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DEXTERITY TESTING AS A MEANS TO EVALUATE EFFECT OF HANDEDNESS ON PERFORMANCE OF SURGICAL RESIDENT DOCTORS

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ABSTRACT

Dextrous hand is one that is quick, able to achieve target positions, focuses accurately on target and is capable of making very small movements skilfully. Variety of tests are available to measure manual dexterity, one amongst which is O'Connor Finger Dexterity Test. Clinically this test can be used to determine the consistency with which different surgical tasks are undertaken by novice and experienced surgeons. This study aims to evaluate if handedness affects manual dexterity of fingers and hand eye co-ordination.

INTRODUCTION

It is a curious quirk of human nature that most of us prefer using our right-hand, while a minority of around 10 % prefer using their left - a ratio that has remained relatively stable throughout human history [1]. A number of cultural myths have grown up around the differences between left and right-handers. The myth about left-handers and handedness is Left-handers are more introverted, intelligent and creative. Another recent study [2] has demonstrated an increased cognitive flexibility among the ambidextrous and the left-handed—and lefties have been found to be over-represented among architects, musicians, and art and music students. Any surgical operation requires tremendous hand dexterity and invaluable hand-eye co-ordination. Precision of finger movements and concurrently the speed with which a surgical task is carried out is also significant. O'Connor finger dexterity test acts as an invaluable screening test, which in advance determines all the above parameters. Clinically, this test can be used to determine the consistency with which different surgical tasks are undertaken by novice and experienced surgeons [3]. Earlier the test was used in a study for assessing dexterity of patients with functional splint for trapeziometacarpal osteoarthritis [4]. Functional capabilities of individuals (e.g., dexterity) with finger disabilities was assessed by this test [5]. Surgical residents performing this test and scoring below average scores became candidates for intensive training sessions so that at the end of their residency, they become competent, efficient and more skilful surgeons. This finger dexterity test is not just the scope for assessing dexterity and handedness parameters of surgeons but it can also be explored by physiotherapists, occupational therapists, and neuro physicians in their patients to know their recovery after giving their line of management. This test can also be used to assess if gender really affects dexterity. Surgical programs often rely on objective measures of medical school cognitive performance, to predict the success of an applicant in their training program. Although job applicants in non-medical fields often undergo dexterity testing prior to being hired, this has not been widely used in the selection process for surgical residency applicants. Thus, successful identification of applicants likely to succeed in surgical fields remains elusive [6].

METHODOLOGY

The present study "Dexterity testing as a means to evaluate effect of handedness on performance of surgical resident doctors", was conducted at various tertiary health centres of Mumbai. The study was undertaken with the due clearance of the Institutional Ethical Committee. This study included a total of 120 surgical resident doctors consisting of 38 females and 82 males ranging in age between 24 years and 30 years who gave their consent for voluntary participation. After careful clinical examination, only those, who satisfied the inclusion criteria, were chosen for the study. Calculation of sample size was done according to pilot study, according to which the confidence interval is 95%. Considering various surgical departments, there were 212 resident doctors including all 3 years of residency. Taking into consideration approximately 50% of this population, we considered 120 resident doctors.

➢ **Inclusion criteria**

a. Subjects in the age group 24 to 30 years.

b. Subjects with normal acuity of vision as tested by Snellen and Jaeger's test type.

c. Subjects having no neuromuscular disorder.

d. Subjects with corrected acuity of vision i.e. those wearing spectacles.

➢ **Exclusion criteria**

a. Subjects age below 24yrs and above 30yrs.

b. Subjects having neuromuscular disorder.

c. Subjects having personal history of smoking and other habits like eating gutka.

The equipment used was O'Connor Finger Dexterity Test apparatus for determining manual dexterity. Proper written informed consent of the volunteers was obtained before the procedure. The residents were approached in their respective departments. When they were not available there, they were approached personally wherever they were, during their duty hours and the test was performed then and there only as per their availability. History taking, general examination & systemic examination were carried out. Resident doctor was made to sit comfortably at a table thirty inches in height. The pin board was placed before him about a foot from the edge of the table, with the tray at the right if the right hand was to be used, and at the left if the left hand was preferred. Suggest that he draw the chair close to the table in order that he may rest his arms on its surface. The tray contained 300 pins. The board was at an angle of about 90 degrees to the subject's working hand, but the subject was made to change this position if he desired. The equipment for the finger dexterity test consists of a board with 100 holes arranged in 10 rows of 10 holes. Above the holes is a shallow well holding 300 metal pins. Each pin is 1 inch long and each of the 100 holes in the board will accommodate three of the pins. The test requires that three pins be picked simultaneously, from the pile of pins with the fingers of one hand and placed into each of the 100 holes, starting from the farthest corner, filling every row one after the other in "Z pattern" moving towards yourself. The time required, in minutes, to fill the 100 holes is the basis for the score. The fewer minutes required, filling the 100 holes, the higher is the score, in turn indicating that the efficiency of a resident doctor in handling surgical instruments is better. Resident doctors of each year of residency were compared amongst themselves. Every resident doctor was informed about his score and rank as compared to others at the end of the study. Respective HOD's were not informed about the final outcome. The outcome measures for all resident doctors receiving training in micro and macro surgeries were assessed for their manual dexterity. Evaluation of whether handedness affects manual dexterity was carried out. Also Resident doctors scoring below average were recommended more intensive training compared to those scoring average and excellent.

