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The Efficacy of a Movement Education Program for Cerebral Palsy Caregivers in Reducing Chronic Musculoskeletal Pain and Disability: A Pilot Project

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Abstract

Purpose: This educational intervention is specifically directed at caregivers of individuals with CP to help improve poor body mechanics which can lead to the attainment of chronic pain.

Methods: The intervention is presented through two methods: An E-learning module and an in-service program. The E-learning module is an online interactive tool which uses instructional videos and written materials to increase the caregiver's base knowledge on proper biomechanics. The in-service practical, group session gives caregivers an opportunity to practice proper movement techniques with a trained biomechanical expert. This environment will allow the biomechanical expert to correct improper movements and restructure caregiver thinking and awareness. Bandura's social cognitive theory is implemented to facilitate behavioural change. Additionally, a biomechanics comprehension test is used to measure caregiver knowledge attainment and assessments of measures such as pain and body mechanics are implemented to acquire a baseline and improvements in successive follow ups.

Results: Caregiver biomechanical knowledge improved by 43% after completion of the in-service practical session which is statistically significant. Caregiver's ability to identify appropriate biomechanical movements during the completion of caregiver tasks vastly improved. Caregiver's ability to implement proper mechanics showed improvement.

Conclusion: Implementation of a caregiver biomechanics program helps to reduce degenerative disorders in caregivers by increasing their body movement awareness.

Keywords: Cerebral Palsy, Caregivers, Biomechanics, Chronic Pain, Intervention, Rehabilitation, Musculoskeletal, Exercise Rehabilitation

Background

Children with cerebral palsy (CP) show limitations in self-care management such as dressing, bathing, feeding, and mobility; activities of daily living (ADL) [1]. Therefore, they require a high level of assistance from their caregivers. These caregivers report experiencing increased physical detriments in their mobility which limits their ability to complete tasks such as walking, as their child ages and increases in weight [2]. By the age of 12, the child can weigh up to 40 kg [3]. Concurrently, 65% of caregivers were shown to be lifting more than 20 kg on a regular basis [4]. From birth to adulthood, caregivers learn and adopt poor movement mechanics to ease the difficulty of moving the child. Overtime, caregivers may develop maladaptive movements such as increased bending in the lumbar spine, increasing the risk of injury should a heavier load be introduced [5]. Consequently, when this pattern is transferred into the child's adolescence and then adult years, it creates the potential for problems for the caregivers.

The longer the caregiver takes care of the child, the more their physical and psychological condition worsens [6,7]. Long term poor mechanics slowly bring about chronic musculoskeletal pain, and with 14.7 hours per day spent on caregiving activities the detrimental effects add up. Repeated poor movements when transferring the child can accumulate as microtraumas, which may result in overuse injuries and long term damaging effects [5,8,9]. Tissue compliance reduction over time leaves the caregivers susceptible to the attainment of chronic diseases such as arthritis or chronic back pain [10]. Findings by Shojaei et al also demonstrate that long-term exposure to abnormal movement mechanics can unfavourably alter joints, increasing susceptible to additional pain or injury [11].

With the overwhelming attentional demands of the child as they age, the caregivers tend to neglect their own self-care making a health improvement intervention directed at caregivers essential [2]. An analysis by Tonga and Duger revealed 94% of caregivers back postures were 20 degrees over-flexed and rotated with their lower extremities right positioned (53%) or with a flexed knee (45%) [4]. These positions are shown to be the primary mechanism through which one acquires back injuries, but also presents an opportunity to introduce a movement correction program to reduce the attainment of chronic conditions. The caregivers are tasked with helping their child with their everyday tasks, but it is their quality of movement which presents a danger and a detriment to their own health.

Many of the educational materials accessible to the caregivers of children with CP primarily target the health and well-being of the child but not the movement mechanics and well-being of the caregiver [12]. In short, there is limited information on the short and long-term effects on the education of caregivers of children with CP in respect to proper movement mechanics. It is therefore important to intervene, as soon as possible, to encourage healthy behaviours and postpone the accumulation of related health problems.

Three different areas can contribute to chronic pain in caregivers: increased child weight, decreased tissue compliance as caregivers age, and poor caregiver movement mechanics. Of the three areas, the most easily modified component is the poor movement mechanics. Musculoskeletal pain can be prevented if proper movement mechanics are demonstrated to the caregivers, avoiding unnecessary use of health

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care resources and enhance self-care managements [13,14]. Patient education helps improve one's understanding of back pain, introduces steps to manage it, and gives the caregiver the power to take action in improving their back health [15]. After a 50 minute educational session, Kirby et al were able to show an increase in caregiver ability to effectively navigate their environment after a wheelchair skills training program [16]. Essentially, to improve caregiver biomechanics, the primary goal should be to bring about a behavioural change and the implementation of an appropriate behavioural change model is an important step to do so. Bandura's social cognitive theory helps to improve self-efficacy, reduce maladaptive behaviours and improve observational learning, which all leads to changes in health behaviours [17].

