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COMPARISON OF INTERESTS AND SPECIAL ABILITIES OF LEFT- AND RIGHT-HANDERS

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Abstract. Cerebral lateralization is associated with differences in brain organization and handedness is seen as its main marker. In order to verify the hypothesis that differences in brain organization tend to be associated with different patterns of interests and abilities, 379 normal left-handed subjects (221 women, aged 18 – 72 years) and 366 normal right-handed subjects (256 women, aged 18 – 72 years) were interviewed about their interests and special abilities. The following interests and special abilities were studied: singing, playing an instrument, dancing, painting, acting, foreign language skills, sports skills, and writing poetry.The results in the left-handers group showed that there is a significantly higher percentage of subjects with a pronounced interest in playing an instrument. In the group of right-handers, the study demonstrated a significantly higher percentage of subjects specifically interested in learning foreign languages. With respect to the abilities, a significantly higher incidence of participants with vocal, instrumental, sports, and foreign language skills was found in the left-handers' group. Differences in functional cerebral organization between left- and right-handers were suggested as possible explanation for the relationship of handedness with special abilities.

Keywords: handedness; interests; musical abilities; foreign language skills; sports skills; cerebral lateralization

Introduction

For decades on end scholars of psychology have explored the relation between handedness and cerebral lateralization focusing, among other issues, preeminently on the effects of handedness upon individual differences.

Trying to explain the differences between right-handers and left-handers, as well as the factors determining these differences, researchers have attempted to define a relation between handedness and health, personality, cognitive abilities, interests, etc. Although inconsistent, the data accumulated over the years support the conception that there is a tendency for left-handers to show differences from right-handers, which is related to both benefits and losses for the former (Llaurens, Raymond, & Faurie 2008).

In terms of health, left-handedness is primarily associated with losses. Left-handers are reported to suffer more often from immune diseases, such as dermatomyositis, Hashimoto's disease, mixedema, Crone's disease, rheumatoid arthritis, thyrotoxicosis, acute colitis, migraine, allergies, bronchial asthma, psoriasis (for a detailed review see Porac 2015; and Ruebeck, Harrington, & Moffitt 2007). Additionally, the incidence of sleep disorders, as well as epilepsy and high blood pressure is higher with left-handers (Bryden, Bruyn, & Fletcher 2005), who are also at greater risk of traffic or accidents at home or work (Daniel & Yeo 1994; Dutta & Mandal 2006). Their life span is about 8 years shorter than that of right-handers, who in turn exceed them in height and weight (Fudin, Renninger, & Hirshon, 1994). Their puberty tends to occur later in life (Coren, Searleman, & Porac 1986) and their percentage is higher among homosexual men (Lalumiere, Blanchard, & Zucker 2000). However, they suffer less frequently from arthritis and ulcer than right-handers (McManus & Wysocki 2005).

The relation between handedness and personality has received much less attention and the experimental results are inconsistent. *According to some studies,* left-handers tend to be more introverted (Lester 1987), dominant, arrogant, calculating, and cold-hearted (Coren 1994), more agreeable, and left-handed females more extroverted (Sartarelli 2016). They show initially higher anxiety due to task novelty (Wright & Hardie 2012) and tend to be more anxious (Asenova 2005; Lyle, Chapman, & Hatton 2012). Conversely, other researchers argue that there are no differences between left- and right-handers in terms of personality traits (Beaton & Moseley 1984; Nettle 2003). A survey based on the Eysenck Personality Questionnaire (which measures the personality traits Extroversion, Neuroticism and Psychoticism) (Camposano, Corail, & Lolas 1991) and a study of the personality traits of the Big Five (Grimshaw & Wilson 2013) claim not to have detected statistically significant differences between left- and right-handers in any of the factors that were measured.