RESULTS

Thus this study assessed if handedness affects dexterity. The resident doctors of each year of residency were plotted graphically considering their score in minutes on O' Conner Finger Dexterity Test and their handedness. The overlap of the two graphs show handedness does not affect dexterity.

Table 1. Table showing the number of resident doctors in each year of residency

Year of residency	Total number of residents
1st year residents	45
2nd year residents	33
3rd year residents	42

Table 2. Speciality wise distribution of Resident Surgeons

Speciality	Jr. 1	Jr. 2	Jr. 3	Total
Orthopaedics	15	22	8	45
Gynaecology	20	1	17	38
Surgery	10	10	17	37

Figure 1. Distribution of surgical residents according to years of residency.

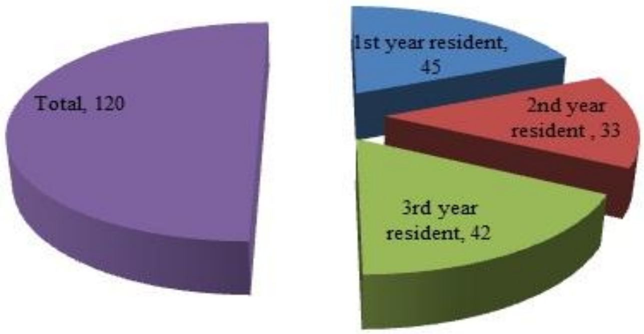


Figure 2. Resident surgeons according to academic year and departments

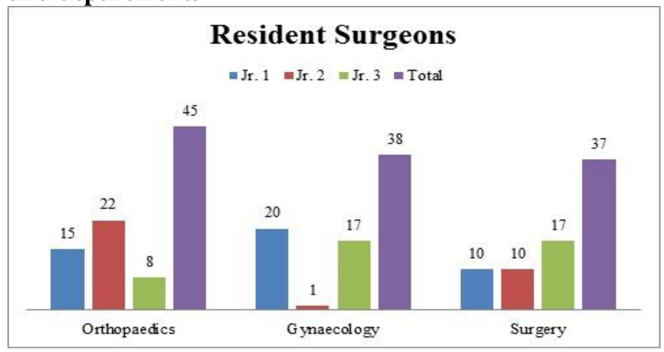


Figure 3. Distribution of Left and Right handed scores in Jr. 1 group

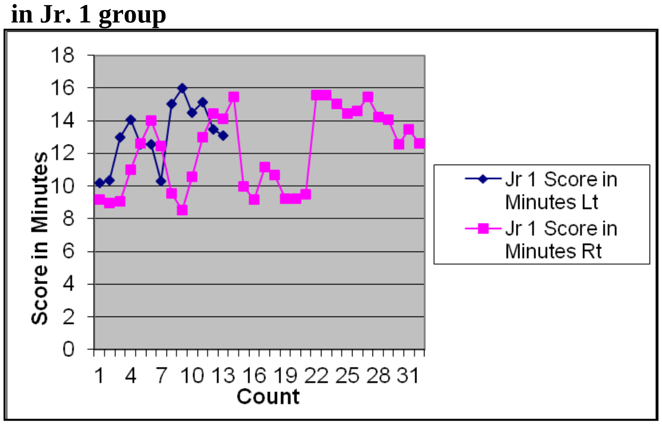


Figure 4. Distribution of Left and Right handed scores in Jr. 2 group

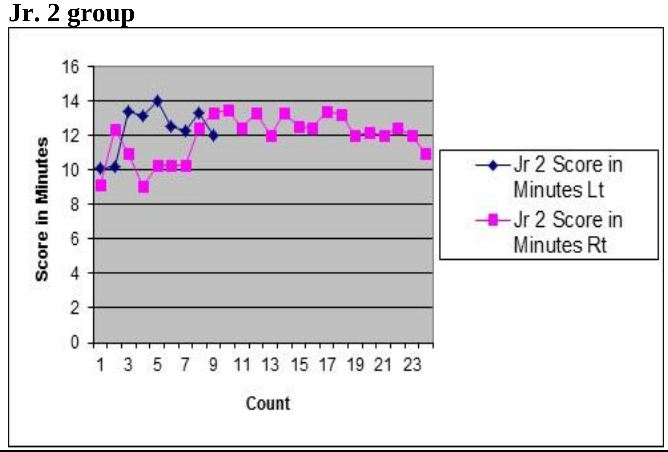
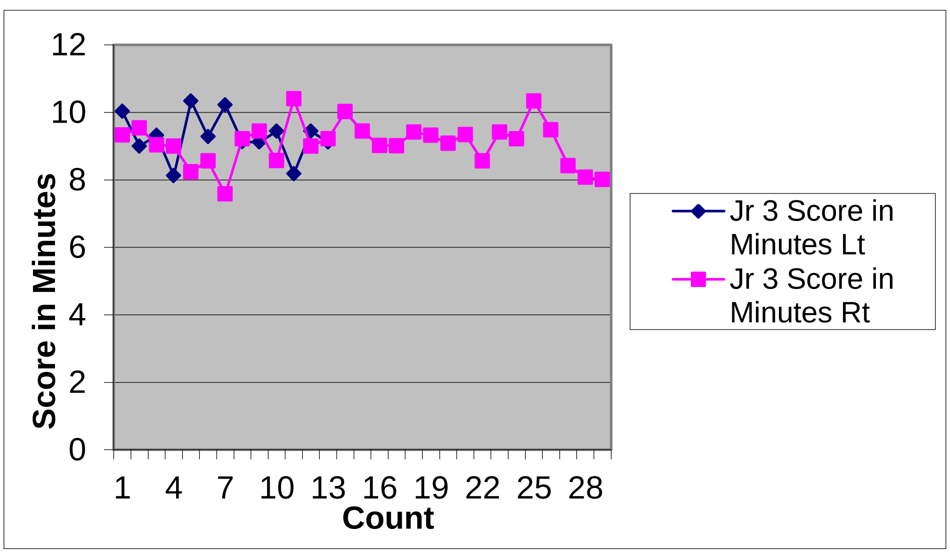


Figure 5. Distribution of Left and Right handed scores in Jr. 3 group



DISCUSSION

In this study, O'Connor finger dexterity test was used, which determined if handedness affects manual dexterity. Any surgical operation requires tremendous hand dexterity and invaluable hand-eye co-ordination. Precision of finger movements and concurrently the speed with which a surgical task is carried out is also significant. O'Connor finger dexterity test acted as an invaluable screening test, which in advance determined all the above parameters too. Several parameters affect digital dexterity [7]. There was a decrement in performance assessed by O'Connor finger dexterity test, under cold temperature conditions. Digital dexterity performance improves with age [8]. With this test, it was concluded that digital dexterity is not affected by handedness but the performance improved with each succeeding year of residency. The O'Connor tweezer dexterity test was found to be very successful at screening out those individuals, who do not have the necessary fi ne dexterity to perform the work of hair graft placement [9]. Gloves decrease dexterity and hand sensitivity. The use of even thin gloves causes a decrease in dexterity [10] sensitivity and increases the time required to perform manual tasks. The test was used to assess dexterity of individuals with bare hands and those wearing chemical gloves. Thickness of gloves [11] affects dexterity too.