There is a need and a demand for an educational program specifically directed at caregivers of children with CP to tackle and improve body mechanics before chronic pain develops [6]. Additionally, a space and time to practice these proper mechanics under supervision can facilitate proper understanding and development of the skills required. Tonga and Duger [4] concluded that a protective back health program needs to be developed for cerebral palsy children's caregivers to actively teach proper transfer and lifting techniques. Additionally, Kaya et al concluded training for caregivers from wheelchair to bed and vice versa was required as caregivers do not currently have enough knowledge to do the activity correctly [18]. In a meta-analysis by Demoulin et al, it was uncovered that simply educating on biomechanical movements was ineffective in preventing lower back pain [19]. A more rigorous program which incorporates a biomechanical awareness session, exercise and self-care management education may prove to be more effective an intervention. In addition to being cheap and easy to implement, this intervention should increase the capacity and awareness of the caregivers to safely execute their activities of daily living, while assisting their child with CP. Therefore, the aim of this program is to create a biomechanics educational intervention for parents of children with CP, in order to help improve caregiver movement mechanics and reduce chronic musculoskeletal pain. We hypothesize that an intervention focused on movement biomechanics will improve movement knowledge and reduce musculoskeletal pain for caregivers of patients with cerebral palsy.

Method

Recruitment

The participants were recruited from the LIFEspan. The LIFEspan service is a unique service created by Toronto Rehabilitation Institute (TRI) and Holland Bloorview Kids Rehabilitation Hospital. LIFEspan provides services for youth and young adults who have cerebral palsy and childhood onset acquired brain injury (ABI), while acting as a bridge between pediatric and adult rehabilitation services.

Inclusion Criteria

Caregivers were recruited through a voluntary sign-up process. The inclusion criteria allowed for caregivers of children with cerebral palsy. In addition, caregivers had to be able to attend the caregiver biomechanics intervention.

Description of the Educational Program Components

The two components of the intervention were an E-learning module and a practical in-service/telehealth session. The E-learning module was an interactive tool which provides caregivers with easily accessible resource to assist in learning and internalizing basic biomechanical knowledge. The practical in-service session reinforced the E-learning module and provided a group setting for behaviour change to occur through Bandura's Social Cognitive Theory tenets. The in-service session can also be completed through telehealth services to abide by Covid-19 safety protocols.

E- Learning Module Implementation

The E-learning module was a 2-hour online tool divided into 6 topics containing 12 instructional videos that provided biomechanics background knowledge and facilitate a comprehensive learning and behaviour change intervention. (Table 1)

Practical In-Service/Telehealth Session Implementation

The 2-hour practical in-service session was designed to give the caregiver time for "hands-on" simulated practice based on the 6 topics presented in the E-learning module. This environment allowed for an exercise rehabilitation specialist (ERS) to correct improper movements, elaborate and demonstrate topics, address gaps in caregiver knowledge and restructure caregiver's behaviour through the use of healthy movement cues. The specific ways in which Bandura's Social Cognitive Theory tenets were applied in this intervention are described in Table 2 [17]. Overall, this session can be summarized into five key points: 1) Neutral spine, 2) Pushing the hips back, 3) Aligning the external mass with the midline of the body 4) Stable base of support and 5) Weight shifting.

Assessments and Evaluation Tools

Four outcome measures were used to gather information on caregiver's response to the intervention: the caregiver biomechanics knowledge questionnaire (CBKQ), the Oswestry Lower Back Pain

