>		<b>240</b>	-----

**Table: 2.** *Instruments used in the study*

S. No.	Instrument	Purpose	Respondents
1	Opinionnaire	Identification of Exercises, activities & therapies to be included in the package	Physiotherapists & Occupational therapists
2.	Package Validation Scale (PVS)	To get the experts' opinion about the validity of the package	Physiotherapists & Occupational Therapists
3.	Package Effectiveness Scale (PES)	To examine the Effectiveness of the Package	Teachers, Physiotherapists & Occupational therapists

### Validity & Reliability of Instrument

By consulting with specialists in Special Education and Research, the study was able to confirm the validity of its instruments. These specialists were Special Education Ph.D. faculty members. Pilot research was conducted to ensure the validity of the instruments utilized in the study. The pilot study of these instruments involved thirty participants. These people were not a part of the study's subsequent phases. PVS had a Cronbach's alpha of .85 and PES a Cronbach's alpha of .76.

Simple descriptive inferential statistics i.e., mean scores & ANOVA were used.

### Data Analysis

**Table 3:** List of Exercises and Activities:

Sr. No	Fine Motor Skills	Activities, Exercises and Therapies Suggested by Physiotherapists	Activities, Exercises and Therapies, Suggested by Occupational Therapists
1.	Warm-up Skills	<b>Strengthening Exercises:</b>	<b>Push up Exercises:</b>
2.	Functional Skills	<b>Lower Limbs Exercises:</b> <b>Upper Limbs exercises:</b>	<b>Development of Gross Muscles:</b> <b>Focus on Bilateral:</b> <b>Visual Integration:</b>
3.	Grasping Skills	<b>Release and transferring objects between hands</b>	<b>Release and transferring objects between hands</b>  <b>Grasping Exercises</b> <b>Reaching Activities</b>
4.	Transitional Skills	<b>Beginning pre-writing</b>	<b>Grooming skills</b>
5.	Manipulation	<b>Pencil Control</b>	<b>Hand manipulation</b>

## Skills

6. Implementation **Fine Motor Skills**  
Skills**Handwriting Skills**

The activities, exercises, and therapies shown in the table above are part of interventional package for FMS development in CWCP. On an open-ended opinion questionnaire, physiotherapists (PTs) and occupational therapists (OTs) each provided a variety of suggestions. Stage one of the package included Exercises to increase warm-up skills were recommended by physiotherapists. PTs said that standing on one leg and standing on one toe would help with the development of FMS in CWCP warm-up abilities. Table 3 reveals that occupational therapists recommended CWCP warm-up skills include push-up exercises. Warm-up activities for CWCP can be as simple as big or wall push-ups, according to occupational therapists. The functional skills stage made up the bulk of the second phase of the programme. Occupational therapists and physiotherapists recommended a variety of exercises to help CWCP improve their functional mobility and stability. Standing Leg Exercise, Stretching Exercise, and Ankle Pump Exercise were all advised by physiotherapists as Lower Limb Exercises. Flexion exercise are recommended for upper limb exercises. There are several exercises recommended by occupational therapists for the development of gross muscles in order to help patients improve their functional abilities and motor control. These include exercises like clapping and combining together as well as exercises like holding a large ball or a hardball while throwing it (Small

Ball). Occupational therapists promoted Focus on Bilateral therapy, including prone lying backward gazing and neck flexion exercises. Playing with toys on both sides of the room and chasing them were suggested by the occupational therapist in order to help the child develop visual integration.

The final stage of the package involved learning the implementation skills. PTs and OTs recommended a variety of activities to help children improve their grasping abilities at this stage. These skills include Beads Exercises, Beads Activities, Bead Scoop and Transfer, and Rice Scoop and Transfer to improve CWCP's grasping ability. Physiotherapists recommend these activities to enhance FMS for CWCP. Occupational therapists recommended grasping and reaching activities to help children improve their grasping abilities. Block Building, Squeezing/Strengthening, and other Grasping Exercises are examples. Activities such as playing with playdoh, shape-fixing with Pegs, and puzzles were recommended as ways to improve FMS while attaining activities. As part of the programme, transitional skills were included in stage 4. A variety of exercises were recommended by physiotherapists and occupational therapists at this point. Children should begin their writing journey by engaging in pre-writing activities such as scribbling or colouring or painting or tracing. Grooming tasks such as unzipping and zipping, unlacing and lacing, undressing and dressing, putting on socks,



unbuttoning and buttoning, and unbuckling exercises were recommended by OTs to help children develop FMS.

