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ORIGINAL ARTICLE

A BETTER APPROACH OF ASSESSING LALERALITY BY USING COMBINED FOOT AND EYE DOMINANCE SCALE IN MENTALLY HEALTHY SUBJECTS

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Abstract. Objective: *To investigate the reliability (internal consistency) of a Combined Foot and Eye Dominance Scale in healthy subjects.* ***Materials and methods:*** *A total of 82 mentally healthy subjects were assessed with a Combined Foot and Eye Dominance Scale. The Foot Dominance Subscale included a modified Chapman & Chapman Foot Dominance scale and a new Complex Tasks scale with four foot tests reflecting more complex tasks. The Eye Dominance Subscale included three eye tests. Scale reliability statistics (item-scale statistics, summary statistics for the items, Cronbach's alpha), non-parametric Mann-Whitney test and Spearman's rank correlation coefficient were used.* ***Results:*** *Considerable differences were found in the contribution of the single items to the Combined Scale. The means of some items were 37.83 times greater than those of other items (from 0.15 to 5.61), which suggested greater phenogenetic component and consequently greater contribution of these items to the total scale mean. The mean correlation between the items of the Combined Foot and Eye Dominance Scale was strongly positive (0.39), indicating good internal consistency of the scale.* ***Conclusions:*** *Eye and foot dominance appear to be a much subtler indicator of altered hemispheric lateralization than hand dominance. The Combined Dominance Scale provides a more adequate tool for objective measuring of leftedness, as a way to assess laterality, since this scale is to a great degree unaffected by socio-cultural impact. The scale would provide comparability of leftedness as an indirect clue of abnormal lateralization in studies of mentally healthy subjects and subjects with neurodevelopmental disorders with presumed abnormal cerebral asymmetry across cultures.*

Key words: *dysmorphogenesis, laterality, eye dominance, foot dominance, Foot and Eye Dominance Scale*

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INTRODUCTION

Human lateralized behaviors relate to the asymmetric development of the brain. The dominance of one cerebral hemisphere over the other helps a human brain to acquire laterality, which is defined as the ability to perform the majority of day to day tasks more effectively with one hand of our body. Laterality is a measurable tool and various standardized questionnaires have been proposed to define the types of laterality in an individual.

The word lateralization relates to the preferred localization of a function or activity on one side of the body. Recent research shows that lateralization is present in the animal kingdom and is not a human specific phenomenon [1, 2]. The asymmetry found in vertebrate animals shows the evolutionary advantage of the specialization of each hemisphere [3, 4, 5, 6, 7, 8, 9, 10]. Cerebral asymmetry is a unique feature of the human nervous system and might have been related to the development and the evolution of humans from earlier primates [11].

Although there are many aspects of functional lateralization (hand, foot, eye, ear, language, etc.), the investigators have assessed laterality mostly by hand preference, despite some disadvantages of this. Many researchers have found that left-handedness is influenced by different factors. Age, gender, social and cultural environment play a major role in defining as well as fixation of laterality. The male brain is thought to be more lateralized than the female [12, 13, 14, 15]. The distribution of left-handedness varies from culture to culture and from region to region [16]. Geographical differences are evident both between continents [17] and within continents themselves.

Left-handed people are put under direct and indirect social pressure. Direct social pressure involved the pressure to write with the right hand, as was the case in Victorian schools [18] and in communist regime countries like Bulgaria before 1990. The appliances are adapted for right handed people (with the greatest impact seen during the Industrial Revolution in the 19th Century) and social conformity determines the use of the right hand. However, any attempts to switch handedness could only result in a change in the phenotypic expression, without changing the genotype, and individuals continue to carry and pass onto their offspring the gene of left-handedness. Indirect social pressure makes left-handed people more stigmatized and “taboo”-ed, making it more difficult for them to leave a generation. As a result, their genes are not frequently passed onto the offspring, and the percentage of left-handers decreases over the generations.

Laland et al. proposed a model of handedness, which incorporates both genetic and cultural factors [19]. Other authors proposed that handedness may be influenced by a combination of cultural and developmental factors [20, 21].

