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CORRELATION OF VISUAL PERCEPTION AND ACTIVITIES OF DAILY LIVING IN ACUTE HEMIPARESIS RESULTING F ROM CEREBRO VASCULAR ACCIDENT

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ABSTRACT

The objective of this study is to correlate visual perception and activities of daily living in acute hemiparesis resulting from cerebrovascular accident. Quantitative Study design was used and was conducted in SRM hospitals at Kancheepuram and Vijaya Health Centre at Chennai. The samples were 36 subjects with either clinically definite, and laboratory supported with average age limit 46.33 years .Outcome measures like MoCA ,Beery-Buktenica Developmental Test of Visual-Motor Integration and Functional Assessment Measures were used in this study. The results indicated that Visual perception has a strong positive correlation with ADL. The visual perceptual deficits influence VMI which is considered to be the pre requisites for ADL. Visual perceptual deficits are most notably present in self care, locomotion and communication in acute Hemiparetic patients. The influence of visual perceptual deficits on ADL is comparatively high in patients with Left Hemiparesis than with the Right Hemiparesis.

KEYWORDS: **Cerebrovascular Accident, Hemiparesis, Visual Perceptual deficits, Motor coordination, Visual Motor Integration, Activities of Daily Living.**

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INTRODUCTION

Cerebrovascular Accidents (CVA) affects patient's motor function[1, 2].In India the prevalence of CVA in the younger individual is high (18% to 32%) of all cases of CVA compared with high income countries [2]. Individuals who sustain CVA are especially challenged in their daily activities (self-care, sphincter control, mobility, communication, cognitive functions) as they have difficulty in adapting their environmental constraints. CVA is the major and most frequent cause of Hemiparesis and may affect Activities of daily living ADL. Following CVA, motor disability is due to sensory dysfunction and perceptual dysfunction. Stroke patients showed significant deficits in perceptual performance, some of which correlated with activities of daily living performance and various other executive functions [3]. It refers to our ability to take in sensory information through our senses, organize, and interpret that sensory information and make a meaningful response[4]. Visual perception is the most significant independent predictor in functional impairment [5]. It is estimated as 30% to 85% of stroke patients will experience some type of visual dysfunction following stroke[6], there is a growing need for early accurate prediction of outcome after stroke to see realistic and attainable treatment[7,8,9] . Roughly about two thirds of all the stroke patients have arm paresis, leading to reduced upper extremity function and after 6 months of stroke the affected arm remains without function for approximately half of the patients. Occupational therapists need to know more about their patient's specific visual motor deficits and how these might correlate with performance of activities of daily living[10] Although visual perceptual deficits has been observed clinically to influence the accomplishment of rehabilitation objectives in ADL, there is no published literature explaining the role of visual perceptual deficits, on activities of daily living in acute Hemiparesis resulting from CVA. Purpose of this study is to make a first step in this dimension by explore relationships between visual perceptual deficits and activities of daily living in acute Hemiparesis resulting from CVA The aim of the study is to assess the relationship between visual perceptual and activities of daily living in acute hemiperaisis resulting from cerebrovascular accidents. Objectives of the study are 1. To correlate Visual Perception, Motor coordination and Visual Motor Integration in person with acute Hemiparesis resulting from CVA. 2. To correlate Visual Perception and Activities of Daily Living in person with acute Hemiparesis resulting from CVA. 3. To correlate Motor Coordination and Activities of Daily Living in person with acute Hemiparesis resulting from CVA. 4. To correlate VMI and Activities of Daily Living in person with acute Hemiparesis resulting from CVA. 5. To compare the impact of VMI on ADL between acute Right Hemiparesis and acute Left Hemiparesis resulting from CVA.

MATERIALS AND METHODS

Montreal Cognitive Assessment Scale (MoCA)

The Montreal Cognitive Assessment (MoCA) is a standardized rapid screening instrument for mild cognitive dysfunction. It assesses different cognitive domains: attention and concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculations, and orientation. Time to administer the MoCA is approximately 10 minutes. The total possible score is 30 points; a score of 26 or above is considered normal. This scale was used as a screening tool.

Beery VMI

The Beery's Developmental Test of Visual-Motor Integration (VMI; Beery, 1989) contains 30 items to work with clients ranging from 2-100 years. The Beery VMI supplementary test for Visual Perception helps to find a confident diagnosis of Visual Perceptual Deficits. It has been used extensively in the assessment of children. The VMI has items ranging from very easy to difficult, allowing even impaired patients to enter task set, and VMI may potentially be sensitive to aging effects. It is a reliable and valid measure with a well-established scoring system. Commonly used tests of construction

abilities are complex, often intimidating to impaired elders, and lack a range of items.