S. No.	Topic	Description
1.	Mechanism of Injury	Caregivers are taught the mechanism of injury of the spine including surrounding structures such as the bones, muscles, and ligaments. The importance of maintaining a lordotic curve including avoiding bending and twisting actions of the lower back. Appropriate body mechanics when lifting heavy/light objects such as transferring/tying shoelaces of their child.
2.	Correct and Incorrect Postures and Biomechanics	Caregivers learn the differences in correct/incorrect postures. Key points are 1) neutral spine; 2) bending at the hips, knee, and ankles; 3) Maintaining objects near the at midline/close to the body; 4) Base of support (BOS) including BOS modification/adaptation.
3.	Proper Biomechanical Lifts	Caregivers learn three lifting techniques: squat lift, split stance lift and deadlift which simulate caregiver transfer positions when transferring their children.
4.	Proper Transfer Techniques	Caregivers are presented with 3 levels of transfer based on the Gross Motor Function Classification System (GMFCS) for CP [20]. Level 1: CP children with high trunk mobility but low lower body function; Level 2: CP patient with high trunk mobility with no lower body function; Level 3: CP patient with no trunk or lower body function. This section covers step by step movements from set up of environment to execution of transfer while maintaining healthy posture and movement mechanics. As the levels increase, the CP child is less able to assist their caregiver during transfers and other movements; therefore, the required techniques vary. For example, caregiver with a CP child at level 3 are more likely to implement the cradle carry technique because the child is unable to provide any assistance. Thus, learning to perform the cradle carry technique with a healthy posture becomes their primary focus. In contrast, a level 1 CP child's caregiver is likely to focus on a pivot shift transfer because the CP child typically has low level weight bearing abilities; therefore, only stability assistance is required from the caregiver to transfer the CP child.
5.	Managing Acute Back Pain	Caregivers learn how to handle back/joint pains which includes when to apply heat or ice.
6.	Safe Strengthening and Stretching Exercises	Caregivers learn the importance of strength, aerobic and flexibility exercises on their joints and overall health based on the recommendations of the American College of Sports Medicine's Guidelines for Exercise Testing and Prescription [21].

Table 1: E-learning module topics.

Concept	Intervention Application
Environment	A supportive group environment with peers and an exercise rehabilitation specialist (ERS) support stimulates active/observational learning. The ERS ability to modify the clinical space to simulate the caregiver's home environment enhances context dependent learning. Furthermore, through telehealth, caregivers can actively participate in the program within their home environment to further strengthen this effect.
Situation	The ERS presents various scenarios indicating unhealthy joint and back motions. The caregivers are given the opportunity to modify the ERS's unhealthy biomechanical movements into safe joint motions.
Behaviour Capability	By ERS implementing movement cues, caregiver's biomechanics are modified. Thus, caregivers improve their proficiency and knowledge on the different biomechanical techniques.
Expectations	E-learning videos and the practical in-service/telehealth highlight common scenarios in which improper body mechanics appear. Additionally, barriers to biomechanical implementation with their child are presented.
Expectancies	ERS repeatedly informs the caregiver that implementation of the learned techniques takes time, effort, and regular practice. Through consistent implementation, caregivers can mitigate and limit current and future pain.
Self-control	Caregivers learn multiple methods and resources to alleviate pain through strength/flexibility exercises and other methods to improve self-sufficiency at self-care management.
Observational Learning	Caregivers follow the demonstrations of the ERS. Following, caregivers then critique the movements of the other caregivers and suggest corrections.
Reinforcements	A negative reinforcement approach is used with the caregivers; by teaching the caregivers pain free movement techniques, it reinforces the use of proper movement techniques.
Self-Efficacy	Caregivers use dedicated time in the practical session to actively rehearse biomechanical movements. Caregivers can also involve their child with CP by practicing the learned techniques while assisting with a transfer or ADL. Additionally, caregivers can then reserve a one-on-one appointment with the ERS to tackle specific barriers in manipulating their child's and own body.
Emotional Coping responses	Caregivers use specific resting positions and exercises which help to alleviate joint pain as well as specific methods to reduce swelling, inflammation and body stiffness.
Reciprocal determinism	By surrounding the caregivers with a supportive peer group, they are able to share and find proactive methods to overcome personal factors such as the hardship of taking care of a child with CP. This in turn helps the caregiver to modify their behaviour by adopting proper and healthy movement mechanics.

Table 2: Direct application of the Bandura's Social Cognitive Theory into the Caregiver Biomechanics Education Intervention.

Scale, the Pain Assessment Tool and a modified Child Health Questionnaire (cerebral palsy specific) [22-24]. All outcome measures were completed prior to the E-learning module; however, the CBKQ was also completed after attending the practical in-service session. The CBKQ tests the caregiver's knowledge pre- and post-intervention. It is comprised of a battery of questions which test the caregiver's knowledge on bodily biomechanics, healthy/unhealthy movement techniques and methods of alleviating musculoskeletal pain. The modified Child Health Questionnaire (cerebral palsy specific) illuminates how the child's physical health limitations impacts the caregiver's own health. This was done by assessing areas of the caregiver's life which directly play a role in caregiver duties, such as dressing and transferring the child.

Skills Required

For implementation, the ERS should have an understanding of basic anatomy and physiology, cerebral palsy, proper movement techniques, exercise prescription and benefits, caregiver duties, and the principles of social cognitive theory.

Equipment Required

Implementation presents minimal costs, requiring: two chairs with hand bars or wheelchairs, two adjustable clinic beds, five-pound dumbbells, a spine model, two basketball-sized balls, two towels and three pillows. It is best to have two instructors to allow for effective technique demonstration.