We applied the four most used questionnaires for handedness – Edinburgh Handedness Inventory (EHI), Annett Hand Preference Questionaire (AHPQ), Chapman and Chapman, Hand Preference Demonstration Test (HPDT). The tests from the scales which do not overlap are 23. We added 7 more tests, selected to help in the assessment of spontaneity. This made for a total number of 30 tests, assessing the proximal (arm and shoulders) and distal (wrist and fingers) muscles in terms of the quality of performance and precision, as well as the spontaneity. Even though the questionnaires are self-reported, we did performance tests to minimize invalid answers, but we didn’t find a statistically significant difference in left-handedness between schizophrenia patients and controls. Handedness is influenced by different cultural factors like the cultural pressure during the communist regime and the material world of appliances, devices, instruments, adapted to right-handed individuals.

We assessed foot and eye dominance by a modified Chapman & Chapman questionnaire with 4 additional tests for foot dominance and a set of three tests for eye dominance. Our findings showed significantly higher left foot dominance and left eye dominance in patients with schizophrenia than in controls. All of the above made us conclude that foot and eye dominance may assess lateralization much better than hand dominance.

The Combined Foot and Eye Dominance Scale with its subscales – the Foot Dominance Subscale and the Eyes Dominance Subscale appeared to be a more adequate scale to strongly and objectively measure leftedness. Such a combined scale could be a more useful tool for the assessment of lateralization regardless of culture and nation.

The reliability (internal consistency) of the Chapman & Chapman scale and the other 4 tests for foot dominance as well as the three tests for eye dominance has not been studied so far, at least based on the literature available to us. We investigated the internal consistency of the so proposed Foot and Eye Dominance Scale in patients with schizophrenia, control subjects and in relation to sex. However, in the present publication we present our results concerning only the group of the mentally healthy subjects.

MATERIALS AND METHODS

This study is part of a larger investigational project on the intriguing relations between six groups of markers of neuronal dysontogenesis – left-handedness, left-footedness, left-eyedness, minor physical anomalies, digit ratio and cognitive (attention and memory) deficit.

Subjects

The mentally healthy volunteers consisted of 82 subjects (30 men, 52 women) with a mean age 34.70 years (SD = 16,82, range 18-79) for men and 34.45 years (SD = 15.67, range 23-79) for women. Normality was defined as the absence of a previous or present psychiatric disorder according to the criteria of the Diagnostic and Statistical Manual of Mental Disorders-V (DSM-V), (American Psychiatric Association, 2013). Potential subjects were excluded if they had a history of drug or alcohol abuse, identifiable neurological disorder (seizure disorder, head injury, multiple sclerosis, etc.), any signs of intellectual disability or somatic disorder with neurological components. Another exclusion criterion was having a first-degree relative with a history of a psychotic disorder, major affective disorder or suicide.

Exclusion criteria for the eye tests were any previous or present eye and upper limb disorders hampering the performance on the eye tasks. Impaired visual acuity, higher than ± 2 diopters and more than ± 1 diopter difference between the two eyes were exclusion criteria, as these have been proven to confound the performance on the eye tasks.

For the foot tests exclusion criteria were any previous or present lower limb disorders hampering the performance on the foot tasks, any disease affecting the balance or the coordination.

To avoid eventual confound due to ethnic and racial differences related to MPAs or lateralization, all subjects were of Bulgarian origin. Individuals were excluded if their parental or grandparental ethnic group was other than Bulgarian.

The refusal rate of potential participants was insignificant (below 5%), excluding selectivity bias.

This work complied with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. The study was approved by the Local Ethics Committee and all subjects gave written informed consent prior to participation.

Instruments

Combined Foot and Eye Dominance Scale

It includes two subscales: Foot Dominance Subscale and Eye Dominance Subscale.

Foot Dominance Subscale

It includes two component scales:

1. Modified Chapman & Chapman Scale

The most popular among the foot dominance instruments in the literature available to us is the Chapman & Chapman questionnaire [22]. It includes 11 foot performed activities: kicking as high as possible, kicking a ball, arranging cubes, going through cubes with a ball, rolling a golf ball around a circle, stamping out a cigarette, balancing a rod on the thigh, writing your initials on the sand, smoothing the sand, hopping on one foot, tapping out a rhythm.

Two modifications were made to the subscale:

- The task “Tapping out a rhythm of Yankee Doodle”, due to the fact that this melody is unknown to Bulgarians, has been reformulated to „Tapping out the rhythm of a favorite song“.
- The task “Going through cubes with a ball” was excluded due to poor informativeness. Some participants could not complete the task by choosing only one foot to lead the ball and used both feet. This led to the false overuse of the category “Both equally”, which however did not reflect the actual dominant foot of the subject for this task.

