Original Research Article

Prevalence of Backward Disequilibrium in Subjects with Chronic Low Back Pain

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ABSTRACT

Background: Backward disequilibrium (BD) is a postural disorder in subjects who have distortion in their perception of vertical posture. This is characterized by posterior trunk tilt in standing or sitting position which predisposes the subject to fall backward. Chronic Low back pain (CLBP) is defined as pain in the lumbosacral region, buttocks and thighs that is mechanical in nature and seen to be pain that persists beyond the expected period of healing.

Methodology: This study was a prevalence study to identify the backward disequilibrium in subjects with chronic low back pain subjects. Out of 70 participants 53 subjects were identified with the inclusion criteria of the study. The questionnaires used to assess backward disequilibrium were Timed backward walking test, Tampa's kinesiophobia scale and Mini Best-test.

Results: The study concluded that the ability to walk in normal speed, static balance and dynamic balance are affected due to chronic low back pain (CLBP) and it also leads to fear of fall. The subjects with chronic low back pain showed significant p value with respect to Timed backward walking test (0.05*), Tampa's kinesiophobia scale (0.05*) and Mini Best-test (0.05*) for the age group 51-55 years compared to other groups. In addition, Mini Best-test was statistically significant even in the age range 46-50 with p value of 0.05*.

Conclusion: The current study concluded that as the age advances in subjects with chronic low back pain, there will be definite backward disequilibrium evidently seen.

Key words: Backward disequilibrium, Chronic Low Back Pain, Tampa's kinesiophobia scale, Mini best-test, Timed backward walking test.

INTRODUCTION

1. Chronic low back pain
2. Balance
3. Backward disequilibrium
4. Why balance is affected in CLBP
5. Chances of backward disequilibrium in CLBP.

One of the commonest Musculoskeletal problem that people experience in their life is Low back pain. It is one of the principal cause of activity limitation, participation restriction and work absence [1]."Chronic low back pain is also defined as pain within the lumbosacral region, buttocks and thighs that is mechanical in nature, it varies with physical and time factor and also it is seen to be pain that persists beyond the expected period of healing [2] ". Roughly 5–10% of patients with low back pain develop incapacitating condition that lasts longer than 3 months [3].

Causative factors for low back pain; such as; occupational hazards, monotonous work, constant maintenance of poor posture during work, sedentary lifestyle, history of trauma or injury, congenital mal-development, mechanical issues and soft tissue injuries,

which directly or indirectly cause structural and functional changes to the muscular, facial slings, and intervertebral disc which may lead to compression of nerve roots. Other causes are, torn or pulled muscle & ligament (muscle and ligament strain) and scoliosis[4]. The chronic low back pain leads to change in curvature of lumbar spine causing exaggerated lumbar lordosis. According to Janda's theory; the muscular changes seen in exaggerated lumbar lordosis are tight iliopsoas and back extensors whereas weak abdominals and hip extensors.[5] This postural mal-alignment of vertebrae results in posterior displacement of COG leading to poor posture and imbalance in such individuals[6].

Signs and symptoms seen in chronic low back pain are localized initially which progress and worsens with time. As the condition deteriorates, proprioceptors are also affected along with muscular, neural and joint involvement. Proprioceptors are the structures present in muscles, tendons, fascia and joints. Proprioception functions in maintaining both static and dynamic stability of the body. Proprioceptors present in muscle and joints functions to maintain balance and stability of human body. Muscles or joint damage in turn causes imbalance because of the decreased function of proprioceptors within. Muscles undergo dysfunction gradually affecting the proprioception. Thus, any damage to these structure lead to impairment in balance.

Human body equilibrium is based on postural and balance control of which proprioceptors take the lead role.

"Backward disequilibrium (BD) is a postural disorder in subjects who have distortion in their perception of vertical posture." The reason for this might be posterior displacement of Center of Gravity. An author quoted that; in subjects with hyper-lumbar lordotic curvature the COG is displaced posteriorly[8]. This is characterized by posterior trunk tilt in erect standing or sitting position in the perception of verticality[8] which predisposes the individual to have backward fall. This is frequently seen in elderly population and advances with the age.

