International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Effectiveness of Blackburn Exercise with Conventional Therapy in School Children Aged 10-14 Years with Upper Back Pain -A Comparative Study

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Abstract

Background: Upper back pain is a growing concern among school children due to heavy backpack loads, poor posture, and prolonged sitting. Conventional therapy, including stretching and strengthening exercises, is commonly used to manage upper back pain. Blackburn exercises, which focus on scapular stabilization and postural correction, may enhance these outcomes by strengthening key muscle groups. This study aims to compare the effectiveness of Blackburn exercises combined with conventional therapy versus conventional therapy alone in alleviating upper back pain among school-aged children.

Methods: A randomized control trial was conducted among 30 school children aged 10–14 years diagnosed with upper back pain. Participants were randomly assigned to either the control group (conventional therapy) or the experimental group (Blackburn exercises + conventional therapy). The intervention lasted six weeks, with sessions held three times per week. Pain intensity, muscle strength, and disability were assessed using the Visual Analog Scale (VAS), Manual Muscle Testing (MMT), and the Neck Disability Index (NDI) at baseline and post-intervention. Data analysis was performed using SPSS software, employing parametric and non-parametric statistical tests.

Results: Both groups showed significant improvement in pain reduction and functional outcomes. However, the experimental group demonstrated greater improvements in MMT scores (pre: 2.6 ± 0.5, post: 4.06 ± 0.79) and NDI scores (pre: 21.86 ± 3.09, post: 9.53 ± 1.95) compared to the control group (MMT pre: 2.6 ± 0.50, post: 3.2 ± 0.67; NDI pre: 21.93 ± 2.98, post: 13.46 ± 1.59). Statistical analysis confirmed that the differences between groups were significant ($p < 0.05$).

Conclusion: The addition of Blackburn exercises to conventional therapy significantly enhances upper back pain management in school-aged children. These exercises improve muscle strength, reduce pain, and enhance postural control more effectively than conventional therapy alone. This study supports the integration of Blackburn exercises into pediatric rehabilitation programs to promote musculoskeletal health and prevent long-term complications.

Keywords: Blackburn exercises, conventional therapy, upper back pain, school children, musculoskeletal health, randomized control trial

INTRODUCTION

Backpacks play a crucial role in school life, with over 90% of schoolchildren worldwide relying on them to transport their belongings. However, carrying heavy loads beyond recommended weight limits has been linked to musculoskeletal issues in school-going children. The additional strain on their developing spinal structures can contribute to postural deviations, discomfort, and long-term health problems.(1)

Throughout the school day, children carry backpacks filled with textbooks, sports attire, packed meals, and other necessities. Concerns are growing regarding the increasing weight of these backpacks and their potential consequences for children's health. Regular exposure to excessive loads increases the risk of musculoskeletal disorders and chronic back pain, which can negatively impact physical well-being and academic performance.(1,2)

Upper back pain is becoming increasingly common among schoolchildren due to prolonged sitting, poor posture, and excessive screen time. If left unaddressed, these factors can lead to musculoskeletal imbalances, discomfort, and even chronic pain in adulthood. Recognizing these risks, several professional organizations have established guidelines for safe backpack loads.(3,4)

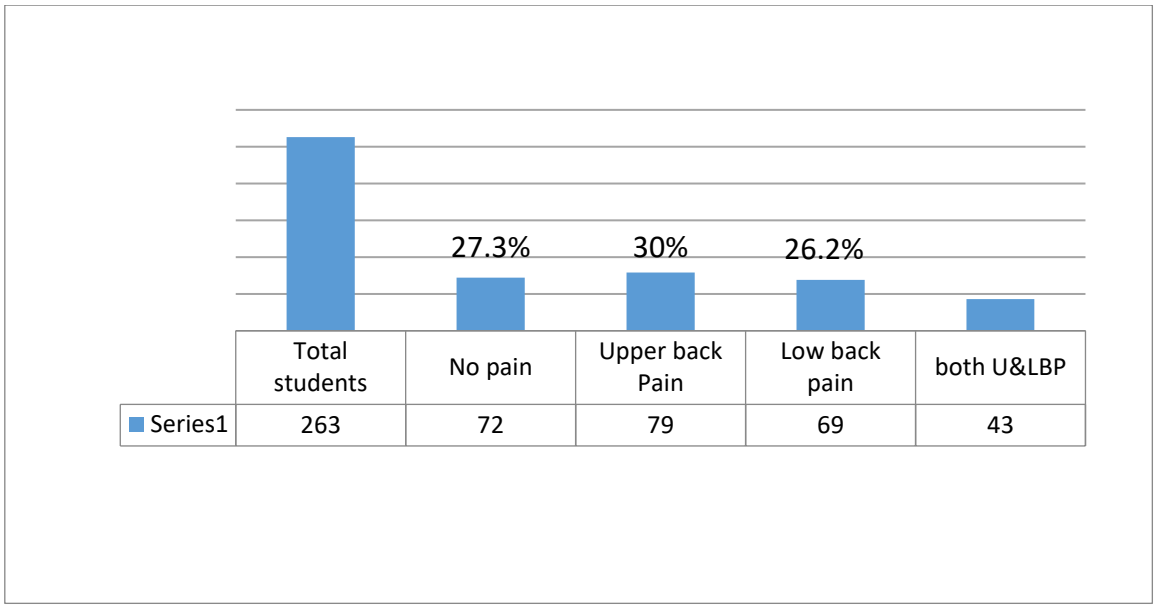
The American Occupational Therapy Association, the American Academy of Orthopaedic Surgeons, and the International Chiropractic Pediatric Association recommend that a child's backpack weight not exceed 10% of their body weight, while the American Physical Therapy Association suggests a slightly higher limit of 15%. Exceeding these recommendations can result in increased physical stress, leading to postural imbalances and musculoskeletal disorders.(5,6)