The relation between manual laterality and cognitive abilities seems to be the most controversial issue in this line of research. The data is highly disputed and the results vary from one extreme to the other. Some studies report that no differences in cognitive abilities have been observed between left- and right-handers (Mulligan et al. 2001; Nettle 2003; Sartarelli 2016), while others claim that the former have poorer (Johnston et al. 2010; Nicholls, Chapman, Loetscher, & Grimshaw 2010), or, conversely, better cognitive abilities (Ghayas & Adil 2007). What is even more important is that some scholars simultaneously situate the cognitive abilities of left-handers at the two opposite ends of the scale (Geschwind & Galaburda 1987), giving evidence for overrepresentation of left-handers both among gifted and talented people (Benbow 1986; Coren 1995; Hicks & Dusek 1980), and among people suffering from different types of neurodevelopmental deficits such as autism, intellectual disability, learning disabilities, developmental dysphasia, stuttering, dyslexia

(for an overview see Bishop 1990), or from psychiatric diseases such as schizophrenia (Dragovic & Hammond 2005) and depression (Denny 2009).

Despite the inconsistency of the findings, most of the researchers take the stand that left-handers have better right-hemisphere abilities related to music (Adekoya & Ogunola 2015; Aggleton, Kentridge, & Good 1994; Kopiez, Galley, & Lee 2006), mathematics (Annett & Manning 1989; Casey, Pezaris, & Nuttall 1992), spatial abilities (Adekoya & Ogunola 2015; Annett 1992; Mefoh & Samuel 2013), as well as abilities requiring higher interhemispheric cooperation, such as bimanual coordination (Gorynia & Egenter 2000; Judge & Stirling 2003), psychomotor speed, executive functions (cognitive flexibility, inhibitory control and working memory) (Gunstad et al. 2007), while right-handers have better left hemisphere abilities: time estimation skills (Gunstad et al. 2007), and convergent thinking (Coren 1995).

A study on the relationship between handedness and interests as reflected in hobby preferences shows that right-handers are overrepresented among people doing sports, while left-handers tend to prefer reading books, collecting, and going to the theatre or the cinema. Subjects with mixed handedness, on the other hand, have preferences to arts, like playing music, drawing, or handicraft (Giotakos 2004).

All these differences between right- and left-handers are considered to stem from handedness-related differences in hemispheric dominance (Annett 1992; Bishop 1990; Geschwind & Galaburda 1987).

An interesting idea emerges in relation to the research on handedness and abilities, which suggests that the specific cognitive faculties of left-handers probably lead them to certain types of jobs, mainly creative, and give them a better socioeconomic status, which in turn makes them preferred partners and provides them with greater reproductive success (Faurie et al. 2006, 2008). This hypothesis is supported by comparative studies on occupational choice and professions and on income levels, which demonstrate that left-handers are overrepresented among architects (Schacter & Ransil 1996), artists (Mebert & Michel 1980), musicians (Hassler & Gupta 1993), among people who practice sports such as basketball (Heilman 2005), boxing (Gursoy 2008), fencing (Voracek, Reimer, Ertl, & Dressler 2006) baseball (Heilman 2005), tennis (Holtzen 2000), cricket (Wright, Hardie, & Rodway 2004), handball (Baker et al. 2013).

According to Ruebeck, Harrington, and Moffitt (2007), as regards income comparison, the results show that left-handed men are paid better by the hour as compared to right-handed ones (nearly 4%) and their salaries are much higher (about 15%) than those of highly qualified right-handed men. However, according to Goodman (2014), left-handers have consistently lower labor market earnings than right-handers.

The brief literature overview concerning handedness-related differences in interests and abilities leads to the conclusion that such a relationship does exists. Its parameters, however, are far from being clearly defined, which opens additional research opportunities.

The present comparative study of left- and right-handers is designed to test the validity of the hypothesis that, as the most direct expression of cerebral lateralization, handedness is associated with different patterns of interests and special abilities.

Methods

Participants

A total of 745 healthy adults (477 women, age range 17-71) voluntarily participated in the study. Their selection was made on the basis of an initial screening from an initial number of 819 subjects including the following obligatory conditions:

– No history of neurological and psychiatric disorders;

– Explicit self-determination as left- or right-handed based on the information about the preferred writing hand and absence of experienced pressure in childhood to switch the writing hand from the preferred left to the right.

