

Research Article

PREVALENCE OF LEFT/RIGHT CONFUSION AMONG MEDICAL STUDENTS IN MUTAH UNIVERSITY, AL KARAK, JORDAN

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Abstract

Background: The ability to distinguish left from right has been shown to vary substantially within healthy individuals, yet its characteristics and mechanisms are poorly understood.

Objective

Aims: The study was designed in an effort to spot the extents of Left-Right Confusion (LRC) among medical students in Mutah university and to investigate the relationship between LRC and multiple health and socioeconomic variables.

Methods: Analytic cross section study was performed. Database gathered by google sheet in order to introduce them to software. Before analysis, survey was checked for missing data, statistically analyzed by SPSS version 25.

Results: The prevalence in our sample was slightly lower than the prevalence reported in prior research, which was 14.7%, and this may be attributed to medical students greater level of education and overall understanding when compared to the general population.

Conclusions: It was found that there is a statistically significant link between gender, communication issues, and ADHD. The challenge now is where we go from here; since the relationship we discovered between ADHD and left-right confusion is novel, we need to carry further research to establish this unique association more solidly.

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List of Abbreviations: LRC: Left-Right Confusion; ADHD: Attention Deficit Hyperactive Disorder; BLRD: Bergen Left-Right Discrimination test

Introduction

The ability to distinguish between left and right, known as Left Right Discrimination (LRD), is critical in everyday life. It is important to be able to distinguish left from right while following directions to an unknown location or operating on a patient's knee. It is acceptable to presume that most people have acquired such a necessary skill during childhood, but recent research indicated that it differs significantly within healthy individuals and this phenomenon of confusing left and right is widely spread. Surprisingly little is known about the features of this phenomenon and the underlying process involved in differentiating between left and right. There are just a few papers on this sort of spatial processing accessible.

There are two types of LRD: Egocentric and allocentric. The ability to distinguish left from right from

one's own perspective with usual orientations is known as egocentric LRD. Allocentric LRD is claimed to be an association of egocentric LRD with mental rotation and is employed for uncommon orientations or for other people's bodies. The Bergen left-right discrimination test was utilized in this study to investigate allocentric LRD [1].

Different measures can be used to examine left-right discrimination. Older research frequently relied solely on self-report questionnaires (questions on subjective LRD performance in daily life). In recent research, behavioral tasks such as the BLRDT have been utilized instead of self-report, or self-report questionnaires have been combined with behavioral tasks. Several characteristics, including sex, handedness, and education, were identified as contributors explaining LRD variability in those

investigations [2].

After evaluating his own very selective issues in this area, Wolf was the first to quantify left-right confusion. According to a brief survey of 790 doctors and their spouses, 17.5% of women and 8.8% of men had "often" difficulty distinguishing between the left and right sides. Then, in their study, Harris and Gitterman incorporated both gender and hand variables. The researchers discovered that 44.7% of women and 15.8% of men have trouble rapidly recognizing the left and right sides among 364 university professors. They also discovered that the difficulty was greater for left-handers, particularly women. These gender and handedness effects have been confirmed in more recent studies, but the effect of gender has been shown to be age modulated and sex difference has either not been found or not been reported in older adults in the study by Often and Hugdahl with a wider age range. Women are more prone to left-right confusion compared with men or detected in the opposite direction, to the benefit of women. Others, on the other hand, found no noticeable effect of handedness [3].

Women's reported performance is inconsistently correlated with their actual behavioral task performance, with some studies reporting a moderate correlation and others reporting no correlation. Women's lower self-report ratings may be due to their compliance with sex stereotypes. When behavioral tasks involve analyses, some research reveal sex differences, however, other investigators have found no such differences. As a result, the impact of gender on left-right discrimination remains an open question, with one possible explanation being that sex interacts with other variables like handedness [4].

When it comes to handedness. Indeed, it has been found that right handers reported fewer difficulties than left handers in LRD. Moreover, left handed men performed better than right handed men on the BLRDT. Yet, there are many studies that do not report a significant difference between left handers and right handers.