Backward disequilibrium is often associated with reduced self-confidence during activities like standing and walking leading to kinesiophobia and frequent falls. Backward Disequilibrium roots to poor dynamic and static postural control which in turn leads to dependance[10].

Falls can be caused by, disturbed gait due to neurological, balance, vision problems and chronic diseases such as arthritis, Postural deformities, Musculoskeletal changes as well as psychological changes etc.[9]. Human body has two types of Balance: Static balance (ability to maintain the body in some fixed posture) and Dynamic balance (ability to maintain balance while moving the body). Balance is affected in individual when structures maintaining stability like, bones, joints, muscles and proprioceptors are affected. Studies have demonstrated that subjects with subacute non-specific low back pain displayed significantly reduced static and dynamic balance control and proprioception sense compared to healthy subjects[12].

Studies have concluded that backward walking a traditional and dynamic activity is an effective means to reduce low back pain by greater activation of the para spinal muscles along with core extensors and global extensors during backward walking in patients with chronic low back pain[7]. Therefore, backward walking is an effective aerobic exercise to enhance lumbar paraspinal recruitment[11].

Studies have demonstrated that backward walking when used as therapy has demonstrated significant positive effect for both acute and chronic low back pain. The reason stated behind the positive results by the authors were backward walking stretches entire posterior fascia and posterior muscular chain or sling which indirectly facilitates postural alignment by reducing the increased lumbar lordosis.[7-8]. Subjects with chronic low back pain have

poorly coordinated neuromuscular control, which may alter the normal postural stability of the spine. Studies have also demonstrated the altered movement control as a symptom of low back pain. [7]

There are numerous articles demonstrating the reduction in static and dynamic balance in subjects with Chronic Low Back Pain, also there are various articles stating the effectiveness of backward walking therapy in subjects with chronic low back pain. But, there is scarcity in literature for backward disequilibrium in subjects with chronic low back pain. Hence, this study is been undertaken.

METHODOLOGY
Type of study- Observational study.
Research Design: Cross-Sectional study
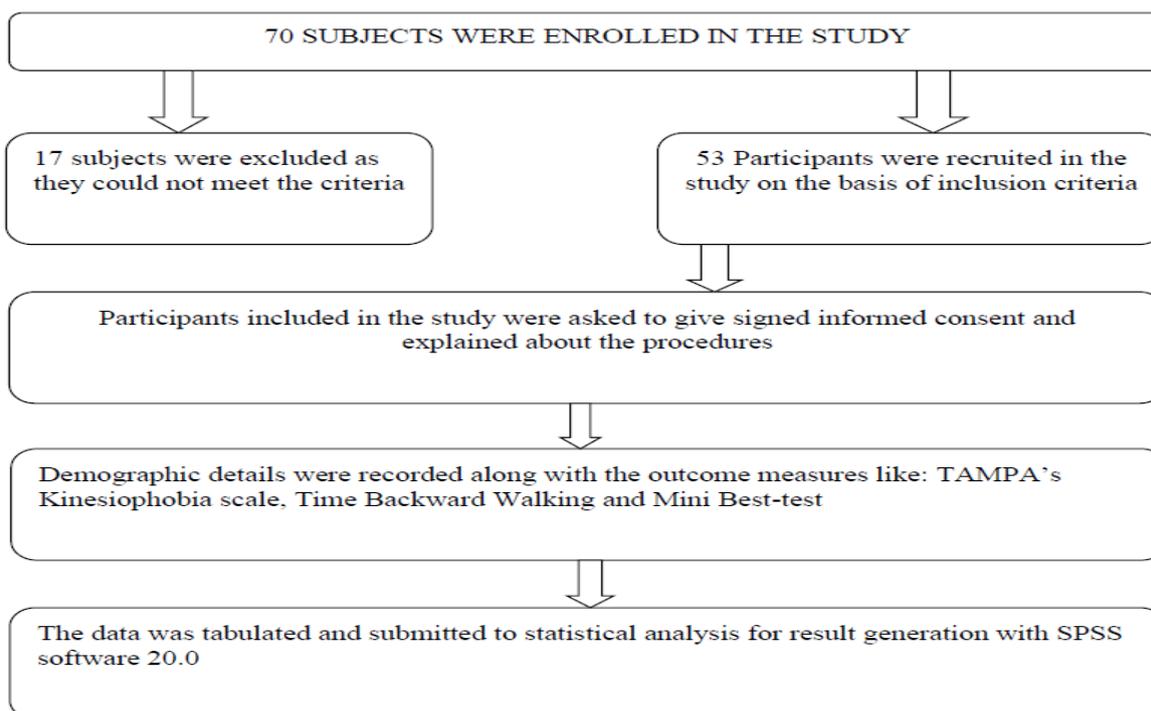Place of study –OPD, College of Physiotherapy, Dayananda Sagar University-KARNATAKA.
Sample size – 150
Sampling method – Convenient sampling.
Study duration – 6 months