Proper backpack use is essential in preventing postural problems and musculoskeletal issues. Research indicates that load distribution significantly influences strain levels. Carrying a load in a lateral position, such as holding a suitcase in one hand, requires greater muscular effort compared to wearing a backpack, which distributes weight more evenly. However, improper backpack use—such as carrying excessive weight or not utilizing both shoulder straps—can still lead to muscle fatigue, postural misalignment, and localized discomfort..(5,6)

This study aims to evaluate the effectiveness of Blackburn exercises combined with conventional therapy versus conventional therapy alone in managing upper back pain among school-aged children. By assessing pain reduction, postural improvements, and functional outcomes, this research seeks to provide evidence-based recommendations for physiotherapeutic interventions in pediatric populations. The findings may contribute to the development of more effective rehabilitation strategies, ultimately promoting better musculoskeletal health among children.

Blackburn exercises focus on scapular stabilization and postural correction by targeting key muscle groups such as the trapezius, rhomboids, and rotator cuff muscles. These exercises have demonstrated promising results in improving muscle endurance and postural control, which are essential for maintaining spinal health in children. While conventional therapy—including stretching, strengthening exercises, and ergonomic corrections—has been widely used to alleviate upper back pain, emerging evidence suggests that targeted exercises like Blackburn exercises may offer additional benefits.(9,20,21,24,26)

To explore these potential benefits, a cross-sectional study was conducted to assess the influence of postural deviations caused by backpack load and associated pain among schoolchildren. Participants completed the Cornell Musculoskeletal Discomfort Questionnaire to evaluate discomfort and postural changes. The results of this study will provide valuable insights into the impact of backpack use and potential intervention strategies for preventing and managing upper back pain in school-going children.



Using a pen-and-paper method, the completed forms were assessed, and the results were analyzed. Overall, 263 questionnaires were filled out by students, of which 72 reported no neck or back pain, 79 reported upper back pain, 69 reported low back pain, and 43 reported experiencing both upper and lower back pain.

INCLUSION CRITERIA

- Age – 10 to 14 years
- Sex – both male and female
- Diagnosed with upper back pain by taking assessment
- Not participating in any formal physical rehabilitation program
- Subjects willing to participate in the study

EXCLUSION CRITERIA

- Surgeries to the cervical area
- Subjects taking analgesics and/or muscle relaxants.
- Known thoracic scoliosis, VBI, and kyphosis
- Neurological problems
- Congenital abnormalities,
- The patient is not willing to participate in the study

MATERIALS

- Consent form
- Paper
- Pencil
- Eraser
- Neck Pain Index Score sheet
- Cornell scale

- VAS Scale
- Goniometer
- Record sheet
- MAT/couch
- Chair or wall support
- Weight cuffs and dumbbells

METHODOLOGY

- Subjects included in this study were those diagnosed with upper back pain through assessment.
- Subjects were selected based on the inclusion and exclusion criteria of the study.
- Written consent was obtained before the study from parents of each child.
- The intervention consisted of Blackburn exercises and conventional therapy.
- Range of motion (ROM), manual muscle testing (MMT), visual analog scale (VAS) scores, and the Neck Pain and Disability Index score were recorded before and after the intervention.
- Data were analyzed using statistical software, including SPSS, Excel, and GraphPad.
- Both parametric and non-parametric tests were used to compare the results of the study.
- Outcome measures
- Neck disability index
- MMT
- Follow-up pre-test assessment was taken for pain and disability using manual muscle testing and the neck disability index on the first day before starting treatment.
- Post-test assessment was taken on the last day of the treatment using manual muscle testing and the neck disability index.