Functional Assessment Measure (FAM)

The FAM items were developed by clinicians representing each of the disciplines in an inpatient rehabilitation program. The FAM consists of 12 items. These items do not stand alone, but are intended to be added to the 18 items of the FIM. The total 30 item scale combination is referred to as the FIM+FAM. The time required to administer the FIM+FAM is approximately 35 minutes.

STUDY METHOD

Quantitative study design was used in this study and was conducted in SRM hospitals, Kancheepuram and Vijaya Health Centre at Chennai. CVA patients with acute Hemiparesis were selected using Non Probability Convenient Sampling. (n=36) based upon the inclusion criteria. The inclusion criteria include patients, who had a first episode of CVA with right and left Hemiparesis during the previous ≤ 1 year with absence of cognitive impairments, MoCA score ≥ 26.As per optometric opinion patient who has normal or corrected Visual Acuity ≥ 20/60, and normal or near normal motor function in the dominant hand and arm. Subjects with normal or corrected hearing with stable vital signs and the ability to read and follow simple commands were included. The patients who were not demonstrating any evidence of Visual Spatial Neglect and Patient who are taking psychiatric medication(s) and who are having any other neurological problem were excluded from the study. Institutional ethical committee approval was obtained. The purpose of the study was explained to the subjects. Written consent form was obtained from each subject duly filled and signed. Demographical details were obtained. The participants with acute Hemiparesis was administered individually with Beery VMI and its supplementary Test in order to quantify Visual Perceptual Deficits and Motor coordination to quantify visual motor integration to find out the correlation between of Visual motor integration and Activities of daily living.

DATA ANALYSIS

Percentage wise description of data was used to find out the incidence and type of visual perceptual deficits and motor coordination deficits in patients of CVA with hemiparesis assessed on Berry VMI. (Frequency, percentage distribution, Mean & SD was measured). Percentage wise description of data was used to find out the ADL skills using FAM scale. (Frequency, percentage distribution, Mean & SD was measured.) In order to observe the basic characteristics of the data, the descriptive statistics such as mean, standard deviation for continuous variables and frequency distribution for categorical variables have been calculated. The relationship between the three VMI variables (Visual Perception, Motor Coordination, and Visual Motor Integration) can be examined by the use of correlation coefficient. The relationship of each VMI variable (i.e., Visual Perception, Motor Coordination, and Visual Motor Integration scores) with all the 7 FAM variables (Self care, Sphincter control, Mobility items, Locomotion, Communication items, Psychosocial adjustments, and Cognitive function) was examined by the use of correlation coefficient. The relationship of each VMI variable (i.e., Visual Perception) with all the 7 FAM variables (Self care, Sphincter control, Mobility items, Locomotion, Communication items, Psychosocial adjustments, and Cognitive function) was examined by the use of correlation coefficient. The relationship of each VMI variable (i.e., Motor Coordination) with all the 7 FAM variables (Self care, Sphincter control, Mobility items, Locomotion, Communication items, Psychosocial adjustments, and Cognitive function) was examined by the use of correlation coefficient. The relationship of each VMI variable (i.e., Visual Motor Integration) with all the 7 FAM variables (Self care, Sphincter control, Mobility items, Locomotion, Communication items, psychosocial adjustments, and Cognitive function) was examined by the use of correlation coefficient. The relationship of each VMI variable (i.e., Visual Perception, Motor Coordination, and Visual Motor Integration scores) with all the seven FAM variables (Self

care, Sphincter control, Mobility items, Locomotion, Communication items, Psychosocial adjustments, and Cognitive function) separately for Right Hemiparesis was examined by the use of correlation coefficient and Independent Sample 't' test..

RESULTS

1. The study has been conducted among 36 subjects, of which 72.2% are male and 27.8% are female. The average age of the 36 subjects involved in this study is 46.33 years with the standard deviation of 9.89 years
2. Correlation of visual perception, Motor coordination and visual motor integration.

The results in table 1 indicate that there is a strong positive correlation between the variables of visual perception and motor coordination.

Table 1
Correlation between the variables of Beery VMI

Correlation Matrix			
	visual perception	**motor coordination**	**visual motor integration**
visual perception	1	r = 0.758; t = 6.776, p=0.000<0.05	r = 0.803, t = 7.856, p=0.000<0.05
motor coordination	r = 0.758; t = 6.776, p=0.000<0.05	1	r = 0.833, t = 8.779, p=0.000<0.05
visual motor integration	r = 0.803, t = 7.856, p=0.000<0.05	r = 0.833, t = 8.779, p=0.000<0.05	1

1) Correlation of visual perception with ADL.