It should be emphasized, however, that no research has a left-hander ratio greater than 15%. Furthermore, most research rely exclusively on self-reports, which have been shown to be inaccurate, until a research using a balanced sample of left and right handed persons discovered a left hander advantage in both detecting left hands (41%) and validating "left" assertions. Furthermore, Vingerhoets and Sarrechia found that handedness had no effect on performance on its own, but that greater manual preference strength and asymmetry were associated to higher performance.

Since the dawn of this issue it was suggested that LRD a developmental skill, It wasn't until 2002, when Ofte and Hugdahl found the cognitive abilities component, that it became well known, they stated that LRD performance is lowest among children under the age of eight (12%). Performance was better in adolescents (12–13 years old) and older adults (40%). Young adults outperformed all other categories by a substantial margin (60%).

Furthermore, LRD performance in older individuals appears to follow the same downward pattern as spatial cognitive ability declined in elderly people [5].

As a result, it has been discovered that a student's

academic curriculum has an impact on their left-right discriminating performance, with medical students outperforming law and psychology students. The fact that medical students are better at LRD and have better spatial abilities supports the theory that LRD and spatial cognitive ability are linked. Furthermore, medical students aspiring to be surgeons scored higher on the LRD than those aspiring to be general practitioners or medical physicians. It was suggested that this improvement was due to future surgeons more frequent use of spatial abilities than other medical students.

Since Benton proposed that one component of LRD is visuo-spatial ability, research failed to show a link between LRD and performance on a mental rotations test or a navigation task in a 3D virtual maze, thus the nature of the visuo-spatial skills associated with good performance in LRD remains unknown [6].

Also as an attribution of words to RLD concept, regardless of sex, a negative association of LRD response time with visuo-spatial and verbal long-term memory was discovered, offering fresh insights into the link between cognitive skills and LRD performance. Recent insights into the suggested cognitive mechanisms underlying right-left confusion were discussed by Ubuka Tagami and Shu Imaizumi in their recently published paper as they proposed that it could be classified into visuo-verbal and verbo-visual processes and mental rotation based on a self-reported measure, although their psychometric and behavioral indices might be distinct, as they cross react with other factors such as cortical lateralization, handedness, and sex. These relations need to be studied broader alongside the whole aspect of the mechanism of right-left confusion including visuo-verbal and verbo-visual processes and mental rotation. From the previous point we hypothesized that the disorders affect this pathway may affect the LRC rate, ADHD was chosen with a number of diseases. Studies showed that ADHD is associated with weaker function and structure of Prefrontal Cortex (PFC) circuits, especially in the right hemisphere and it affects sound intensity response, showed a significant effect of handedness and seems to cause atypical left-right balance of visuo-motor awareness in adult ADHD (combined type), these things seems to affect LRD also as mentioned in previous literature [7].

Furthermore, given the lack of consensus on what processes may drive LRC, recent research sought to include a question on strategy usage. An informal pilot questionnaire demonstrated that people may utilize numerous similar ways to pick between left and right. Such approaches may aid in determining if LRI is based on body position, verbal labeling, or basic perception. Furthermore, they investigated if certain techniques are associated to subjective LRI; they investigated whether specific methods were linked to greater or poorer performance evaluations. Including strategy use as an extra issue was beneficial; there was a distinct separation between those who used their body, notably their hands, to decide on left and right and those who did not. The great majority of individuals who did not utilize their body said that they did not apply any overt method and "simply knew" left from right. The use of hands to

differentiate left from right underlines the relevance of spatial body characteristics in LRI, however this impact appears to be restricted to 42.9% of individuals. Those who did not use their hand evaluated their LRI skill significantly higher than those who did. It is probable that LRI is more internalized and automatic for those persons, and that relying on hand cues is more common in those who are inherently less clear about left and right [8].

In addition to the relationship between verbal labelling or lower level perception with LRD, there could be an association between horizontal body centered orientation and LRD in the context of using the body in navigating left-right decisions, as proposed by Gold et al., that LRD is a defect in horizontal body centered orientation, they offer a model in which such body centered spatial orientation is represented by horizontal, vertical, and radial representation systems, which explains the selectivity of the Left-Right Identification (LRI) problem. The evidence that LRD comes from a defect in body or its internal characteristics and not from external 16 are rapidly increasing, as it confirmed by Vingerhoets and Sarrechia who documented that body symmetry is linked to the ability to distinguish between left and right. They discovered that having a stronger physiological asymmetry, as evaluated by handedness, grip strength, and tactile sensitivity, is connected to having less left-right issues [9].