2. Complex Tasks Scale

It includes four foot dominance tests, measuring more complex tasks:

- stepping up on a chair (assessing spontaneity);
- picking up object with toe (assessing precision);
- pushing shovel into the ground (assessing strength);
- standing on one foot (preferred foot for carrying the body weight), (assessing balance).

Measuring these additional complex tasks allows for a more subtle and comprehensive assessment of foot dominance. The Combined Foot Dominance Subscale includes a total of 14 tasks, administered as performance assessments, not as preference questionnaires. Each test was performed twice and the subject was asked to perform the test again if there was any inconsistency in the preference.

Each foot test was rated: 0 – Preference of right foot; 1 – No preference (both feet equally); 2 – Preference of left foot. Each test score ranges from 0 to 2; the total score of the Combined Foot Dominance Subscale ranges from 0 to 28.

Eye Dominance Subscale

Eye dominance (ocular sighting dominance) was measured by a set of three eye dominance tests, administered as performance assessments, not as preference questionnaires.

Each test was performed twice and the subject was asked to perform the test again if there was any inconsistency in the preference.

1. **Looking through a monocle test** – the participant is asked to take with both hands a monocle and look through it.

2. **Hole-in-card test** – the participant is asked to hold the card with both hands at arm's length and look with both eyes through the hole at an object. While continuing to focus on the object and keeping the object centered in the hole with both eyes open, the participant has to slowly bring the card towards the face until it touches his nose. The card is positioned over one of the subject eyes.

3. **Porta test (modified Miles test)** – the participant is asked to extend one arm and to align a forefinger with a distant object with both eyes open, then to close his left eye and then the right eye consequently. The object is still aligned with the index finger when seeing with the dominant eye. Potential limitation of the test is the impact of the arm the patient uses according to his hand dominance.

Each eye test was rated: 0 – Preference of right eye; 1 – No preference (both eyes equally); 2 – Preference of left eye. Each test score ranges from 0 to 2; the eye set total score ranges from 0 to 6.

The total score of the Combined Foot and Eye Dominance Scale ranges from 0 to 34.

All assessments were performed by the same examiner (K.A.).

Statistical Analysis

Data was analyzed with SPSS 25.0.

Scale reliability statistics (item-scale statistics, summary statistics for the items, Cronbach's alpha) were applied to a Combined Foot and Eye Dominance Scale (17 foot and eye tests), consisting of Foot Dominance Subscale (14 foot dominance tests) and Eye Dominance Subscale (3 eye dominance tests).

As our data is not continuous and lacks normal distribution, the non-parametric Spearman's rank correlation coefficient for correlation analysis were used.

The categories of the eye and foot tests can be treated as ordinal data – graded, in ascending order of leftedness: 0 – Preference of right foot (eye); 1 – No preference (both feet (eyes) equally); 2 – Preference of left foot (eye). Ordinal data allows calculating the mean left-footedness and the mean left-eyedness for every single foot (eye) test. A variable mean is usually more sensitive than its categories in detecting a difference between the groups. Besides, it enables comparing the important differences of the mean sum of left-footedness from the Foot Dominance Subscale, the mean sum left-eyedness from the Eye Dominance Subscale and the mean sum from the Combined Foot and Eye Dominance Scale (17 foot and eye tests) between schizophrenia and control subjects.

Statistical significance was defined as $p < .05$, two-tailed.

RESULTS

Item-scale statistics of the Combined Foot and Eye Dominance Scale in mentally healthy subjects

The analysis of the items of the Combined Foot and Eye Dominance Scale and their relations to the whole scale (Table 1) shows the following:

Foot Dominance Subscale. The tests "Push shovel into the ground" (31.7%), "Stand on one foot" (24.4%), "Step up on a chair" (20.7%), show the highest frequency of left foot dominance. The lowest frequency, under 10%, is shown by "Write your initials on the sand" (7.3%), "Stamp out a cigarette" (8.5%), "Rolling a golf ball around a circle" (9.8%) and "Kick a ball" (9.8%).

Eye Dominance Subscale. In mentally healthy subjects the frequency of left eye dominance from all three tests is relatively high – Porta test* (20.7%), Hole-in-the-card test (19.5%), Looking through a monocle (19.5%).