TARGET POPULATION: Subjects with chronic low back pain
CONSORT:

SAMPLESIZE: $n=4Pq/d$
$n=4*20(80)/11$
$n=52.89=53$

OUTCOMEMEASURES
- Tampa's kinesiophobia scale
- Mini best test
- Timed backward walking test (3metre)

INCLUSION CRITERIA: Patients with chronic low back pain, Age: 40-55years and Subjects willing to participate in the study.

EXCLUSIONCRITERIA: Subjects with vision impairment, History of trauma or undergone surgery, Subjects with neurological problems, Subjects with spondylolisthesis, Subjects with recent fracture of spine, Subjects with OA of knee, hip and ankle.
After obtaining ethical clearance the subjects were approached and then the procedure was explained. Subjects who come under study inclusion criteria were recommended for the study and signed informed consent was taken from each participant.


70 SUBJECTS WERE ENROLLED IN THE STUDY

17 subjects were excluded as they could not meet the criteria

53 Participants were recruited in the study on the basis of inclusion criteria

Participants included in the study were asked to give signed informed consent and explained about the procedures

Demographic details were recorded along with the outcome measures like: TAMPA's Kinesiophobia scale, Time Backward Walking and Mini Best-test

The data was tabulated and submitted to statistical analysis for result generation with SPSS software 20.0

RESULTS

TABLENO:1. AGE AND GENDER

Sr. No	Age Range	Male	Female	Total
1.	45-50	9	4	13
2.	51-55	3	8	11
3.	56-60	5	22	27
4.	Total	17	34	51

GRAPH NO:1. AGE AND GENDER

The statistical analysis shows that out of 53 samples majority of participants falls under the age of 51 to 60 which is almost 53% and 51-55 age group contribute 21.5% 0f the total sample and the remaining 25.5% comes under 45 to 50 age group. Regarding age
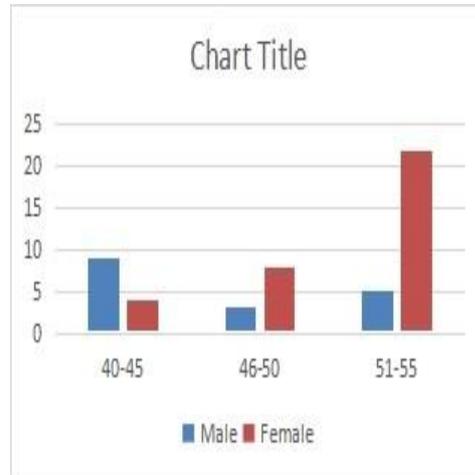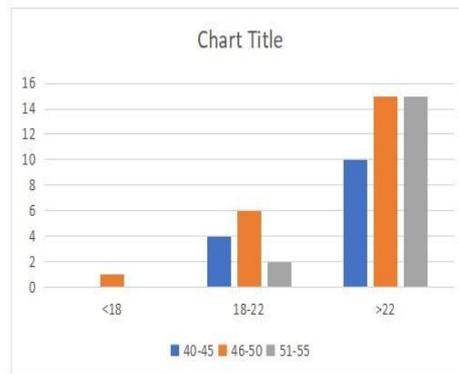
TABLE NO 2: AGE and BMI

Sr. No	Age Range	<18	18-22	>22	Pvalue
1.	40-45	0	4	10	1.821
2.	46-50	1	6	15	0.172
3.	51-55	0	2	15	0.05*
4.	Total	1	12	40	
	P value	1.829	1.821	0.912	

