Research in Developmental Disabilities 35 (2014) 1885–1898

Contents lists available at ScienceDirect

Research in Developmental Disabilities

Hand preference of individuals with blindness in everyday activities: The effects of age of sight loss, age, and gender

Vassilios Argyropoulos [a,*], Georgios D. Sideridis [b], Vassilios Papadimitriou [a]

[a] University of Thessaly, Greece
[b] Boston Children's Hospital, Harvard Medical School, USA

ARTICLE INFO

Article history:
Received 27 November 2013
Received in revised form 11 March 2014
Accepted 11 March 2014
Available online 24 April 2014

Keywords:
Blindness
Visual impairments
Hand preference
Handedness
Item level
Latent level

ABSTRACT

The research aims of the present study were: (a) to assess the hand preference of blind persons in everyday activities on the basis of gender, type of blindness, and age; and (b) to conduct the above analysis at both the item level and the latent trait level, after concluding the optimum factor structure of the instrument. Participants were 82 individuals with visual impairments and blindness. Their mean age was 29.99 years. Handedness was evaluated using a modified version of the Edinburgh Handedness Inventory (Oldfield, 1971). When comparing handedness preferences across age of sight loss, gender, and age groups results indicated that there were significant differences in preference for several everyday tasks across age of sight loss and age groups but not gender. These results were also confirmed at the latent-trait mean level. The present findings add to the extant literature that highlighted hand preferences for individuals with visual impairments and blindness.

1. Introduction

In neuropsychology, hand preference or handedness indirectly indicates cerebral laterality (Van der Elst et al., 2011) and it is the most representative example of specialized function or activity on one side of the body. It has a strong hereditary basis (McKeever, 2000; McManus, 1991; Ocklenburg et al., 2010; Scharoun & Bryden, 2014) and has been essential in the development of higher kinesthetic and cognitive functions that have their basis on fine motor skills (Gutwinski et al., 2011). Based on a general definition, hand preference refers to the consistent selection of one hand for executing more or less skilled manipulations (Millar, 1994), although disagreements in definitions exist (Kaploun & Abeare, 2010). Hand preference is most commonly assessed via questionnaires and less frequently using observational protocols. However, its assessment has not been standardized due to differences in classification of individuals and the lack of a common format for hand preference measurement (Papadatou-Pastou, Martin, & Munafó, 2013).

Furthermore, different instruments of measuring handedness in conjunction with gender differences possibly affect the way individuals and groups complete questionnaires. For example, males have been less prone to provide extreme answers, which, consequently, results in heightened laterality scores for females (Bryden, 1977). Papadatou-Pastou et al. (2013) on the other hand argued that reaction to extreme responses in such questionnaires is not due to gender as the phenomenon is equally observed among right- and left-handers. Other studies, which employed questionnaires, revealed that right-handed individuals consistently report right hand preference from childhood to adulthood, but the same is not true for left-handed

* Corresponding author at: University of Thessaly, Department of Special Education, Volos 38221, Greece. Tel.: +30 6979256357; fax: +30 2421074799.
E-mail address: vassargi@uth.gr (V. Argyropoulos).

http://dx.doi.org/10.1016/j.ridd.2014.03.027
0891-4222/

individuals (Scharoun & Bryden, 2014). Other studies give prominence to the trend that both right- and left-handers are more likely to replace an "either/no preference" response by the preferred hand response than the non-preferred hand response (Peters, 1998).

Another debate relates to the origin of hand preference. Annett (1985) supported that the underlying natural asymmetry between the hands does not alter, even though practice can indeed improve the performance of the non-preferred hand. Therefore, preference for right or left hemispheric function with regard to motor tasks seems to be a matter of natural variation. On the other hand, although it is thought that handedness is genetically determined, a purely genetic model has yet failed to satisfactorily explain some observations regarding hand preference. Thus, when researchers apply models that attempt to interpret handedness, it is essential that factors other than genetic (e.g., environmental and cultural) are taken into account (Ocklenburg et al., 2010). For instance, experience, learning, practice (Scharoun & Bryden, 2014), early-life environment and social pressures (Suzuki & Ando, 2014) affect handedness decisively, while hand preference in people with severe visual impairments depends on a set of factors such as cultural expectations, experience, task requirements, strategy preferences, familiarity with the material, and reading habits in addition to accounting for individual differences on handedness (Sadato, 2005). Specifically for the visually impaired, Ittyerah (2009) indicated the possibility of improving the proficiency of both hands with practice on visuospatial tasks in the absence of vision. In his view, the seemingly lower performance of the non-preferred hand is a consequence of its spatial orientation during performance and does not necessary express a lack of ability. Thus, equipotentiality is likely to be observed between the hands for both prehensile and nonprehensile actions (Ittyerah, 2010).

