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Prevalence of writer's cramp in students and its influence on distal upper extremity performance.

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Article

Introduction: Writer's cramp was studied and described in detail from 19th century onwards. Writer's cramp is a task specific focal dystonia of the hand characterized by co-contraction of the agonist and the antagonist muscle causing over activation during task requiring skilled hand use such as writing [1-4]. There are various subtypes of writer's cramp namely simple writer's cramp, complex writer's cramp which further has involvement of abnormal neck posturing and oromandibular involuntary movement while writing [2] .Dystonia is characterized by regular or irregular muscular contractions that result in aberrant, frequently repeated motions, postures, or both [5,6]. Focal dystonia is seen complex in origin and has no known cause and task specificity being an interesting feature of writer's cramp that is the task of writing only being affected, the hand writing is less fluent, fatiguing, lagging and often hurting[1-4,6,7]. The common signs & symptoms seen in writer's cramp include complain of pain during writing in the hand and the forearm, excessive grip pressure on the pen, muscle hyperactivity during handwriting, asymmetrical and jerky script with cumbersome and slowed pen movement during writing, sustained spasm of intrinsic muscles of the hand during and after writing for long duration or after a long period of absenteeism [5,7.] The conventional clinical and electrodiagnostic neurological assessment distinctively reveals no secondary manifestations in students with writer's cramp [4,5]. The exponential growth seen in technology throughout the last three decades has its own impact in all the areas of life and education is no exception to it as during the period of Covid-19 pandemic the students as well as institutions supported online learning & blended form of learning, where using of gadgets and typing activity was more frequent. After the Covid-19 pandemic the institutions had started

resuming the traditional methods of learning and it might have been difficult for the students to cope up with the traditional method of assessment after a long gap. The study curriculum of Physiotherapy in India, still involves a lot of writing work but the use of new technology as a substitute for writing may have additionally put-up negative impact on their writing performance. In existing physiotherapy curriculum, examinations require compulsory writing of long, lengthy answers and usage of electronic devices is prohibited unlike in other courses. Students who had mild symptoms of writer's cramp before Covid-19 period they may have been aggravated after the covid period as the documentation and journaling work is more when the students are studying on campus rather than off campus. Hence the study aims to find out the prevalence of writer's cramp in Physiotherapy students. Since subclinical cases of writer's cramp can become more evident after long term writing, it can influence distal extremity function and affect writing work. Study further aims to assess influence of this pathology on the distal upper extremity performance in the form of strength assessment. Implementation of appropriate measures for prevention can be planned accordingly.

Subjects and Methods: Ethical clearance was obtained from the Institutional Ethics Committee. The participants were explained about the study and an informed consent was taken. A cross-sectional survey study was conducted on 151 Undergraduate Physiotherapy students of first to fourth year with a purposive type of sampling. Participants fulfilling the criteria of Age- 18-25yrs Physiotherapy Students, and willing to participate were included in the study. Participants with any neurologic &/or orthopaedic condition related to upper quadrant & congenital disorder related to spine & upper quadrant were excluded from the study. A self-made questionnaire was formed considering with consideration of three areas like demographic detail, diagnostic criteria & exposure to writing and typing work. Questionnaire was administered to the students to document diagnosed cases of writer's cramp by interview method. Participants who were diagnosed with writer's cramp were considered as the experimental group (Group A:sample size 51)

the participants without writer's cramp were considered as control group (Group B: sample size 51). Dominance, and gender matched population was selected for group B. Pinch Strength was assessed in both Group A and Group B before examination and after examination immediately within 30 mins of completion of examination using Baseline 5 position pinch gauge[10]. Inter group and intra group pinch

strength comparison was done using Wilcoxson Signed Rank test and Mann Whiteny test respectively with the help of GraphPad Prism version 10 on Windows 11 version 22H2.

Procedure-Pre and Post examination pinch strength assessment of participants was done in sitting. The participant position was selected according to the American society for hand therapy (ASHT) guidelines, where the arm was kept adducted to the midaxillary line, elbow joint into 90 degrees of flexion, (Fess, Elaine & Moran, Christine. (1981). American Society of Hand Therapists Clinical Assessment Recommendations) forearm into pronation, wrist in slight extension with the second and third phalanx's pads (index and middle finger pads) were kept above and the pad of the first phalanx (thumb pad) was kept below the handle[12]. The arm forearm and wrist joint were kept supported by the arm rest of the chair and the trunk supported by the back rest. The therapist sits beside the participant's dominant hand side facing the participant and holding the instrument with the same hand as that of the participants hand being tested and looking at the dial of the instrument.

Statistical Analysis: Prevalence of writer's cramp in total population and year wise prevalence was found using the percentage method with the help of Microsoft excel 2019. Normality was assessed using Shapiro Wilk test.