Moreover, a recent research stated that the process appears to rely on a stored body representation rather than bottom-up sensory information and so as a result, even when this is not explicitly part of the job, they believe a top-down body representation is the main process in identifying left and right, also the performance was enhanced when there is an external stimuli, in particular with a hand related strategy [10].

Right-left confusion in medical practice may lead to iatrogenic mishaps and thus can be of serious concern with respect to the patient care. Hence, the purpose of this study was to assess the Right-Left Discrimination (RLD) ability among medical students and since a lot of doors has been left open, in this study and unlike other studies, we intend to investigate and introduce a new aspects that have never been studied before including life style factors, various disorders, childhood experiences and role of individual differences and personality traits; to unravel the relationships between it and RLC whether such interactions could also affect performances in left-right discrimination using objective and subjective tests, and in the first place to assess the prevalence among this interesting population and make a solid ground for further research [11].

Aims:

- To determine medical students' self-awareness and ability to discriminate right from left; to

identify characteristics associated with this ability; and to identify any techniques AND strategies used to aid discrimination.

- To identify the prevalence of RLC among medical students in Mu'tah university.
- To detect the relation between RLC and sociodemographic, and medical characteristics of the medical students.
- To investigate the correlation between RLC and lifestyle factors, chronic intake of certain medications.
- To find a correlation between RLC and various disorders) learning disabilities, ADHD, chronic diseases).

Materials and Methods

Participants: Overall 636 medical student in Mutah university, female (N=358, 56.3%) and male (N=278, 43.7%) were participated in online self-questionnaire provided by google forms; which included first year (N=179, 28.1%), second year (N=121, 19.0%), third year (N=132, 20.75%), fourth year (N=57, 8.96%), fifth year (N=92, 14.4%), sixth year (N=55, 8.64%). Age of the participants ranges 17–24 years. The mean age was (20.08) for female and was (20.28) for male, classified into; 61 left handed, 551 right handed and 24 right/left handed [12].

Methods

Analytic cross section study was performed. Database gathered by google sheet in order to introduce them to software. Before analysis, survey was checked for missing data, statistically analyzed by SPSS version 25, based on bar chart, columns, number, tables. P value (less than 0.05 considered to be significant) [13].

We confirm that ethical approval has been granted by Mutah school of medicine ethical approval committee.

We confirm that participants have given consent for their data to be used in the research [14].

Material

Survey data was collected through many various question (yes, no questions; can you distinguish between left and right?, Do you have the ability to distinguish between left and right but not from the first time?, Have you ever choose the right while someone told you to the left?). (MCQ: what the mechanism that you usually used to distinguish between right and left? How much time do you needed to distinguish between them?).

Results

Our sample size was 636 students, with a mean age of 20.17 years old (Tables 1 and 2) [15].

Table 1. Shows a gender split of participants. Where 56.3% female (358/636) and 43.7% male (278/636). Students in the basic years (first to third) participated at a higher rate than students in the clinical years, and the most of participant it was first medical student.

Sample size	636 participants out of 2519 students (25%)
Gender	Females: 358 participants (56.3%) Males: 278 participants (43.7%)
Year of study	Basic years 67.9% Clinical years 32.1%
Area of living	Amman 31.1% Karak 30.3% Irbid 11% Other governorates 27.6%

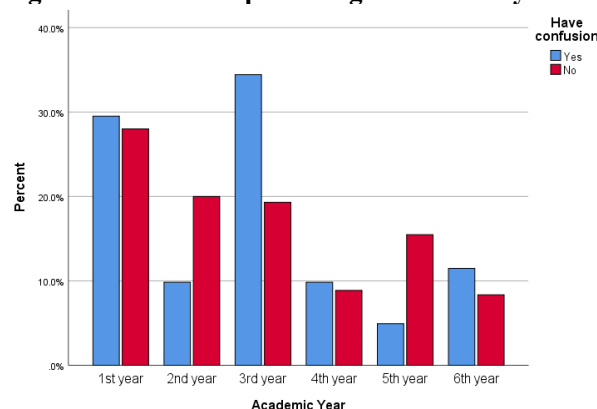
Table 2. Shows the frequencies of each response option per question.