GRAPH NO:2. AGE AND BMI

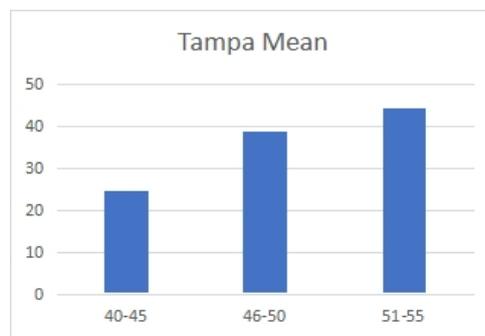In the parametric test of age and BMI the age group of 40 to 45shows a P value of1.821which is statistically not significant, the age group of 46to50alsogivesaPvalue of0.172which is not significant, and the age group of 51 to 55 shows a significant association(P<0.05). Majority of these samples comes under BMI>22. The paired and unpaired test shows the mean and mode are close to each other (Mean=47.396 and Mode=50), and the distribution follows normality.

TABLE NO 3: AGE and TAMPA

Sr. No	Age	Mean	SD	P value
1.	40-45	24.7	1.217	0.148
2.	46-50	38.91	2.182	0.187
3.	51-55	44.51	1.891	0.05*
4.	P value	0.05*	0.152	

GRAPH NO:3. AGE AND TAMPA

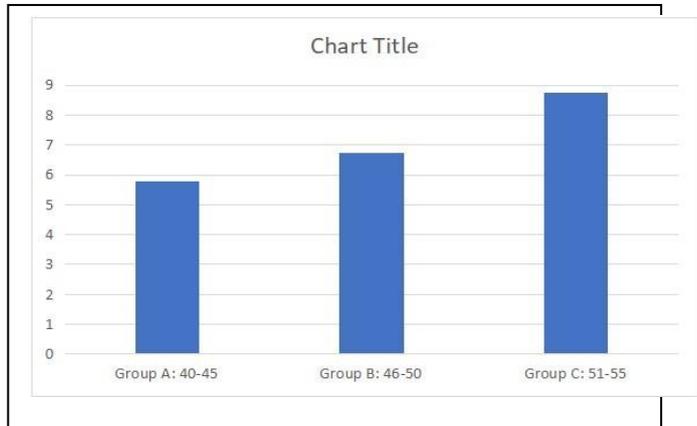In paired t test of age and Tampa's kinesiophobia scale the age group of 40 to 45 shows a p value of 0.148 which is statistically not significant, the age group of 46to50giveaPvalueof 0.178 which is also not statistically significant. But the age

group of 51 to 55gives a P value of 0.05 which is statistically significant.

TABLE NO.4: AGE AND TIMED BACKWARD WALKING (PAIRED T TEST)

| Age group	Avg Time taken per group	Pvalue
40-45	5.8seconds	0.172
46-50	6.75seconds	1.204
51-55	8.75seconds	0.05*
pvalue	0.05*	

GRAPH NO:4. AGE AND TIMED BACKWARD WALKING

In the paired t test of age and timed backward walking the age group of 40 to 45 shows a P value of 0.172 which is statistically not significant. The age group of 46 to 50 shows a P value of 1.204(statistically not significant). And the age group of 51 to55shows a P value of which is statistically not significant.

TABLE NO. 5: AGE AND MINI BEST TEST (PAIRED AND UNPAIRED T TEST)

Age group	Anticipatory	Reactive	Sensory	Dynamic	Total	P value
40-45	6.5	4.2	4.5	5.2	22.78	0.182
46-50	6.2	5.5	5.2	8.4	24.59	0.05*
51-55	4.3	6.1	5.9	9.3	18.91	0.05*
P value	0.182	0.05*	1.287	0.05*	0.0001*	0.05*