Comparison of Pre-post examination pinch strength of Group A and B was done using Wilcoxson Signed Rank Test and Pre examination pinch strength of Group A and B, Post examination pinch strength of Group A and B was compared using Mann Whiteny Test.

Table1- Shows demographic details of the study population

Demography Of Study Population					
Total Population	**Male**	**Female**	**Left Hand Dominant**	**Right Hand Dominant**	**Mean Age**
151	**18%**	**81%**	**11%**	**88%**	**21±1.38**

Graph 1- Total percentage prevalence of study population

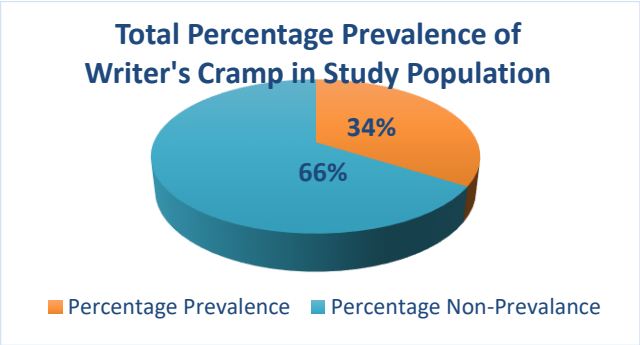


Table 2- Comparison of Pre and Post Pinch strength of Group A (Using Wilcoxson Signed Rank test)

Wilcoxson signed Rank test Pre & Post Experimental group		
	Pre experimental	Post Experimental
Actual median	7	3
Sum of signed ranks (W)	1326	1326
Sum of positive ranks	1326	1326
Sum of negative ranks	0	0
P value (two tailed)	<0.0001	<0.0001
Significant	Yes	Yes
Discrepancy	7	3
95% confidence interval	7.000 to 7.500	3.000 to 4.000
Actual confidence level	95.11	95.11

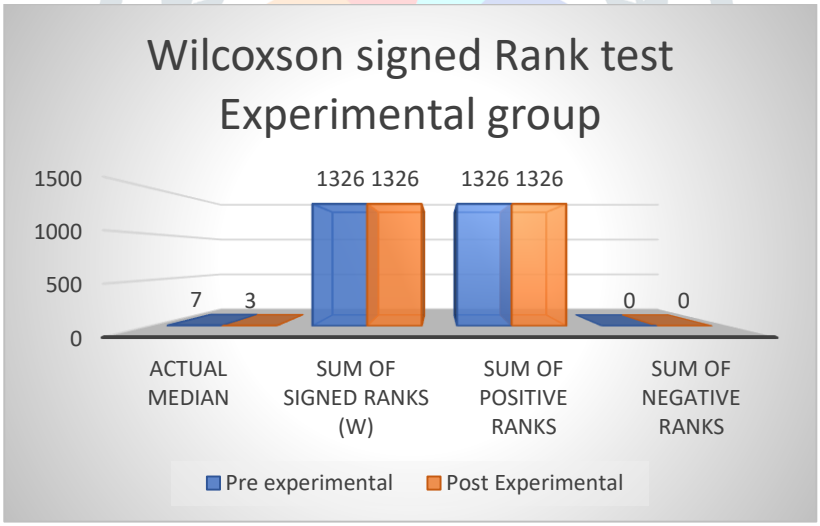


Table 3 – Comparison of Pre and Post Pinch strength of Group B (Using Wilcoxson Signed Rank test)

Wilcoxson Signed Rank Test for Pre-Post Control group		
	Pre-Control	Post Control
Actual median	7	6
Sum of signed ranks (W)	1326	1326
Sum of positive ranks	1326	1326

Sum of negative ranks	0	0
P value (two tailed)	<0.0001	<0.0001
Discrepancy	7	6
95% confidence interval	6.500 to 7.500	5.500 to 6.500
Actual confidence level	95.11	95.11
Significant	Yes	Yes