Exercises such as Holding the pencil, Imitating, and Shaping were prescribed by PTs to help patients go through the manipulation stage more quickly. When it

comes to developing FMS for CWCP, OT recommended a wide range of activities including performing Hand Manipulation Activities such as Warming Up Your Hands, English Alphabets, and Numbers (1-10) to help you get better at manipulating the fingers.

**Table: 4.** Mean Scores of PTs (N=10, OTs (N=10)&Teachers (N=10) on the Package Validation Scale (PVS).

Sr. No	Statements on Package Validation Scale (PVS)	Mean Score of PTs	Mean Score of OTs	Mean Score of Teachers
1.	The Interventional Package's alignment is correct.	4.00	4.80	4.70
2.	The Interventional Package's activities and exercises are highly beneficial.	3.90	3.30	4.60
3.	The indicated treatments in the Interventional Package are appropriate.	4.10	3.30	4.20
4.	The Interventional Package is well-ordered and follows strict rules.	3.90	3.40	4.40
5.	The Interventional Package's language is simple to understand.	4.00	3.70	4.50
6.	Planned timeline for interventional package completion	4.10	3.40	4.30
7.	Children with cerebral palsy who receive the Interventional Package appear to benefit greatly from it in terms of improving their fine motor abilities.	4.20	3.70	4.10
8.	The proposed manner of delivering the Interventional Package is helpful.	4.30	3.60	4.20
9.	Explanations of all the Interventional Package's workouts, therapies, etc. are quite helpful.	4.40	4.00	3.80
10.	Children with cerebral palsy will find the activities, exercises, and therapies included in the Interventional Package appealing.	4.00	3.50	4.10
<b>Overall Score</b>		<b>4.09</b>	<b>3.67</b>	<b>4.30</b>

(Ranges of Scores 1-5 while the Cut Score was 3)

For Physiotherapists, Occupational Therapists, and Teachers, the mean scores on the Package Validation Scale are shown in Table 4. (PVS). Likert scale scores ranged from 1 to 5, which meant that the respondent may score between 1 and 5 on each item. The median or cut score for the Package Validation Scale (PVS) statements was determined to be 3. This means that a score below 3 indicates that respondents are dissatisfied with the PVS statements. Respondents' satisfaction with the Package Validation Scale (PVS) statements is indicated by a score above 3. All responders had an average Package Validation Scale (PVS) score of more than three, as shown in the table. Package Validation Scale (PVS) statements were accepted by physiotherapists, occupational therapists, and teachers with a mean score of 4.09, 3.67, and 4.30, respectively. This signifies that all of the teachers who took part in the study were happy with the interventional package's validity for improving their C.W.P.C. fine motor abilities.

**Table: 5.** Mean Scores of Physiotherapists (N=10), Occupational Therapists(N=10)& Teachers (N=50) on Package Effectiveness Scale (PES).

Sr. No	Statements on Package Effectiveness Scale (PES).	Mean Scores of PTs	Mean Scores of OTs	Mean Scores of Teachers
The Interventional Package is effective in developing and improving following skills among CWCP:				
<b>Stage: 1</b>	<b>Warm-up Skills</b>			
1.	Standing skills	4.36	4.80	4.70
2.	Push-up skills	3.90	3.60	4.30
<b>Stage: 2</b>	<b>Functional Skills</b>			
3.	limbs exercises	3.86	3.60	4.00
4.	Strengthening Gross muscles exercises	<b>3.92</b>	3.50	<b>4.50</b>
<b>Stage: 3</b>	<b>Grasping Skills</b>			
5.	Skills to Release and transfer objects between hands	3.96	3.80	4.40
6.	Grasping exercises	3.92	3.50	4.30
<b>Stage: 4</b>	<b>Transitional Skills</b>			
7.	pre-writing skills	4.04	3.80	4.20
8.	grooming skills	4.04	3.70	4.30
<b>Stage: 5</b>	<b>Manipulation Skills</b>			