The items with the lowest frequency of left foot dominance also have low mean left-footedness (Write your initials on the sand – 0.15, Stamp out a cigarette – 0.17, Rolling a golf ball around a circle - 0.20, Kick a ball – 0.23). Exclusion of any of these items from the scale exerts little change on the Combined Foot and Eye Dominance Scale Mean. This indicates that they do not provide significant information on laterality and have low phenotypic variation in mentally healthy subjects.

Spearman's rho correlations matrix of the Combined Foot and Eye Dominance Scale items in mentally healthy subjects

Analysing the 190 correlations between the 17 items (Table 2), the Subtotals of the subscales and the Total of the Combined Foot and Eye Dominance Scale in mentally healthy subjects shows the following:

Almost all correlations between the single items are positive, as only 7 of 136 correlations display negative and moreover very small values.

About 54% (74) of the correlations between the single items are strongly statistically significant ($p < .01$) and about 13% (18) are statistically significant at $p < .05$.

The correlations between the Subtotals of the Foot Dominance Subscale and the Eye Dominance Subscale and the total Combined Foot and Eye Dominance Scale are strongly significant ($p < .01$).

Importantly, all the 17 items of the Combined Foot and Eye Dominance Scale have strong statistically significant correlations with the Total of the Combined Foot and Eye Dominance Scale ($p < .01$).

Table 1. Items of the Combined Foot and Eye Dominance Scale and their relationships to the whole scale (item-scale statistics) in mentally healthy subjects

		N = 82	Item mean	Scale Mean Item Deleted	Item-Total Correlation	Alpha if Item Deleted
		n (%)				
Foot Dominance Subscale						
Kick as high as possible	Both	1 (1.2%)	.30	5.32	.49	.878
	Left	12 (14.6%)				
Kick a ball	Both	3 (3.7%)	.23	5.40	.71	.871
	Left	8 (9.8%)				
Arrange cubes	Both	5 (6.1%)	.40	5.22	.64	.872
	Left	14 (17.1%)				
Rolling a golf ball around a circle	Both	0 (0.0%)	.20	5.43	.76	.870
	Left	8 (9.8%)				
Stamp out a cigarette	Both	0 (0.0%)	.17	5.46	.76	.870
	Left	7 (8.5%)				
Balance a rod on the thigh	Both	2 (2.5%)	.27	5.33	.73	.869
	Left	10 (12.3%)				
Write your initials on the sand	Both	0 (0.0%)	.15	5.46	.81	.869
	Left	6 (7.3%)				
Smooth the sand	Both	2 (2.4%)	.24	5.37	.65	.872
	Left	9 (11.0%)				
Hopping on one foot	Both	6 (7.3%)	.41	5.20	.31	.885
	Left	14 (17.1%)				
Tapping out a rhythm	Both	2 (2.4%)	.24	5.36	.75	.869
	Left	9 (11.0%)				
Step up on a chair	Both	1 (1.2%)	.43	5.17	.59	.874
	Left	17 (20.7%)				
Pick up object with toe	Both	4 (4.9%)	.27	5.36	.67	.872
	Left	9 (11.0%)				
Push shovel into the ground	Both	1 (1.2%)	.65	4.95	.41	.883
	Left	26 (31.7%)				
Stand on one foot	Both	12 (14.6%)	.63	4.98	.26	.889
	Left	20 (24.4%)				
Eye Dominance Subscale						
Looking through monocle	Both	0 (0.0%)	.39	5.23	.25	.888
	Left	16 (19.5%)				
Hole-in-the-card test	Both	0 (0.0%)	.39	5.23	.15	.892
	Left	16 (19.5%)				
Porta test*	Both	0 (0.0%)	.41	5.21	.50	.878
	Left	17 (20.7%)				
Combined Foot and Eye Dominance Scale			5.60			

* Valid cases – the sum of the Right, Both and Left categories does not always account to 82, due to missing data for some cases

Table 2. Spearman's rho Correlations matrix of the 17 variables from the Combined Foot and Eye Dominance Scale in mentally healthy subjects