Results

Caregiver Description (Table 3)

Caregiver Characteristics	#
Caregivers	5
Men	1
Women	4
Caregiver's child's age range	19-24

Table 3: Caregiver characteristics, child's age range and average pain level.

Caregiver Participation Summary

Five caregivers registered for the In-service and E-learning module. Four of five caregivers filled out the pre-questionnaire quiz. One of five caregivers did not attend the in-service because of her ill child. One of five caregivers completed the E-learning module but did not participate in the In-service. Three of five caregivers completed the Pre-assessment. One of five caregivers did not fill any of the pre-assessment materials.

Four of five caregivers participated in the In-service. Two caregivers arrived 10 minutes after the start time. One of two caregivers expressed wheel transit as the reason why she arrived late. Two other caregivers arrived 15 minutes after the start time. These two missed the awareness section of the In-service.

One of four attending caregivers brought their child with cerebral palsy to the in-service even through specific instructions were given not to do so. The child was quiet and undisruptive through-out the entire session but began to distract his mother by the end of the in-service. Four of four attending caregivers filled in the post-quiz. Average score increase was 4.6 points. One of four attending caregivers presented as having ESL level understanding of English. Two of four attending caregivers were a married couple.

Pre-Post Caregiver Biomechanics Knowledge Questionnaire (CBKQ) Results (Table 4)

ID	Pre-Quiz/20	Post-Quiz/20
2	12	16
3	11	16
4	9	14
Average (mean)	10.7	15.3
Variances (s)	2.33	1.07
Standard Deviation (s)	1.53	1.03

Table 4: Caregiver pre-post quiz results, mean, variance, standard deviation.

Statistical analysis of CBKQ

One-way repeated measure paired T-test analysis revealed a p value=0.002 which is statistically significant with an alpha value set at 0.05. (Figure 1 and 2)

In-service sections analysis

Yoga and exercise section: The caregivers arrived late; therefore, there was no time for this section to occur.

Body Awareness section: This section was used to teach caregivers the difference and importance between proper and improper body mechanics. The caregivers ran through 2 scenarios led by two ERS. The caregivers were instructed to pick up and place down a basketball from a bed to a chair and then from a chair to the floor in whatever fashion they felt comfortable. The goal was to examine the caregiver's body mechanics and to draw attention to it, in order to bring awareness to their improper movements. The caregivers found this section to be very important because they were able to examine their own movements. Most importantly, the ERS were able to identify incorrect biomechanics giving an indication of the caregivers' current level of understanding. The caregivers showed to have minimal understanding of appropriate body mechanics. Statements such as, "how do I bend without my back" were expressed by the caregivers.

Torque, body positioning and injuries section: ERS used a spine model to demonstrate spinal mechanics. ERS pointed out specific areas of the body, allowing the caregivers to gain a better understanding of the anatomy of the spine during movement.

During the 'base of support' topic, the caregiver practiced the split and shoulder width stance base of support. At this point, during the session, the caregivers began to demonstrate an understanding of the fundamentals of implementing proper body mechanics.

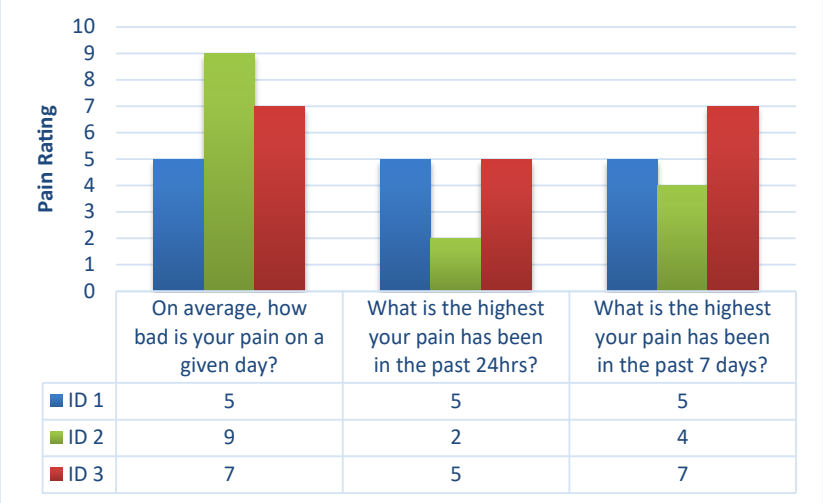

Figure 1: Caregiver pain rating.