9.	enhancing pencil control	4.04	4.10	3.90
10.	hand manipulation	3.86	3.60	4.10
<b>Stage: Implementation Skills</b>				
6				
11.	shaping handwriting skills	3.86	4.00	4.30
12.	increasing cutting & pasting skills	3.92	4.20	4.30
<b>Overall Score</b>		<b>3.96</b>	<b>3.80</b>	<b>4.13</b>

(Ranges of Scores 1-5 while the Cut Score was 3)

A total of 10 physiotherapists, 10 occupational therapists, and 50 instructors completed the Package Effectiveness Scale (N=10), and the results are shown in Table 5. (PES). Respondents may score a minimum of 1 and a maximum of 5 on each item on the Likert scale, which is why the range was 1-5. The cut score or median score for the Package Effectiveness Scale was set at 3, which indicates that respondents disagreed with the claims of the Scale (PES). Scores above 3 indicate that respondents agree with the remarks on the PES. The data in the table demonstrates that the mean PES score for teachers, physiotherapists, and occupational therapists was over three. Package Effectiveness Scale (PES) item scores for teachers, physiotherapists and occupational therapists were all 3.96, 3.80 and 8, respectively, which indicates that all stakeholders in the CWCP, including the physiotherapists, occupational therapist and teachers have agreed with the statements on the PES (PES). This suggests that the interventional package for instructors to improve their CWCP fine motor abilities was well-received by all parties involved.

**Hypotheses Testing**

**HO: 1.** there is no significant difference between the perceptions of various stakeholders such as physiotherapists, occupational therapists, and teachers on the package validation scale (PVS).

**Table: 6.**ANOVA Statistics for HO: 2

Comparison of Stakeholders on NAS	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	200.267	2	100.133	4.097	.028
Within Groups	659.900	27	24.441		
Total	860.167	29			

**POST HOC (Tukey HSD) for Multiple Comparisons**

Stakeholders		Mean Diff.	Std. Error	Sig.
<b>Physiotherapists</b>	Occupational Therapists	4.20000	2.21092	.158
	Teachers	-2.00000	2.21092	.642
<b>Occupational Therapists</b>	Physiotherapists	-4.20000	2.21092	.158
	Teachers	-6.20000*	2.21092	.024
<b>Teachers</b>	Physiotherapists	2.00000	2.21092	.642
	Occupational Therapists	6.20000*	2.21092	.024

For example, physiotherapists, occupational therapists, and teachers all have mean scores on the Package Validation Scale on Table 6. (PVS). When F is 4.097, a p-value of .028 declares the result to be non-significant at  $\alpha=.05$ . This means that the one-way ANOVA ( $F(2, 27) = 4.097, p = .028$ ) shows a statistically significant difference between the means of the various C.W.C.P NAS stakeholders. Hence, the null hypothesis  $H_0:1$  was rejected since the package validation scale (PVS) found no significant differences in the views of diverse stakeholders. According to numerous comparisons of all stakeholders, the mean scores of occupational therapists and teachers differed statistically significantly; however, the mean scores of physiotherapists, teachers and parents did not.

**HO: 2.** there is no significant difference between the perceptions of various stakeholders such as physical therapists, occupational therapists, and instructors on the package effectiveness scale (PES).

**Table: 7** ANOVA Statistics for HO: 2

Comparison of Stakeholders on NAS	Sum of Sq.	Df	Mean Sq.	F	Sig.
Between Groups	146.406	2	73.203	2.245	.114
Within groups	2184.580	67	32.606		
Total	2330.986	69			

**POST HOC (Tukey HSD) for Multiple Comparisons**

Stakeholders	Mean Diff.	Std. Err.	Sig.
<b>Physiotherapists</b>	Occupational Therapists	-5.10000	2.55365 .121
	Teachers	-1.48000	1.97805 .736
<b>Occupational Therapists</b>	Physiotherapists	5.10000	2.55365 .121
	Teachers	3.62000	1.97805 .168
<b>Teachers</b>	Physiotherapists	1.48000	1.97805 .736
	Occupational Therapists	-3.62000	1.97805 .168