Dominance tests	Kick high	Kick a ball	Arrange cubes	Rolling a golf ball	Stamp out cigarette	Balance a rod	Write on the sand	Smooth the sand	Hopping-on one foot	Tapping a rhythm	Step up on a chair	Pickup with toe	Push shovel	Stand on one foot	Foot Subscale	Looking-mon-ocle	Hole-in-the-card	Porta test	Eye Subscale
Kick a ball	.34**																		
Arrange cubes	.44**	.48**																	
Rolling a golf ball around a circle	.43**	.73**	.64**																
Stamp out a cigarette	.47**	.68**	.49**	.78**															
Balancing a rodon the thigh	.43**	.52**	.47**	.51**	.56**														
Write your initials on the sand	.40**	.60**	.55**	.70**	.75**	.70**													
Smooth the sand	.42**	.50**	.41**	.47**	.65**	.61**	.59**												
Hopping on one foot	.16	*.28**	.14	.20	*.24**	*.27**	.31**	.37**											
Tapping out a rhythm	.42**	.60**	.40**	.49**	.54**	.67**	.59**	.51**	.14										
Step up on a chair	*.27**	.24*	.38**	.33**	.48**	.54**	.54**	.42**	.20	.42**									
Pick up object with toe	.30**	.63**	.42**	.55**	.60**	.64**	.53**	.53**	.17	.73**	.44**								
Push shovel into the ground	.41**	.19	*.38**	*.30**	*.26**	.39**	.31**	*.28**	.08	.34**	.38**	*.22**							
Standing on one foot	-.03	.21	.37**	.34**	*.23**	.13	.21	.16	*.27**	.16	*.28**	.19	.03						
Foot Dominance Subscale Subtotal	.51**	.44**	.61**	.48**	.46**	.57**	.46**	.48**	.41**	.55**	.65**	.48**	.62**	.50**					
Looking through monocle	.13	*.27**	.12	*.25**	*.29***	.08	.22	.07	.09	.18	.04	.20	-.08	-.01	.06				
Hole-in-the-card test	.13	.09	.04	.15	.07	-.02	-.02	.07	.09	.08	.04	.13	-.01	-.03	-.01	.61**			
Porta test	*.28**	.43**	.32**	.64**	.49**	*.24**	.43**	*.24**	.13	.34**	*.24**	*.28**	.20	.13	*.23**	.43**	.36**		
Eye Dominance Subscale Subtotal	.17	.35**	*.24**	.47**	.36**	.16	.29**	.17	.15	*.27**	.18	*.27**	.11	.09	.17	.79**	.78**	.76**	
Combined Foot and Eye Dominance Scale Total	.49**	.45**	.54**	.48**	.44**	.53**	.46**	.44**	.36**	.54**	.60**	.47**	.56**	.35**	.85**	.45**	.40**	.51**	.61**

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Almost all correlations between the single items of the Foot Dominance Subscale and the Eye Dominance Subscale are positive, as only 6 of the 42 correlations display very small negative values. A total 14 correlations are statistically significant – 7 correlations are highly statistically significant at $p < .01$ and 7 correlations are statistically significant at $p < .05$.

All the above shows strong consistence between the two component subscales of the Combined Foot and Eye Dominance Scale.

Individually, the correlations of the two components of the Foot Dominance Subscale – the Modified Chapman & Chapman Scale (.77) and the Complex Tasks Scale (.73) – with the Combined Foot and Eye Dominance Scale are strongly statistically significant at $p < 0.01$.

Overall, the analysis of the correlation matrix shows that the Combined Foot and Eye Dominance Scale possesses considerable consistency between the foot and the eye dominance tests of the scale.

Summary statistics of the Combined Foot and Eye Dominance Scale in mentally healthy subjects

The summary statistics (Table 2) shows considerable differences in the contribution of the single items to the Combined Foot and Eye Dominance Scale. The means of some items are 4.42 times greater than those of other items (from .15 to .65), which suggests greater phenogenetic component and consequently greater contribution of these items to the total scale mean. The mean correlation between the items of the Combined Foot and Eye Dominance Scale is strongly positive (.35), indicating a good internal consistency of the scale.

Cronbach's alpha of the Combined Foot and Eye Dominance Scale in mentally healthy subjects

Cronbach's alpha coefficient determines the internal consistency of a scale and depends on the correlations and number of items of the scale. As a rule, Cronbach's alpha increases considerably with the increase of the number of the scale items, even if the mean correlation value between the items does not increase. The predominantly positive and statistically significant correlations between the 17 variables of the Foot and Eye Dominance Subscale in mentally healthy subjects determine its high Cronbach's alpha = .883 (Standardized Cronbach's alpha = .900). This indicates a high internal consistency of the scale in a mentally healthy population.