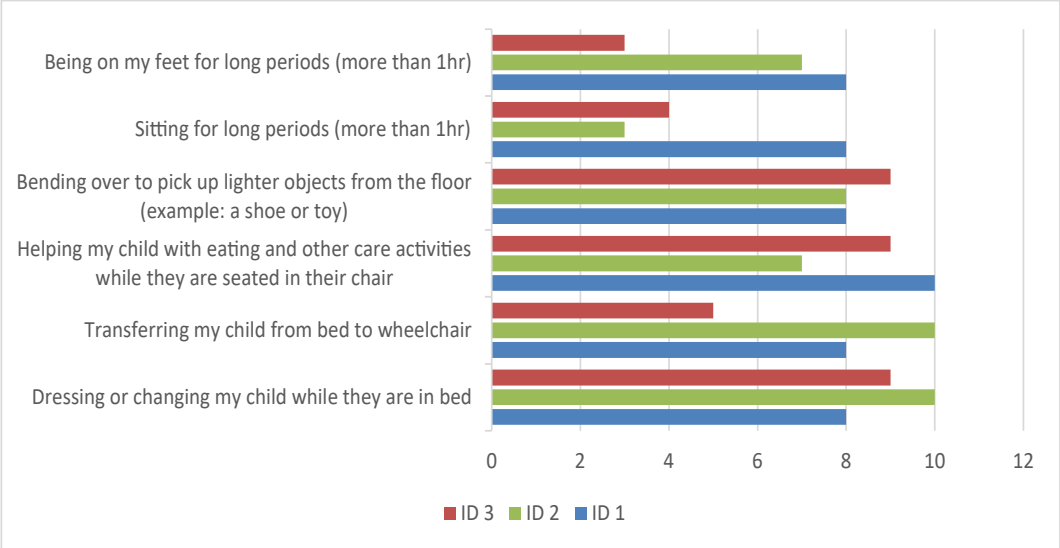

Figure 2: Caregiver pain ratings while completing caregiving tasks.

During the spine mechanism of injury topic, the analogy of an elastic band breaking after multiple stretches of small forces or one large, applied force was used to explain how the ligaments, muscles and discs in the spine can become damaged with different acute versus chronic loads. This analogy directly translated into using proper mechanics during the transfer (high load) of a child and when placing clothing on their child (low load).

During the 'objects close to the body' topic, the ERS used experiential methods to help the caregivers understand the importance of having the object as close to the midline of the body as possible to help reduce bodily strains, rotations and to make the lift easier. By using a 5-pound dumbbell, the caregivers were instructed to hold the weight close to their chest for 10 seconds and away from their body for 10 seconds to understand the difference in difficulty. The idea was to illustrate the difference in rotational forces and the amount of work needed to support both scenarios with the item being close the chest the better option.

In the 'bending at the hips, knees, and ankles' topic, one caregiver had some trouble bending at her knees because it was producing knee pain. To fix this issue, the ERS suggested she pretend that she was sitting into a chair. The knee pain was resolved, and she was able to enter into a proper posture and mechanics.

Demonstrate and practice section: The caregiver actively practiced the squat lift up and down phases. ERS emphasized the importance of using a technique that worked based on the environment they had at home. The emphasis was to place oneself in a situation which did not compromise ones' lower back. The first ERS ran through the motion slowly, emphasizing appropriate movements and steps. The second ERS demonstrated the movement at a standard pace to show how it would be used in a more realistic setting. A two-person deadlift was demonstrated as requested by the caregivers, with an emphasis placed on counting prior to lifting.

Specific transfer techniques section: The caregivers observed as the first ERS transferred the second ERS from the chair to bed. The ERS further explained details based on the questions asked by the caregivers. Caregivers required extra information on methods to turn their child in bed easier. There was an emphasis placed on using their body weight to shift the child instead of just the hands and upper body.

One caregiver used the cradle lifting technique at home and was shown a proper method to improve their biomechanics. This caregiver found the method demonstrated to be far safer than what they were originally conducting. The caregiver was able to recognize and contrast their method of completing the cradle technique with the method demonstrated by the ERS, based on the new knowledge they had acquired during the duration of the session.

Proper Biomechanics during small movements section: By this section, caregivers were demonstrating a good grasp on proper postures and transfer techniques. To help further their understanding, the ERS ran a scenario conducting poor movement techniques while pretending to feed and place clothing on the other ERS. Caregivers were asked to point out incorrect movements and give recommendations on how to correct it to make it safer.

Resting positions and their importance section: Specific resting positions were demonstrated to the caregivers with an emphasis on using it sparingly with a focus on continuous motion and reduced sedentary time.

Exercises for the lower back sections: This section was not completed due to time constraints.

Discussion

The goal of this intervention was to implement a biomechanical behaviour change program driven by Bandura's Social Cognitive Theory by giving caregivers of children with CP the tools to support their own health needs. In addition, the home simulated environment better encouraged direct application of acquired knowledge. The intervention was also designed to overcome the shortcomings of ineffective biomechanics education implementations stated prior [19].