Using the Package Effectiveness Scale, we compared the mean scores of physiotherapists, occupational therapists, and teachers (see Table 7 for more information) (PES). In this case, the F-value is 2.245, and the p-value is .114. A one-way ANOVA shows that there is no significant variation in the judgments of different CWCP stakeholders on the Package Effectiveness Scale (PES). There was no statistically

significant difference between all stakeholders when compared using a Tukey post hoc test. The Null Hypothesis  $H_0:2$  has been accepted.

All of the teachers who participated in the study agreed that the interventional package had a positive effect on their C.W.P.C. fine motor skills. "

## Discussion

Occupational and physical therapists, as well as teachers, who participated in the study, unanimously agree that the C.W.P.C. interventional package for instructors to help their students develop their fine motor skills was successful and had a positive effect on C.W.P.C. fine motor skills. As the activities of daily living can be challenging for people with CWCP due to motor, sensory, perceptual, cognition, communication, and behavioural difficulties; thus, they often require adapted equipment or parental support. According to the findings, CWCP patients with FMS need to have their daily tasks mastered with the use of an interventional package (Basit, Qureshi & Arif, 2022). It was determined that CWCP instructors needed an interventional package to help them improve their fine motor skills (Basit, Qureshi & Arif, 2021). To now, the researcher has been able to confirm the requirement for an interventional package to help children with C.W.C.P. strengthen their fine motor abilities. When asked about establishing an intervention package to help children of all ages improve their fine motor abilities, everyone involved in the study said they were in favour of it. Physical deficiencies, psychological deficiencies, delayed fine motor skills, cognitive skills (receiving, responding and thinking and applying), social and daily life abilities (cutting, pasting, dressing, brushing) are all areas that play a significant role in a child's ability to perform well in academics. The need assessment in this study focused on these areas. All of these aspects of CWCP must be taken into account while putting

together an intervention plan to help C.W.C.P.s improve their fine motor skills in order to do better in school. In their study, Ashfaq & Rana (2015) indicated that faculty training is necessary for the successful growth of FMS. By following the relevant instructions and making the necessary modifications, professional development topics can be incorporated. There is some evidence to suggest that students who have CWCP may benefit from additional measures that can help them become better teachers, according to Khan et al (2012).

Motor, sensory, perceptual, cognition, communication, and behavioural difficulties can impair ADLs' performance in the CWCP. Activities of daily living can be challenging for people with CWCP, thus they often require adapted equipment or parental support. Daily living activities should be assessed and improved upon as needed as a consequence of this evaluation. According to the findings, CWCP patients with FMS need to have their daily tasks mastered with the use of an interventional package. It was determined that CWCP instructors needed an interventional package to help them improve their fine motor skills. (Basit, Querishi & Arif, 2021) To now, the researcher has been able to confirm the requirement for an interventional package to help children with C.W.C.P. strengthen their fine motor abilities. When asked about establishing an intervention package to help children of all ages improve their fine motor abilities, everyone involved in the study said they were in favour of it. Physical deficiencies, psychological deficiencies, delayed fine motor skills, cognitive skills (receiving,

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### **Suggestions & Recommendations**

This study's interventional package was designed for children in the CWCP age range of 5 to 10 years. A more advanced intervention package is recommended to increase FMS of the CWCP in children beyond the age of 18. (10 and above). Gross Motor Skills and FMS are two significant components of CWCP that have a direct impact on CWCP's academic achievement. Specifically, the study looked at how children might improve their fine motor skills. The gross motor skills of children with cerebral palsy should be taken into account when conducting research. In order to verify the usefulness of an Interventional Package in enhancing fine motor skills in children with cerebral palsy, an appropriate experiment is necessary. A Pre-test Post-test Control Group design is suggested for this purpose. Occupational and physiotherapy professionals worked diligently to create and validate the interventional Package. As a result, the inclusion of this interventional package in the CWCP curriculum is highly suggested in order to foster FMS and improve academic performance.

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