Various studies have suggested that 70–90% of the world population is right-handed (Vlachos, 1998). What we do not yet know, however, is why left-handedness is less prevalent (Gutwinski et al., 2011). Empirical evidence has suggested that the frequency of left-handedness varies with culture and region (Peters, Reimers, & Manning, 2006), and it is more common in men than in women (McKeever, 2000; McManus, 1991; Raymond, Pontier, Dufour, & Moller, 1996), although Vlachos et al. (2013) disputed the robust gender differences widely reported in the literature on the prevalence of left-handedness. It is estimated that 10% of the general population is left-handed (McManus, 1991; Vlachos, 1998). Vlachos et al. (2013) found similar results in a large sample of Greek adolescents. Actually, 7.3% of the participants were classified as left-handers and these findings are consistent with data from other countries. Kaploun and Abeare (2010) put forth the hypothesis that differences in cerebral organization (observed with left-handers), might have functional consequences on cognitive functioning. As for cerebral laterality, they reported large variability within the population of left-handers. Other studies on the other hand have suggested that men are more prone to ambidexterity compared to women (Papadatou-Pastou, Martin, Munafó, & Jones, 2008; Vlachos et al., 2013).

2. Hand preference and blindness

Research on hand preference in individuals with blindness is generally limited. Most studies focused on the direction and the degree of hand preference in sighted individuals with the latter being regarded as more important compared to the former (Niebauer, Christman, Reid, & Garvey, 2004). The direction of hand preference is initially evident by the age of three among sighted children (McManus et al., 1988), while there are no such indications among blind children (Ittyerah, 1993). The degree of handedness increases from three years to seven years and is stabilized by the age of eight for both sighted (McManus et al., 1988) and blind children (Ittyerah, 1993, 2000). In line with previous studies, Ittyerah (1993) reported that the degree of blind children's handedness increases with age and the respective correlation appears to be linear. Little research, however, has been conducted for children with severe visual impairments and left-handedness. In the Caliskan and Dane (2009) study, left-handedness was significantly more prevalent in blind compared to sighted children and the effect was universal across gender. The authors attributed their finding to the hypothesis of neural network reorganization. Ittyerah (2000), on the other hand, provided evidence in favor of the null hypothesis regarding hand preference for blind and sighted children. Since degree and direction of hand preference did not differ fundamentally in blind and sighted children, despite their differences in sensory experiences (Ittyerah, 2000), it is possible that vision is not a strong determinant of direction and degree of hand preference (Ittyerah, 2009, 2010). Due to the inconsistent earlier findings on hand preference and blindness more research is required to elucidate the relationship between handedness and blindness.

The present study suggests a hand preference hypothesis for the blind because the influence of the eye preference is absent. More specifically, the research aims were: (a) to assess hand preference of individuals with blindness in everyday activities on the basis of gender, type of blindness, and age, and, (b) test the above hypothesis at both the measurement (item) level and the latent level, after concluding the optimum factor structure for the adapted measured instrument.

3. Method

3.1. Participants and procedures

Eighty-two individuals with blindness (40 females and 42 males), aged 8–61 years ($M = 29.99$, $SD = 17.01$) were recruited from several areas of Greece. Of the 82 participants, 37 were adventitiously blind ($M = 35.03$, $SD = 16.71$) and 45 were congenitally blind ($M = 25.84$, $SD = 16.29$). Total blindness was a universal characteristic with age at loss of sight ranging from 0 (congenitally blind) to 50 years ($M = 6.74$, $SD = 11.74$).