Clinical condition like diabetes affects motor skills (e.g., dexterity), which was assessed by this test in one study [12]. To predict hand function after an occupational hand injury [13], one study included Purdue pegboard test which worked on the same principle as O'Connor finger dexterity test. In the study of Forrester and Hilary [14] on thinking drink, as the brain was dehydrated, the fi ne motor activity was severely affected which was tested by O'Connor finger dexterity test. Kimmerle et al [15] evaluated "eye hand coordination", and "dexterity." by standardized tests such as the O'Connor dexterity tests. The research [16] effort examined the effect of the Level A suit on fine motor and gross motor dexterity. Tasks comprised the Minnesota dexterity test 9 (same principle as O'Connor finger dexterity test). There was a significant detrimental effect from wearing the suit for both measures of performance. Kruskal–Wallis test is a non-parametric test, applied to qualitative data. The distribution of the population was not normal, as the resident doctors were taken from each year of residency, so this test was used. When a group of neurologists scanned the brains of four hundred and sixty-five adults, they found no effect of handedness on either grey or white matter volume or concentration, either globally or regionally [17].

CONCLUSION

Though this study concluded that handedness does not affect manual dexterity, the main aim of this study was "to let the resident doctor of each year of residency, himself know his grade of dexterity as compared to his peers and improvise on his surgical skills." Thus, it helped every resident doctor to assess his/her own personal skills as compared to all the other resident doctors. All surgical resident doctors receiving training in micro and macro surgeries were assessed for their manual dexterity. Resident doctors scoring below average were recommended more intensive training compared to those scoring average and excellent.

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