According to the data from this initial screening, 379 subjects reported to be left-handed (221women; Mean age = 28.2 years, SD = 6.8) and 366 – right-handed (256 women; Mean age = 26.35 years, SD = 5.1). Information about the education and employment status of the two groups is presented in Table 1.

Table 1. Information about the education and employment status of the participants

	Education			Employment Status			
BE	US	HE	undergraduate	employed	unemployed	pensioner	
Group	(n) %	(n) %	(n) %	(n) %	(n) %	(n) %	(n) %
RHs	(3) 0.8	(285) 77.9	(78) 21.3	(191) 52.2	(132) 36.1	(29) 7.9	(14) 3.8
LHs	(4) 1.1	(71) 71.5	(104) 27.4	(182) 48.0	(143) 37.7	(33) 8.8	(21) 5.5

Note. BE – basic education; USE – upper secondary education; HE – higher education

Measures

Each participant was asked to complete a questionnaire containing questions about her/his interests and special abilities as well as the details of their development and improvement in terms of goal orientation, duration, and systematic character of the education and training (Appendix).

The following special abilities of the subjects were studied: singing, playing an instrument(s), dancing, painting, acting, foreign language(s), sports.

The processing and coding of the results of the self-evaluation of interests and abilities was based on the following criteria:

– Irrespective of its duration, all participants that pointed out they had had special training in any of the cognitive activities included in the questionnaire were assessed as demonstrating an interest in it;

– Subjects who pointed out they had had at least 4-year active practice developing a cognitive ability in conditions of formal education and training, with a workload of at least 4 hours a week were assessed as possessing an ability, if they evaluated themselves as "good" or "very good";

– With respect to the number of languages, instruments, or sports the subjects speak, play, or practise at a "good" or "very good" level, they were categorized in two groups: (i) playing one instrument, speaking one language, doing one sport or (ii) playing two or more instruments, speaking two or more languages, doing two or more types of sport.

– Of all the participants who completed the section "other special abilities", only two pointed out an ability other than "writing poetry". One of the participants had "very good photographic skills" and the other "exceptional culinary abilities". For this reason "writing poetry" was included in the comparative analysis.

The questionnaire used for data collection was designed especially for the purposes of the study.

Undergraduate students in Psychology actively participated in recruiting volunteers to participate in the study through personal contacts with students from various specialties of the university, relatives and friends.

Analysis

For statistical evaluation, the crosstab chi square test and two-sample analysis in the SPSS 16.0 were applied.

Results

Table 2 presents the results concerning differences between the groups of left- and right-handers in the percentage of participants that reported an interest and/or good and very good ability for singing, playing instrument(s), dancing, foreign languages, mathematics, sports, painting, acting, writing poetry.

Statistically significant differences between left- and right-handers were observed only in relation to musical and foreign language interests: the percentage of participants interested in playing an instrument was higher in the left-handers group ($X^2_{|1|} = 6.539$, $p = 0.011$, $\varphi = 0.094$), while the percentage of the subjects interested in learning foreign languages was higher in the right-handers group ($X^2_{|1|} = 23.670$, $p = 0.001$, $\varphi = 0.178$). As regards their abilities, the left-handers group demonstrated a statistically significant difference from the right-handers group in terms of singing ($X^2_{|1|} = 6.622$, $p = 0.010$, $\varphi = 0.094$), playing an instrument ($X^2_{|1|} = 6.539$, $p = 0.011$, $\varphi = 0.145$), speaking a foreign language(s) ($X^2_{|1|} = 9.265$, $p = 0.002$, $\varphi = 0.112$), and doing sports ($X^2_{|1|} = 4.576$, $p = 0.032$, $\varphi = 0.078$). No significant between-group differences were established in regard to the interests and abilities in dancing, mathematics, arts, painting, and writing poetry ($p > 0.05$).