Study Design	Randomized Control Trial (Comparative)
Sample Design	Simple Random Sampling
Study Population	Diagnosed Upper Back pain
Sample Size	Total Sample: 30
	Group A: 15 & Group B: 15
Source of Data	Shama School ,Danilimda,Ahmedabad
Study Intervention	6 weeks
	Intensive treatment schedule: 1 hour/day, 3 days/week for 6 weeks
Evaluation	After 6 weeks of treatment, re-evaluation using:
	- Special Tests
	- Range of Motion (ROM)
Statistical Analysis	Parameters and Tests:
	- Microsoft Excel 2016 for prevalence
	- SPSS version 16 for parametric paired t-test of selected variables

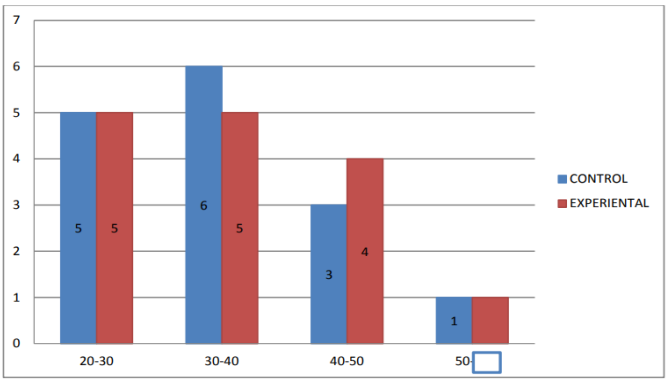
PROCEDURE

Type of Exercise	Control- Group A (Conventional Therapy)	Experimental- Group B (Blackburn exercise + Conventional Therapy)
Stretching exercises	• Sitting chair stretch • Bruegger's • Wall angels • Doorway stretches	• Sitting chair stretch • Bruegger's • Wall angels • Doorway stretches
Strengthening exercises	• Rhomboids • Serratus anterior • Middle and lower trapezius • Deep neck flexors	• Rhomboids • Serratus anterior • Middle and lower trapezius • Deep neck flexors
Black burn exercise	• Not Provided	• Prone Extension "I" • Prone Extension "Y" • Prone Extension "T" • Prone Extension "T" • Prone Extension "Y" • Prone Horizontal External Rotation
Postural education and ergonomics	• Provided	• Provided
Exercise protocol	• Given for 5-7 repetitions per session • 3 days a week for six weeks	• Given for 5-7 repetitions per session • 3 days a week for six weeks
Assessment	• Subjects reassessed after 6 weeks	• Subjects reassessed after 6 weeks


RESULTS

TABLE 1: COMPARISON OF AGE YEARS OF CONTROL GROUP AND EXPERIMENTAL GROUP

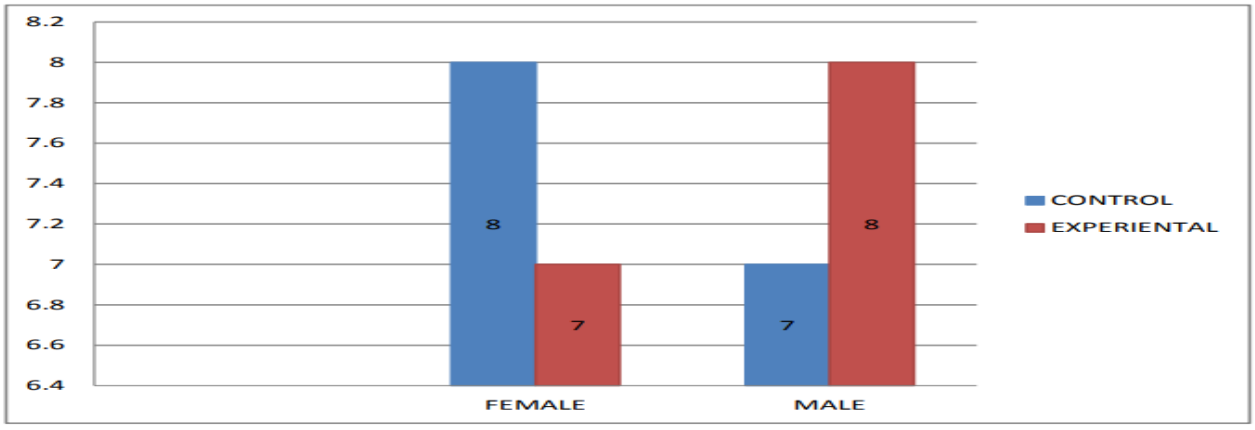
AGE IN YEARS	CONTROL	EXPERIENTAL
20-30	5	5
30-40	6	5
40-50	3	4
50	1	1
TOTAL	15	15