			Have confusion		Total
			Yes	No	
Time needed to distinguish	Very fast (less than 2 sec.)	Count	13	415	428
		% Within have confusion	21.30%	72.20%	67.30%
	Average (2-4 sec.)	Count	41	155	196
		% Within have confusion	67.20%	27.00%	30.80%
	Slow (more than 4 sec.)	Count	7	5	12
		% Within have confusion	11.50%	0.90%	1.90%
Total		Count	61	575	636
		% Within have confusion	100%	100%	100.00%

Data showed that 12 out of 636 participants responded with more than 4 second on Question 1: how well can

identified left and right (21.3%) 9.6% of students reported having left-right confusion (Figure 1).

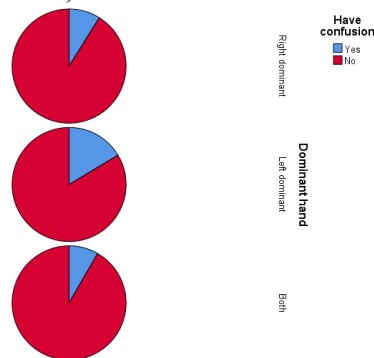
Figure 1. Shows the percentage of medical years and LRC.



The prevalence of participant having LRC was 12.6% in females, and 5.8% in males (p value <0.05), and the fifth

medical student it was the less participant have LRC (Figure 2).

Figure 2. Shows that 86.6% of our sample is right handed and 8.9% of them reported having confusion, while 9.6% of participants are left-handed and 16.4% of them have left-right confusion, even the prevalence is higher among left-handed individuals, but the increase was statistically insignificant.



In the present study it was found that (6.6%) of participants with confusion have taken insulin (anti-diabetic drug) (p value <0.001), and (6.6%) of them take hypnotics (p value $=0.048$), so there is a highly significant association between drugs and left right confusion, not found any relation between LRC and smoking [16].

Moreover, 34.4% of LRC participants reported having difficulty communicating with others (p value 0.001), and the person having anxiety when asked to distinguish between right and left the rate of LRC increased (95.1).

It was also found that there is a significant association between being diagnosed with ADHD and having left-right confusion, as the prevalence of ADHD in the whole sample was 1.7% while the percentage among students who have confusion was 8.2%, the (p -value <0.001) which is highly significant [17].

Furthermore, 27.9% of participants who have LRC were academically affected by having LRC, especially regarding anatomy and radiology courses as these subjects require the allocentric type of discrimination which is a harder skill [18].

Discussion

Overall, our findings mostly align with previous literature regarding LRC with some novel findings that can be further investigated. Firstly, concerning gender, we found a significant association between the female gender and LRC which is in accordance with multiple studies [19].

As for handedness, our study found that Left-handed students experience LRC more than right handed individuals, which does not align with the study on medical students in Ireland, However, this relation we found between LRC with left-handedness was found to be statistically insignificant and the total number of left handed students in our sample was not high enough to suggest a strong link between the two factors, and the absence of a link between handedness and LRC is supported by previous literature.

Most importantly, a statistically significant finding was found between students formally diagnosed with ADHD and LRC. After an extensive literature search, we can confidently say that this link is novel and has not been explored in any other study concerning LRC. Nevertheless, there are a few factors that must be accounted for to establish the link more strongly between LRC and ADHD, the first being that our study relied on a

self-reporting questionnaire, so future research investigating this link should rely more on an objective measure of LRC like the Bergen Left-Right Discrimination test (BLRD). Moreover, the number of formally diagnosed ADHD patients in our sample is low, so a larger sample of ADHD patients is needed to investigate the link in a better way [20].

As it pertains to the population of the study being medical students, we tried to investigate existence of relation between LRC and the desired future specialty, and unlike previous studies investigating this link, our study showed an insignificant association between LRC and the future desired specialty. Furthermore, since medical school involves the skill of left-right discrimination, one of the items on the questionnaire explored the academic effect of having LRC on the students, and a significant number of students reported being negatively impacted by LRC on studying subjects like anatomy and radiology, interestingly, these two subjects mostly require allocentric left-right discrimination which is harder to master so the negative effect of LRC on students performance in anatomy and radiology is justifiable.