The results in table 2 shows correlation results indicate that out of seven variables the influence of visual perception is significantly correlated with the components of self care, locomotion and communication item. Self care and communication items show strong positive correlation (graph 1,2)

Table 2
Correlation of Visual Perception with each seven variables of FAM

	Variable 1: Visual Perception		
Variable 2: Variable FAM	**R**	**T**	**P-value**
Self care	0.643	4.896	0.000
Sphincter control	0.265	1.602	0.118
Mobility items	0.278	1.688	0.101
Locomotion	0.723	6.102	0.000
Communication items	0.553	3.870	0.000
Psychosocial adjustments	0.328	2.025	0.051
Cognitive function	0.316	1.942	0.060

Figure 1
Indicating strong positive correlation between self care and Visual perception

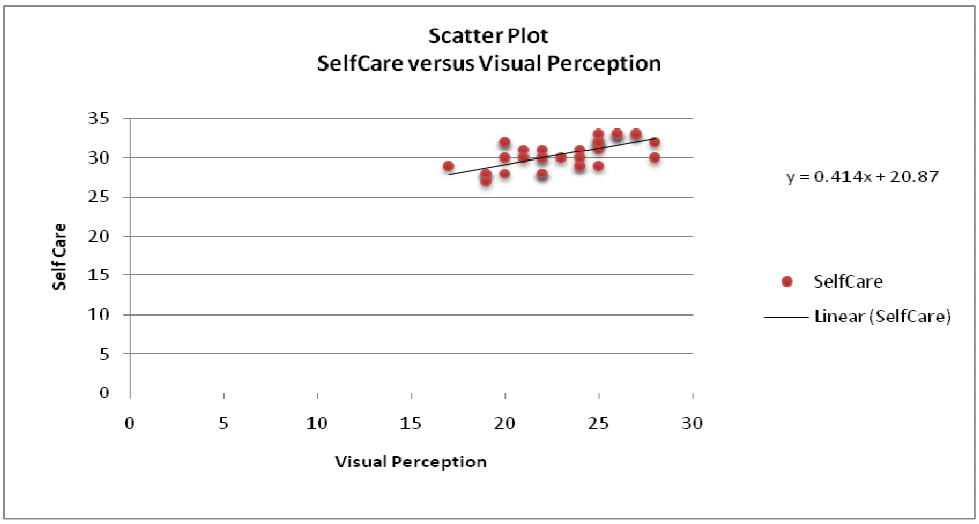
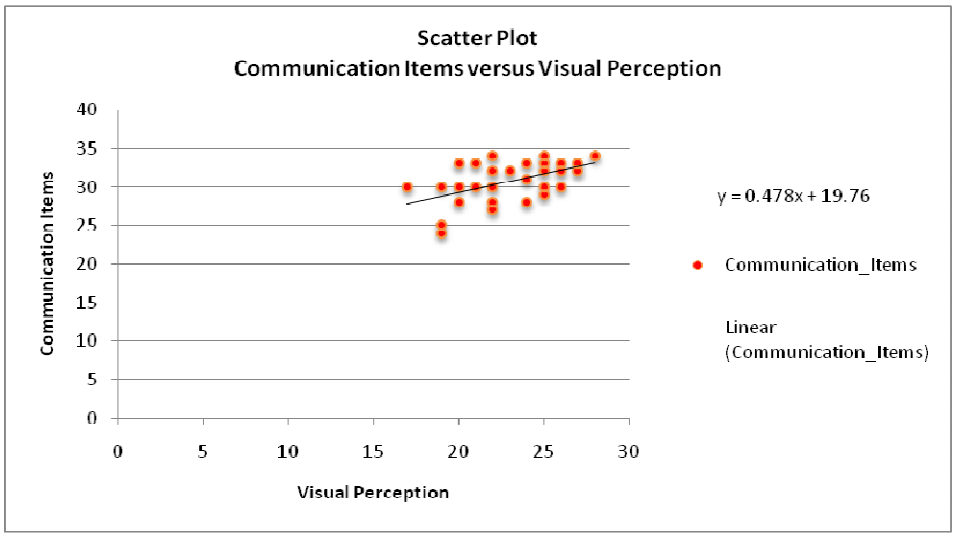


Figure 2
Indicating strong positive correlation between communication and Visual perception