GRAPH 1: **COMPARISON OF AGE IN YEARS OF CONTROL GROUP AND EXPERIMENTAL GROUP**

TABLE 2: COMPARISON OF GENDER IN AND EXPERIMNTAL GROUP

GENDER	CONTROL	EXPERIMENT
FEMALE	8	7
MALE	7	8
RESULT	15	15



GRAPH 2: COMPARISON OF GENDER IN CONTROL AND EXPERIMENTAL GROUP

TABLE 3: COMPARISON OF PRE AND POST CONTROL AND EXPERIMENTAL IN MANUAL MUSCLE TESTING

	MMT	MEAN	S.DEVIATION
CONTROL GROUP	pre	2.6	0.50
	post	3.2	0.67
EXPERIMENTAL GROUP	pre	2.6	0.5
	post	4.06	0.79

GRAPH 3: COMPARISON OF PRE AND POST CONTROL AND EXPERIMENTAL IN MANUAL MUSCLE TESTING

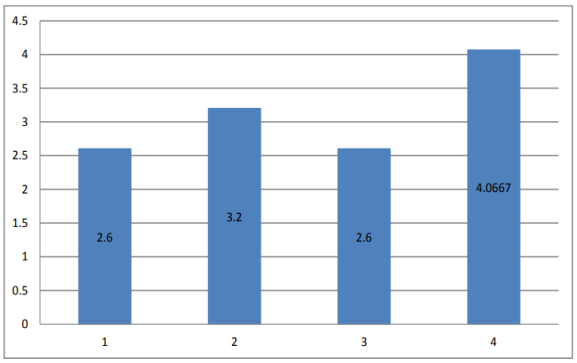


TABLE 4: COMPARISON OF PRE POST MMT BETWEEN GROUPS

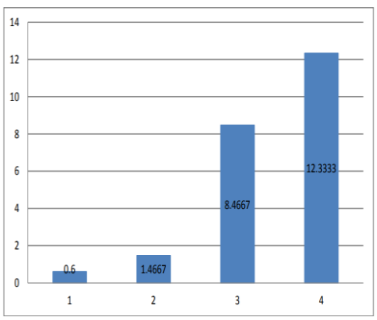
	MMT	Average Improvement	t-value	p value	Result
CONTROL GROUP	pre -post	3.15	0.007	0	p<0.05 SIG
EXPERIMENTAL GROUP	pre -post	0.05	11	0	p<0.05 SIG

TABLE 5: COMPARISON OF PRE AND POST CONTROL AND EXPERIMENTAL IN NECK DISABILITY INDEX

	NDI	MEAN	S.DEVIATION
CONTROL GROUP	pre	21.93	2.98
	post	13.46	1.59
EXPERIMENTAL GROUP	pre	21.86	3.09
	post	9.53	1.95

TABLE 6: COMPARISON OF PRE AND POST BETWEEN GROUPS

	MMT	Average Improvement	t-value
CONTROL GROUP	pre -post	8.46	10.69
EXPERIMENTAL GROUP	pre -post	12.33	13.57



GRAPH 6: COMPARISON OF PRE AND POST BETWEEN GROUPS

- Average improvement of neck disability index in control group is 8.46 and t value is 10.69
- Average improvement of manual muscle testing in the experimental group is 12.33 and t value is 13.57

DISCUSSION

- In the present study, participants aged 10 to 14 years who were evaluated for upper back pain showed promising results from the use of Blackburn exercises, which have been demonstrated in recent studies to improve upper back strength and reduce pain over short durations.
- However, there is a lack of research exploring the long-term benefits of Blackburn exercises on flexibility and postural health of the neck and back muscles.
- Therefore, the results of this study focused on the combination of Blackburn exercises with conventional therapy to enhance the management of upper back pain.

CONCLUSION

- The treatment of upper back pain using Blackburn exercises and conventional therapy demonstrated significant improvements in the subjects' conditions.
- This study provides valuable insights into the most effective management approaches for upper back pain among school-aged children, with potential implications for optimizing the quality of care and enhancing overall well-being.
- Blackburn exercises and conventional therapy can be promoted as rehabilitation techniques and daily training methods to enhance performance for various musculoskeletal neck injuries.
- Additionally, further studies should be conducted to evaluate the efficacy of these exercises in preventing recurrence.

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