Altogether, with the help of the large sample size that participated in the study, we were able to effectively reach the aim of the study of finding the prevalence of LRC and its associated factors. We hope our study opens the door for future studies using more objective measurements and focused investigations.

Conclusion

The prevalence in our sample was slightly lower than the prevalence reported in prior research, which was 14.7%, and this may be attributed to medical students greater level of education and overall understanding when compared to the general population. In addition to that, we discovered a statistically significant link between gender, communication issues, and ADHD. The challenge now is where we go from here; since the relationship we discovered between ADHD and left-right confusion is novel, we need to carry further research to establish this unique association more solidly.

References

1. Auer T, Schwarcz A, Aradi M, Kalmar Z, Pendleton C, et al. Right left discrimination is related to the right hemisphere. *Laterality: Asymmetries of body.*

- Laterality. 2008;13(5):427-438.
2. AL B. Right-left discrimination. *Pediatr Clin North Am.* 1968;15(3):747-758.
 3. Baghdadi G, Towhidkhan F, Rostami R. Left and right reaction time differences to the sound intensity in normal and AD/HD children. *Int J Pediatr Otorhinolaryngol.* 2017;97:240-244.
 4. Braun CMJ, Delisle J, Suffren S, Bolduc M. Atypical left-right balance of visuomotor awareness in adult ADHD (combined type) on a test of executive function. *Laterality.* 2013;18(4):385-406.
 5. Techentin C, Voyer D, Voyer SD. Spatial abilities and aging: a meta-analysis. *Exp Aging Res.* 2014;40(4):395-425.
 6. Constant M, Mellet E. The impact of handedness, sex, and cognitive abilities on left-right discrimination: A behavioral study. *Front Psychol.* 2018;9.
 7. Elkind D. Children's discovery of the conservation of mass, weight, and volume: Piaget replication study II. *J Genet Psychol.* 1961;98(2):219-227.
 8. Gormley GJ, Dempster M, Best R. Right-left discrimination among medical students: questionnaire and psychometric study. *BMJ.* 2008;337(7684).
 9. Vingerhoets G, Sarrechia I. Individual differences in degree of handedness and somesthetic asymmetry predict individual differences in left-right confusion. *Behav Brain Res.* 2009;204(1):212-216.
 10. Grewe P, Ohmann H, Markowitsch H, Piefke M. The Bergen left-right discrimination test: Practice effects, reliable change indices, and strategic performance in the standard and alternate form with inverted stimuli. *Cogn Process.* 2013;15(2):159-172.
 11. Ham IJ van der, Dijkerman HC, Stralen HE van. Distinguishing left from right: A large scale investigation of left right confusion in healthy individuals. *Q J Exp Psychol.* 2020;74(3):497-509.
 12. Hannay HJ, Ciaccia PJ, Kerr JW, Barrett D. Self-report of right-left confusion in college men and women. *Percept Mot Skills.* 1990;70(2):451-457.
 13. Harris LJ, Gitterman SR. University professors self-descriptions of left-right confusability: Sex and handedness differences. *Percept Mot Skills.* 2016;47:819-823.
 14. Jaspers Fayer F, Peters M. Hand preference, magical thinking and left-right confusion. *Laterality.* 2005;10(2):183-191.
 15. Jordan K, Wustenberg T, Jaspers-Feyer F, Fellbrich A, Peters M. Sex differences in left/right confusion. *Cortex.* 2006;42(1):69-78.
 16. Gold M, Adair JC, Jacobs DH, Heilman KM. Right-left confusion in Gerstmann's syndrome: A model of body centered spatial orientation. *Cortex.* 1995;31(2):267-283.
 17. Hirnstein M. Dichotic listening and left-right confusion. *Brain Cogn.* 2011;76(2):239-244.
 18. Ocklenburg S, Hirnstein M, Ohmann H, Hausmann M. Mental rotation does not account for sex differences in left-right confusion. *Brain Cogn.* 2011;76(1):166-171.
 19. Ofte SH, Hugdahl K. Right-left discrimination in male and female, young and old subjects. *J Clin Exp Neuropsychol.* 2002;24(1):82-92.
 20. Ofte SH. Right-left discrimination: Effects of handedness and educational background. *Scand J Psychol.* 2002;43(3):213-219.

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