Table 2. Percentage of the participants with interests and abilities for studied activities

	Interests					Abilities				
	RHs		LHs		$X^2_{\|1\|}$ (p)	RHs		LHs		$X^2_{\|1\|}$ (p)
	N	%	N	%	φ	N	%	N	%	φ
Singing	57	15.6	63	16.6	0.152 (0.697) $\varphi = 0.014$	28	7.7	51	13.5	6.622 (0.010) $\varphi = 0.094$
Playing an instrument/s	39	10.7	65	17.2	**6.539 (0.011)** $\varphi = 0.094$	23	6.3	58	15.3	**15.630 (0.001)** $\varphi = 0.145$
Dancing	86	23.5	77	20.3	1.102 (0.294) $\varphi = 0.038$	43	11.7	62	16.4	3.268 (0.071) $\varphi = 0.066$
Foreign languages	233	63.7	174	45.9	**23.670 (0.001)** $\varphi = 0.178$	62	16.9	99	26.1	**9.265 (0.002)** $\varphi = 0.112$
Mathematics	43	11.7	44	11.6	0.003 (0.953) $\varphi = 0.002$	29	7.9	32	8.4	0.067 (0.796) $\varphi = 0.009$
Sports	149	40.7	179	47.2	3.211 (0.073) $\varphi = 0.066$	75	20.5	103	27.2	**4.576 (0.032)** $\varphi = 0.078$
Painting	39	10.7	30	7.9	1.664 (0.197) $\varphi = 0.047$	18	4.9	16	4.2	0.207 (0. 649) $\varphi = 0.017$
Acting	22	6.0	25	6.6	0.108 (0.742) $\varphi = 0.012$	16	4.4	23	6.1	1.081 (0.298) $\varphi = 0.038$
Writing poetry	-	-	-	-	-	12	3.3	10	2.6	0.266 (0.606) $\varphi = 0.019$

Note. RHs – right-handers; LHs – left-handers

As to between-handedness groups comparisons of the percentages of participants, who reported good/very good knowledge of two or more foreign languages, musical instruments, and sports (see Table 3), the results showed significant differences between left-handers and left-handers only for foreign language abilities, since the percentage of participants with good/very good knowledge of two or more foreign languages ($X^2_{|1|} = 7.812$, $p = 0.005, \varphi = 0.102$) was higher in the group of left-handers as compared with that in the group of right-handers.

Table 3. Percentage of the participants that reported good and very good knowledge of two or more foreign languages, musical instruments, and sports

	Foreign languages		Playing an instrument(s)		Sports	
	2 > languages		2 > instruments		2 > sports	
Group	(n)	%	(n)	%	(n)	%
RHs	(37)	10.1	(3)	0.8	(25)	6.8
LHs	(65)	17.2	(8)	2.1	(24)	6.3
$X^2_{|1|}$	7.812		2.134		0.075	
p	0.005		0.144		0.784	
φ	0.102		0.054		0.010	

Note. RHs – right-handers; LHs – left-handers

Discussion

The present study was designed as yet another attempt to verify the controversial assumption that left- and right-handed subjects differ in their interests and special abilities.

For this purpose, sufficiently representative samples of healthy adults, explicitly self-determined as left- and right-handed, were interviewed about their interests and special abilities in the following areas: singing, playing an instrument(s), dancing, painting, acting, foreign languages, sports, and writing poetry. The analysis of the results showed significant handedness-related differences mainly with regard to the abilities (not to the interests), providing new evidence for the assumption that handedness is associated with functional cerebral organization and that different cognitive and behavioral abilities can be found in left- and right-handers (Annett 1992; Bishop 1990; Geschwind & Galaburda 1987; Porac 2015).

The study demonstrated that essentially more left-handers reported to have good or very good musical (singing and playing an instrument) and sports abilities, which is consistent with data from previous studies (see the introduction), and supports the assumption that the abilities requiring right hemispheric dominance (such as musical abilities) or high interhemispheric cooperation (such as playing an instrument and doing sports) are overrepresented in left-handers (Adekoya & Ogunola 2015; Aggleton, Kentridge, & Good 1994; Annett 1992; Annett & Manning 1989; Casey, Pezaris, & Nuttall 1992; Gorynia & Egenter 2000; Judge & Stirling 2003).