By the end of the in-service intervention, caregivers showed signs of implementation of biomechanics into their actions when caring for their child. The caregiver who brought their child into the in-service program expressed applying what they learned on their child while helping them to use the washroom. There was direct learning, adaptation, and modification of behavior just minutes after the intervention was completed.

When examining the behavioral change wheel framework, which helps to understand behavior, there are three areas to be kept in mind: capability, motivation and opportunity [25]. By choosing to attend the in-service, the caregivers demonstrated their motivation to better their health by seeking out relevant knowledge.

A space was provided in which the caregivers could practice and understand the importance of proper biomechanical movements and increase their confidence in their ability to perform these tasks. Caregivers were able to transfer the knowledge learned into various settings. When examining the pre- and post-biomechanics questionnaire, caregivers' knowledge improved by an average of 43% which was significant. As such, the caregiver's understanding of safe biomechanical procedures was deemed clinically important.

Critical to improving caregiver health and reducing chronic pain related to poor movement mechanics is active usage and application of learned skills while assisting the child. However, for this to occur, caregivers must believe they can effectively apply the skills and techniques learned during the program. Bandura Social Cognitive theory was used to elicit behavior change [17]. Implicit to Bandura Social Cognitive Theory is the effect it has on increasing one's self-efficacy which is critical in the caregiver's confidence when applying learned techniques. Hendrix et al. demonstrated that an intervention incorporating the tenants of Bandura Social Cognitive Theory can increase the self-efficacy of caregivers when completing home care tasks and managing patient symptoms [26].

A factor that cannot be overlooked is the length and duration of the program, as it required one, three-hour session. A one-time, intensive, face-to-face intervention for caregivers supporting in-home care appears to be just as effective as multiple sessions in improving musculoskeletal pain [27,28]. This was a key consideration during the planning of the program, due to a lack of time presenting as a primary barrier for this population. Moreover, caregivers of children with CP demonstrate lower levels of adherence for interventions requiring multiple sessions and a high time commitment [29,30]. Therefore, it was critical that caregivers received maximum benefit in the shortest amount of time. The caregiver's ability to partake was increased due to the low commitment requirement.

Implementation considerations

Limitations

A primary limitation of this intervention is the small sample size presented and lack of completion of some pre- and post-assessments. Even so, the information gathered and improvements established show a

positive outcome after the completion of this intervention, highlighting the utility of such a program in a larger more comprehensive study. By objectively examining the caregivers' knowledge attainment and subjectively examining caregiver comments and appreciation for the intervention, it shows the importance and the success of the program.

Lack of Time: This study presents a large barrier to intervention use, lack of time. With the day-to-day task of providing care for their child with cerebral palsy, caregivers have limited time to complete other tasks, such as attending programs which they believe are beneficial for their health. Therefore, some caregivers chose to complete either the e-learning module or to attend the in-service session. The intervention was deemed successful if caregivers completed both the online component and in-service section [31]. Typically, mothers are left responsible to take care of their child alone at home and with no other caregiver available while they are away, the individual is less likely to attend the educational program. Presenting caregivers with an opportunity to bring their child to the in-service session may help mitigate this barrier.

No Access to Computers: This population's primary reason for not completing their assessment forms was due to lack of access to a computer or it was not compatible with their phones. In the future, it would be important to create a printed program or one that is compatible with a phone to reduce the associated barrier. Caregivers could also be directed to local libraries to access the program forms.

Length of In-service Program: The allocated time for the in-service program was too short forcing some components to be omitted from of the session. In the feedback evaluation, caregivers expressed needing more time to practice transfers and exercises. Therefore, making the program 2.5 hours instead of 2 hours would be beneficial.

Telehealth Access: Due to Covid-19, access to in-person elective healthcare services for those with chronic disease has been greatly reduced [32]. This increases the physical burden on caregivers of children with CP as they have reduced access to support to manage their own personal health. This program presents an accessible and easy to implement program through increased use of telehealth. Through online platforms, all components of the program can be completed. Additionally, instead of relying on a simulated environment of the clinic, healthcare workers can educate caregivers within their home environment and with available resources, while adhering to appropriate safety protocols. This can help reinforce the techniques learned as they practice within the same environment, they use the skills in.

Future Steps/ Sustainability of the Project

Hospitals and clinics which possess programs directed at families with a child experiencing CP are capable of most effectively implementing this program, due to prior relationships. The ease and feasibility of incorporating our intervention into already existing programs which target families of children with CP makes it a step forward in preventing and reducing chronic pain in this population. Furthermore, caregivers may learn of the child's CP diagnosis by the age of 2 and are educated on how the disorder can affect the child's social, cognitive and physical well-being [33]. However, this is also offering an opportunity to implement a self-care biomechanical program as a preventative method for chronic musculoskeletal pain. Earlier intervention reduces long term sick leaves for back pain in the working class, which may allow CP caregivers the ability to better manage other demands in their life [34,35]. Additionally, with reduced debilitating chronic conditions, these caregivers may be able to better help the child for a longer duration. Therefore, this program offers an opportunity for short and long-term health benefits for caregivers of children with CP.