Prospective use of the Scale analysis of the Combined Foot and Eye Dominance Scale in mentally healthy subjects

In any scale the exclusion of some items with low contribution to the scale mean may preserve the internal consistency of the scale and Cronbach's alpha coefficient may even slightly increase. For example, if we exclude the 4 items with the lowest means (Kick a ball, Rolling a golf ball around a circle, Stamp out a cigarette, Write your initials on the sand), the reduced scale, composed of the remaining 13 items, will retain high, above 0.8, Cronbach's alpha – .806, Standardized Cronbach's alpha – .815. This indicates that some items of the Combined Foot and Eye Dominance Scale may be excluded by a given study team for the specific purpose of its investigation, with the ultimate goal of using and implementing a less cumbersome, expedient and parsimonious scale.

Exclusion of these items is likely to improve the convenience of using the scale as a tool for examining left dominance in schizophrenia patients. It is conceivable that other variants with even less items of the scale may be appropriate and used in certain occasions.

DISCUSSION

Our data shows that some items (Write your initials on the sand, Stamp out a cigarette, Rolling a golf ball around a circle and Kick a ball) provide little information on laterality. These items represent only foot dominance tasks and show relatively low correlations with the other items, which suggests a relative lack of close association between these and the remaining items of the Foot and Eye Dominance Scale. It should be noted that developmental observations in foot laterality suggest increasing right-footedness from early childhood to young adult years. As stated by Gentry and Gabbard evidence suggests that footedness adheres to some varying developmental features characterized primarily by a significant shift toward greater right-footedness between 8 and 11 years, after which preferences remain relatively stable [23].

One of the notable aspects of lateral preference is that certain tasks tend to elicit stronger preferences than other tasks. It is known that foot preference for skilled movements is strongly lateralised indicating that skilled and unskilled foot movements utilise different pathways [24]. In addition, the magnitude of the differences in performance abilities between the feet appears to depend on the task being examined. Hence, individuals tend to show strong, consistent preferences for kicking, but are less consistent in their preference for the foot used to step up onto a

chair [25]. This correlates with our findings of low sinistrality for “Write your initials on the sand” (7.3%), “Stamp out a cigarette” (8.5%), “Rolling a golf ball around a circle” (9.8%) and “Kick a ball” (9.8%) and highest sinistrality for “Push shovel into the ground” (31.7%), “Stand on one foot” (24.4%), “Step up on a chair” (20.7%).

The correlation matrix shows consistency and coherence between the Foot Dominance Subscale and the Eye Dominance Subscale and between the two subscales and the total Foot and Eye Dominance Scale. High consistency and coherence is also present between the individual dominance tests from the Foot and Eye Dominance Scale. Almost all of the items have positive inter-correlations and two thirds of them are statistically significant. There are only 7 negative correlations out of 136, which may suggest unequivocal development in the origin of eye and foot laterality. Lateralization of brain functions (including eye and foot dominance) is at stake during the fetal stages of individual development, which suggests that cerebral asymmetry is a key dimension of neurodevelopment. We may speculate that not only the morphogenetic background, but the nature and the time of the supposed insult also influence the processes of morphogenesis.

Our analysis shows high Cronbach’s alpha = .883, which indicates high internal consistency of the scale in the control group. By excluding 4 items (“Kick a ball”, “Rolling a golf ball around a circle”, “Stamp out a cigarette”, “Smooth the sand”) with the lowest mean score, 13 items remain in the scale. This does not affect the reliability of the scale as an objective assessment instrument for cerebral lateralization in the control group. Exclusion of these items is likely to improve the convenience of using the scale as a tool for examining left dominance.

We consider the combined Foot and Eye Dominance Scale, including a Foot Dominance Subscale and an Eyes Dominance Subscale, a more adequate scale to measure laterality than hand dominance. Even though the most widely used means for assessing laterality is hand dominance, eye and foot dominance are a much subtler indicator of altered hemispheric lateralization. It also provides a more adequate comparability of different studies of diverse neuroontogenetic disorders such as ADHD, autism, schizotypy, psychosis, affective disorders, irrespective of culture and nation.

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