On the face of it, the only finding that falls counter to previous research data is the significantly higher percentage among left-handers of persons speaking a foreign language(s) at a good or very good level. As discussed earlier researchers generally agree that right-handers have better left-hemispheric abilities, one of which is the verbal ability (for literature review see Annett & Kilshaw 1982; Geschwind & Galaburda 1987; Wright, Hardie, & Rodway 2004).

It would not be very wise, however, to make a rash conclusion, such as the one presented above, as the data it is based on is received by comparing native language

tasks. Unlike the studies within this line of research, the present investigation compares abilities to use a foreign language(s). So far no analyses grounded in foreign language performance have been made, which gives room for a relative freedom in the interpretation of the results.

In this train of thought, the significantly higher frequency of left-handers having good or very good foreign language abilities demonstrated in the present study can be attributed to the more pronounced bilateral representation of language functions typical of left-handed persons (for a detailed discussion see Geschwind & Galaburda 1987), which, in the context of additional cognitive load, could work as an advantage, as it facilitates the procedural aspect of the acquisition of additional language knowledge – an assumption further supported by our results showing overrepresentation among left-handers of people who speak well or very well two or more foreign languages.

This explanation could be generalized for all special abilities which are overrepresented among left-handers. The lack of clear-cut between-handedness differences in the interests of the participants in the two groups under analysis (except playing an instrument and speaking foreign languages), counterbalanced by a significantly larger presentation of left-handers with good and very good musical (vocal and instrumental), sports and foreign language abilities make it possible to formulate the assumption that the weaker lateralization of brain functions typical of most left-handed subjects is what probably benefits them regarding the development of these abilities, since it facilitates the learning, improvement and automation of the underlying cognitive processes.

Needless to say, a large-scale study comparing both the special abilities and the academic abilities (i.e., mental abilities in various academic areas such as Mathematics, General knowledge, Verbal Comprehension, Perceptual speed etc.), in right- and left-handed people would be the best way to verify this assumption.

Since data collected for the present study was based on participants' self-report, a limitation exists that inadequate self-assessment in some of the cases might have affected participants' answers to the abilities questions. Understanding the potential effect of this limitation at the very planning of our study, both the questionnaire and the criteria for assessing the presence/absence of targeted interests and abilities in the participants were designed in a way, as to minimize its impact on reliability of received data.

Conclusions and future directions

This study confirms that people with musical, sports and foreign language abilities are more common among left-handers than right-handers, providing further support of the assumption that the development and improvement of cognition depend on the biologically determined aspects of brain organization, one of whose reliable indicators is handedness (Annett 1992; Annett & Kilshaw 1982; Geschwind & Galaburda 1987).

Indeed, the findings of the study evidence differences in the special abilities of healthy left-handers without history of forced handedness switch and right-handers

but leaves open for future studies the issue to what extent these differences depend on the interaction of left-handedness with other (biological and environmental) factors.

Future studies should examine gender, familial sinistrality, education, and profession-related differences in the relationship between handedness and interests and special abilities. The inclusion of these factors as additional variables, as well as other potential intervening variables, such as family traditions and parental support regarding targeted interests and abilities, cultural context etc., might provide insight into the obviously complex associations between handedness and interests and special abilities.

Also, given the present study finding for a significantly higher incidence of participants with foreign language skills among left-handers which seems inconsistent with the previous research data for better right-handers' verbal abilities, assessed by comparing the performance of native language tasks, the relation between native language skills and abilities to use a foreign language(s) in right- and left-handers need further exploration.

Implications

The findings of the present study have implications on overcoming the prejudices and negative stereotypes connected with left-handedness, showing that being left-handed is not a bad sign at all but has even certain advantages over right-handers. These findings could also have implications on parents and teachers by raising their awareness about the advantages of left-handedness, by sharpening their attention to the early manifestations of these interests and special abilities in left-handers, and prompting a timely organization of proper environment and creating optimal conditions for strengthening the emerging interests and development of the potential abilities.

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