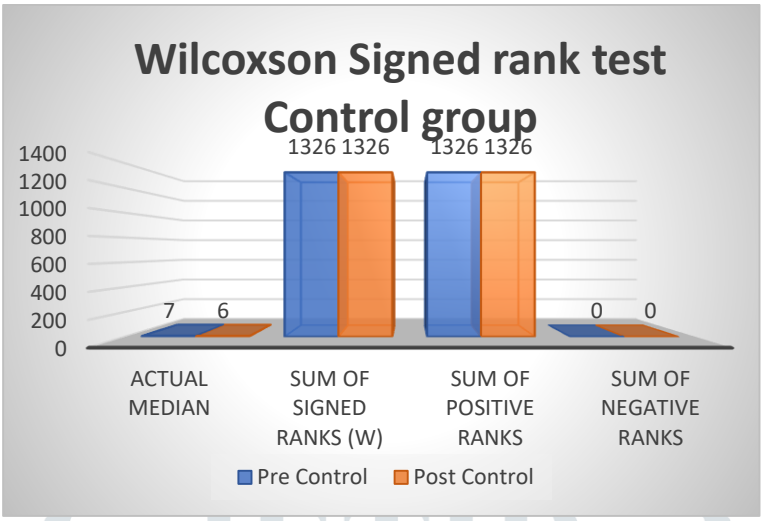


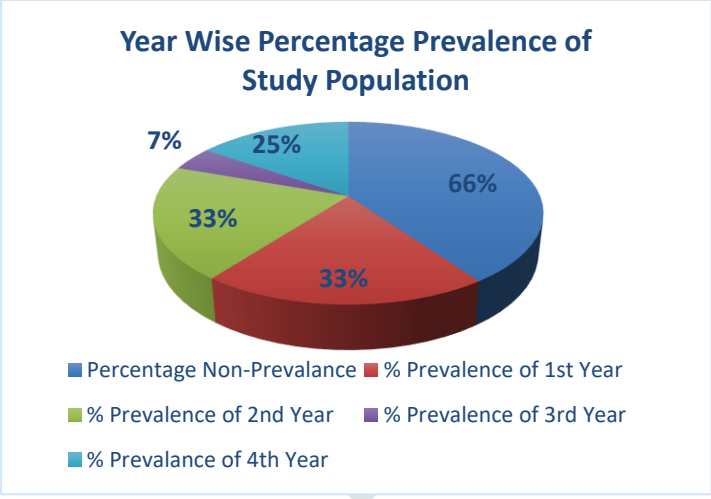
Table 3 – Comparison of Pre examination Pinch strength of Group A & Group B (Using Mann Whiteny Test)

Mann Whiteny Pre-Experimental & Control Group		
	Pre-Experimental	Pre-Control
Median	7	7
Sum of ranks	2785	2468
P value summary	not significant	
Mann-Whitney U	1142	
P value	0.2856	
Difference: Actual	0	
Difference: Hodges-Lehmann	0	

Table 4 - Comparison of Post examination Pinch strength of Group A & Group B (Using Mann Whiteny Test)

Mann Whitney POST Experimental & Control Group		
	Post Experimental	Post Control
Median	3	6
Sum of ranks	1605	3648
P value summary	Significant	
Mann-Whitney U	279	
P value	<0.0001	
Difference: Actual	-3	
Difference: Hodges-Lehmann	-2.5	

Graph 2 – Year wise percentage prevalence in the study population



Result: The incidence of writer's cramp in the study population was found to be 34% (Graph 1).

Both the groups showed significant reduction of pinch strength post 3hour examination, Group A***(p-0.0001)*** & Group B***(p-0.0001)*** (Refer Table 4).

Although there is reduction of pinch strength seen in both the groups post examination but when compared with Group B, the 'Group A' showed significant ***(p-0.0001)*** (Refer Table 4) reduction of pinch strength after a 3hour examination which was due to the development of writer's cramp.

Discussion: Incidence of writer's cramp was seen higher in the first- and second-year students followed by the fourth year and third year students (Graph 2). The incidence of writer's cramp is seen more prevalent in the first- and second-year students as they are the ones who are not exposed to the intense writing work before joining the course and are adapting the examination pattern and stressors of the examination after the period of Covid-19. Fourth year students had a lower incidence of prevalence among the four years as the students are already acclimatized with the learning and writing pattern through the following years. The incidence of prevalence was less in the third-year students as the strength of participants in the third year were prevalence testing. According to the previous study done by Dabholkar, T.A., Shroff, R et.al concluded that there is reduction in pinch strength after overuse of the forearm and hand muscle after any fine motor activity done for a prolonged period of time hence reduction of pinch strength in both the group is seen due to the fatigue factor setting in (14). There are several studies done showing the probable causes of developing writer's cramp.

Environmental and genetic variables have been related to the multifactorial pathophysiology [15]. It is regarded as a motor network disorder affecting the cerebellum, thalamus, basal ganglia, and sensorimotor cortex, and it serves as a model for other types of task-specific dystonia [9,16,17]. Numerous investigations have shown altered motor planning with a lack of neuronal inhibition [17, 19], decreased sensory function, improper reorganisation of the somatosensory cortex (S1) and sensorimotor integration as a result of maladaptive neural plasticity[18], and cerebellar dysfunction. When writing, these areas are also involved. It's likely that the parieto-premotor-M1 network, which codes well-trained and skilful tasks, is weak, as well as the planning of a writing movement [17]. Group A students showing the prevalence of writer's cramp might have any of the above pathology which might be causing the signs and symptoms of it while writing unlike that in the Group B students.

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