Once the intervention has been integrated into healthcare facilities and centres, it can become a program which is conducted every 2-6 months to give an appropriate time frame to practice, incorporate and relearn healthy habits. The E-learning portion can be a section that is continually provided to the caregivers in the 2-6-month time period when no practical in-service sessions are available. Another method of implementation is through specific interventions designed based on the child's age. A practical in-service session can be held when the child is in their infancy, adolescence, teenage and adult years. The sessions would serve as a refresher but would also provide the opportunity to address new challenges that caregivers may experience as the child ages and increases in weight. Overall, this easily implementable program has the potential to improve caregiver mobility and reduce chronic pain, improving overall health and quality of life of the caregiver [14].

Conclusion

Our intervention offers a means to prevent or reduce the musculoskeletal pain of caregivers of children with CP by increasing their awareness and self-efficacy in identifying and correcting improper movements. Implementation of this caregiver program can improve knowledge and execution of proper biomechanics with additional social support. By the end of the intervention, participants were aware of proper movement mechanics and appropriate methods to alleviate musculoskeletal pain. Caregivers also showed proficiency at actively using these skills after the session and in follow-up appointments. The program offers indirect positive impacts as the child's health conditions is linked to the caregiver's ability to support them. This program could help change participants' biomechanics and reduce the occurrence of chronic pain, primarily low back pain.

References

1. Boulet SL, Boyle CA, Schieve LA (2009) Health Care Use and Health and Functional Impact of Developmental Disabilities Among US Children, 1997-2005. Arch Pediatr Adolesc Med 163(1): 19-26.
2. Davis E, Waters SE, Boyd E, Cook K Davern M (2009) The impact of caring for a child with cerebral palsy: Quality of life for mothers and fathers. Child Care Health Dev 36(1): 63-73.
3. Haddad S, Restieri C, Krishnan K (2001) Characterization of Age-Related Changes in Body Weight and Organ Weights From Birth To Adolescence in Humans. J Toxicol Environ Heal Part A 64(6): 453-464.
4. Tonga E, Düger U (2008) Factors affecting low back pain in mothers who have disabled children. J Back Musculoskelet Rehabil 21(4): 219-226.
5. Dolan P, Adams MA (1998) Repetitive lifting tasks fatigue the back muscles and increase the bending moment acting on the lumbar spine. J Biomech 31(8): 713-721.
6. Brehaut JC, Kohen DE, Raina P, Walter SD, Russell DJ, et al. (2004) The Health of Primary Caregivers of Children With Cerebral Palsy : How Does It Compare With That of Other Canadian Caregivers? Pediatrics 114(2): e182-e191.
7. Snyder B, Keefe K (1985) The unmet needs of family caregivers for frail and disabled adults. Soc Work Health Care 10(3): 1-14.
8. Murphy NA, Christian B, Caplin DA, Young PC (2007) The health of caregivers for children with disabilities: Caregiver perspectives. Child Care Health Dev 33(2): 180-187.
9. LLopis E, Padrón M (2007) Anterior knee pain. Eur J Radiol 62(1): 27-43.
10. Gelber AC, Hochberg MC, Mead LA, Wang N, Wigley FM, et al. (2000) Joint injury in young adults and risk of subsequent knee and hip osteoarthritis. Ann Intern Med 133(16): 321-328.
11. Shojaei I, Salt EG, Hooker Q, Bazrgari B (2017) Mechanical demands on the lower back in patients with non-chronic low back pain during a symmetric lowering and lifting task. J Biomech 70: 255-261.

12. Ones K, Yilmaz E, Cetinkaya B, Caglar N (2005) Assessment of the Quality of Life of Mothers of Children with Cerebral Palsy (Primary Caregivers). Neurorehabil Neural Repair 19(3): 232-237.

13. Hess JA, Kincl LD, Mandeville DS (2007) Comparison of three single-person manual patient techniques for bed-to-wheelchair transfers. Home Healthc Nurse 25(9):577-579.

14. Lee M, Park C, Matthews AK, Hsieh K (2017) Differences in physical health, and health behaviors between family caregivers of children with and without disabilities. Disabil Health J 10(4): 565-570.

15. Cherkin D, Deyo R, Street J, Hunt M, Barlow W (1996) Pitfalls of patient education. Limited success of a program for back pain in primary care. Spine 21(3):345-355.