GRAPH NO: 5.AGE AND MINI BEST TEST (PAIRED AND UNPAIRED T TEST)
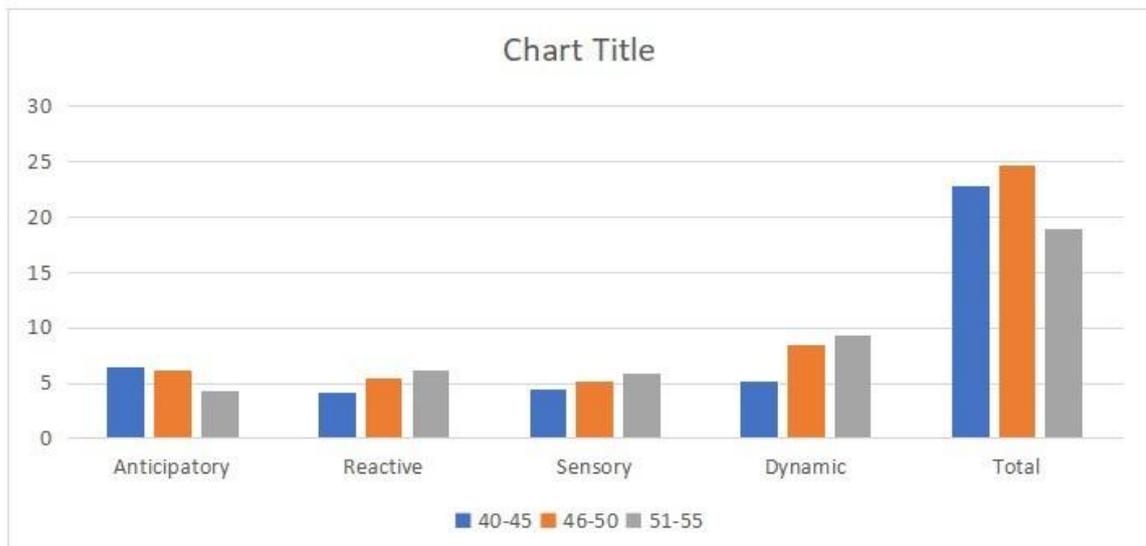
In paired and unpaired t test between age and MINI best test the age group of 40 to 45 gives aP value of 0.182 which is not statistically not significant, 46 to 55 gives a P value of 0.05which is statistically significant. In all age groups the Reactive and Dynamic test gives a Pvalueof0.05 which is statistically significant.

DISCUSSION
In the current study prevalence of backward disequilibrium (BD) is analyzed in subjects

with chronic low back pain (CLBP). The current study demonstrated that the increased fear of movement/ fall is statistically significant on timed backward walking test; with advancing age. A study by Rogério Sarmento Antunes, et al demonstrated that the Patients with low back pain and depression had higher rate of fall related to kinesiophobia as assessed on Tampa's Kinesiophobia scale. The reason authors stated was that individuals with chronic low back pain are known to have depression and higher fear: of mobility, physical activity and of exercising. The author also stated that such subjects demonstrate themselves to be blown up sensitivity towards pain and apprehensiveness of re-injury. Author concludes by stating psychological aspects of chronic low back pain like fear of movement and depression should be acknowledged and attended as they are predictors of worse evolution.[14]

The current study demonstrated that the average time taken to complete the 3Minute Backward Walking Test increases with advancing age and the test is statistically significant with a P value of 0.05. This states that there is definite backward disequilibrium in subjects with chronic low back pain with higher age.

The current study also demonstrated that the mini best test (impaired dynamic and static balance) is drastically affected in subjects with chronic low back pain with advancing age. A study by. Christos T et al on dynamic balance values in subjects with low back pain showed star excursion balance test values to be reduced significantly in group of chronic low back pain subjects when compared to dynamic and static sway. Also, age and Body mass index was a crucial factor discussing that advancing age caused significant effect on star excursion balance test[15]. In the current study mini best-test scale and timed backward walking test were used to assess the dynamic balance and tampa's kinesiophobia was used to assess the fear of movement in subjects with chronic low back pain and demonstrated

that advancing age leads to poor score of the tests stating poor dynamic balance.

CONCLUSION
The current study concluded that advancing age in subjects with chronic low back pain causes increase in Kinesiophobia, increased timed backward walking and poor score of mini best-test test. Thus, this study concludes that the backward disequilibrium for the subjects with chronic low back pain (CLBP).

Limitations Of Future Recommendation
The study can be studied by modifying the inclusion and exclusion criteria
Study in female/male population
Study in young adults

Declaration by Authors
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Conflict of Interest: The authors declare no conflict of interest.

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