16. Kirby RL, Mifflen NJ, Thibault DL, Smith C, Best KL, et al. (2004) The manual wheelchair-handling skills of caregivers and the effect of training. Arch Phys Med Rehabil 85(12): 2011-2019.

17. Bandura A (1971) Social learning theory. Social Learning Theory: 1-46.

18. Kaya K, Unsal-Delialioglu S, Ordu-Gokkaya NK, Ozisler Z, Ergun N, et al. (2010) Musculo-skeletal pain, quality of life and depression in mothers of children with cerebral palsy. Disabil Rehabil 32(20): 1666-1672.

19. Demoulin C, Marty M, Genevay S, Vanderthommen M, Mahieu G, et al. (2012) Effectiveness of preventive back educational interventions for low back pain: A critical review of randomized controlled clinical trials. Eur Spine J 21(12): 2520-2530.

20. Rosenbaum PL, Palisano RJ, Bartlett DJ, Galuppi BE, Russell DJ (2008) Development of the Gross Motor Function Classification System for cerebral palsy. Dev Med Child Neurol 50(4): 249-253.

21. Reibe D, Ehrman JK, Liguori G, Magal M, American College of Sports Medicine (2018) ACSM's Guidelines for Exercise Testing and Prescription. Tenth Edition, Wolters Kluwer, Philadelphia.

22. Davidson M, Keating J (2002) A Comparison of Five Low Back Disability Questionnaires: Reliability and Responsiveness. Phys Ther 82(1): 8-24.

23. Landgraf J, Abetz L, Ware J (1996) Child Health Questionnaire (CHQ): A user's manual. Retrieved from: https://www.healthactchq.com/survey/chq?gclid=CjwKCAjwstfkBRBoEiwADTmnEC_BPXVAHll4emvKeU0gWf6PrwQF5I55hT-JsQMdWlWGk_ynWvLENRoCKLcQAvD_BwE.

24. Stratford P, Gill C, Westaway M, Binkley J (1995) Assessing disability and change on individual patients: a report of a patient specific measure. Physiother Canada 47(4): 258-263.

25. Michie S, van Stralen MM, West R (2011) The behaviour change wheel: A new method for characterising and designing behaviour change interventions. Implement Sci 6(1): 42.

26. Hendrix CC, Landerman R, Abernethy AP (2013) Effects of an Individualized Caregiver Training Intervention on Self-Efficacy of Cancer Caregivers. West J Nurs Res 35(5): 590-610.

27. Hartvigsen J, Lauritzen S, Lings S, Lauritzen T (2005) Intensive education combined with low tech ergonomic intervention does not prevent low back pain in nurses. Occup Environ Med 62(1): 13-17.

28. Sheng N, Ma J, Ding W, Zhang Y (2019) Effects of caregiver-involved interventions on the quality of life of children and adolescents with chronic conditions and their caregivers: A systematic review and meta-analysis. Qual Life Res 28(1): 13-33.

29. Whittingham K, Sanders MR, Mckinlay L, Boyd RN (2016) Parenting intervention combined with acceptance and commitment therapy: A trial with families of children with cerebral palsy. J Pediatr Psychol 41(5): 531-542.

30. Van Wely L, Balemans ACJ, Becher JG, Dallmeijer AJ (2014) The effectiveness of a physical activity stimulation programme for children with cerebral palsy on social participation, self-perception and quality of life: A randomized controlled trial. Clin Rehabil 28(10): 972-982.

31. Fanello S, Jousset N, Roquelaure Y, Chotard-Frampas V, Delbos V (2002) Evaluation of a training program for the prevention of lower back pain among hospital employees. Nurs Health Sci 4(1-2): 51-54.

32. Kendzerska T, Zhu DT, Gershon AS, Edwards JD, Kendall CE (2021) The Effects of the Health System Response to the COVID-19 Pandemic on Chronic Disease Management: A Narrative Review 14: 575-584.

33. Hirose T, Ueda R (1990) Long-term follow-up study of cerebral palsy children and coping behaviour of parents. J Adv Nurs 15(7):762-770.

34. Molde Hagen E, Grasdal A, Eriksen HR (2003) Does Early Intervention with a Light Mobilization Program Reduce Long-Term Sick Leave for Low Back Pain: A 3-Year Follow-up Study. Spine (Phila Pa 1976). 28(20): 2309-2315.

35. Shannon H, Susan N, William H, Gayenell M, Martina M, Marilyn L (2014) Factors Influencing Hospital Admissions and Emergency Department Visits Among Children with Complex Chronic Conditions: A qualitative Study of Parents' and Provider' Perspectives. Issues Compr Pediatr Nurs 37(1): 61-80.