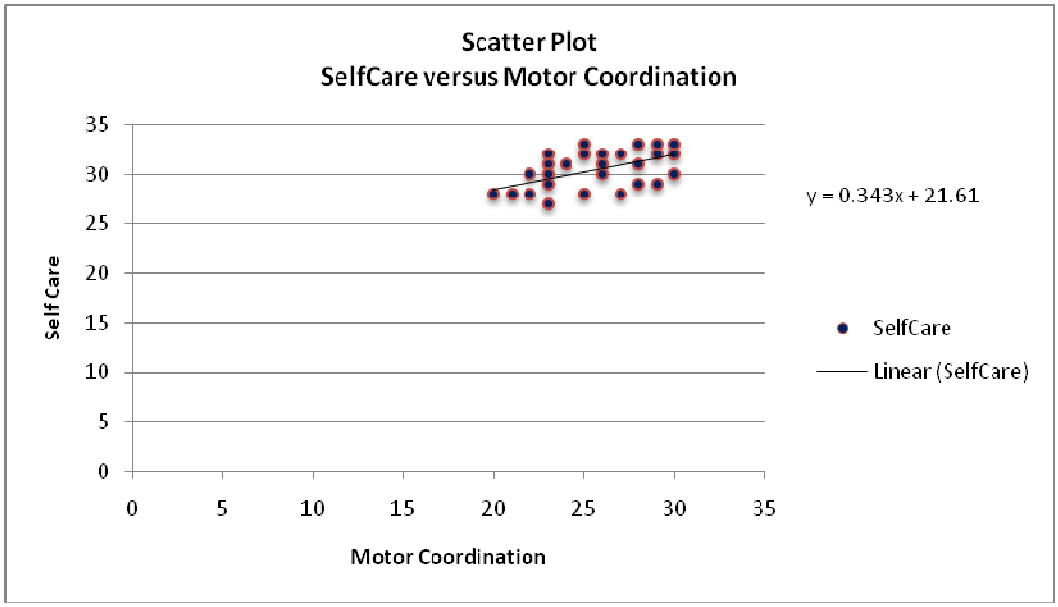
2) Correlation of FAM variables with the Motor Coordination

Motor coordination is in strong positive correlation with Self care in the present study, which is shown in table 3 (graph 3).

Table 3
Correlation of Motor Coordination with each seven variables of FAM

	Variable 1: Motor Coordination		
Variable 2 FAM	**R**	**T**	**P-value**
Self care	0.555	3.890	0.000
Sphincter control	0.335	2.073	0.046
Mobility items	0.258	1.557	0.129
Locomotion	0.584	4.195	0.000
Communication items	0.693	5.605	0.000
Psychosocial adjustments	0.398	2.530	0.016
Cognitive function	0.259	1.564	0.127

Figure 3
Indicating strong positive correlation between self care and motor coordination



4).Correlation of VMI and ADL.

The table 4 suggests that Visual motor integration is significantly correlate with self care(r=0.656,p< 0.05),Mobility items (r=0.0372,p<0.05),locomotion (r=0.713,p<0.05),communication (r=0.577,p<0.055) ,Psychological adjustments(r=0.491,p<0.05),cognitive function(r=0.344,p<0.05)

Table 4
Correlation of Visual Motor Integration with each seven variables of FAM

	Variable 1: visual motor integration		
Variable 2 FAM	**R**	**T**	**P-value**
Self care	0.656	5.068	0.000
Sphincter control	0.243	1.461	0.153
Mobility items	0.372	2.337	0.025
Locomotion	0.713	5.929	0.000
Communication items	0.577	4.119	0.000
Psychosocial adjustments	0.491	3.286	0.002
Cognitive function	0.344	2.136	0.040

5) Comparison of visual perceptual deficits on ADL between Right Hemiparesis and Left Hemiparesis.

The mean differences of Visual perceptual deficits and motor coordination on ADL is comparatively high in patients with Left Hemiparesis than in patients with Right Hemiparesis. The results suggest that difficulties in ADL due to VMI deficits in Left Hemiparesis are more evident than with the Right Hemiparesis table 5 (graph 4).

Table 5

Comparison of correlation between the components of VMI and FAM

	Self care	**Sphincter control**	**Mobility items**	**Locomotion**	**Communication items**	**Psychosocial adjustments**	**Cognitive functions**
Visual perception	Moderate positive correlation (r=0.643)	No significant correlation	No significant correlation	High positive correlation (r=0.723)	Moderate positive correlation (r=0.553)	Low positive correlation (r=0.328)	Low positive correlation (r=0.316)
Motor coordination	Moderate positive correlation (r=0.555)	Low positive correlation (r=0.335)	No significant correlation	Moderate positive correlation (r=0.584)	Moderate positive correlation (r=0.693)	Low positive correlation (r=0.398)	No significant correlation
VMI	Moderate positive correlation (r=0.656)	No significant correlation	Low positive correlation (r=0.243)	High positive correlation (r=0.713)	Moderate positive correlation (r=0.577)	Low positive correlation (r=0.491)	Low positive correlation (r=0.344)

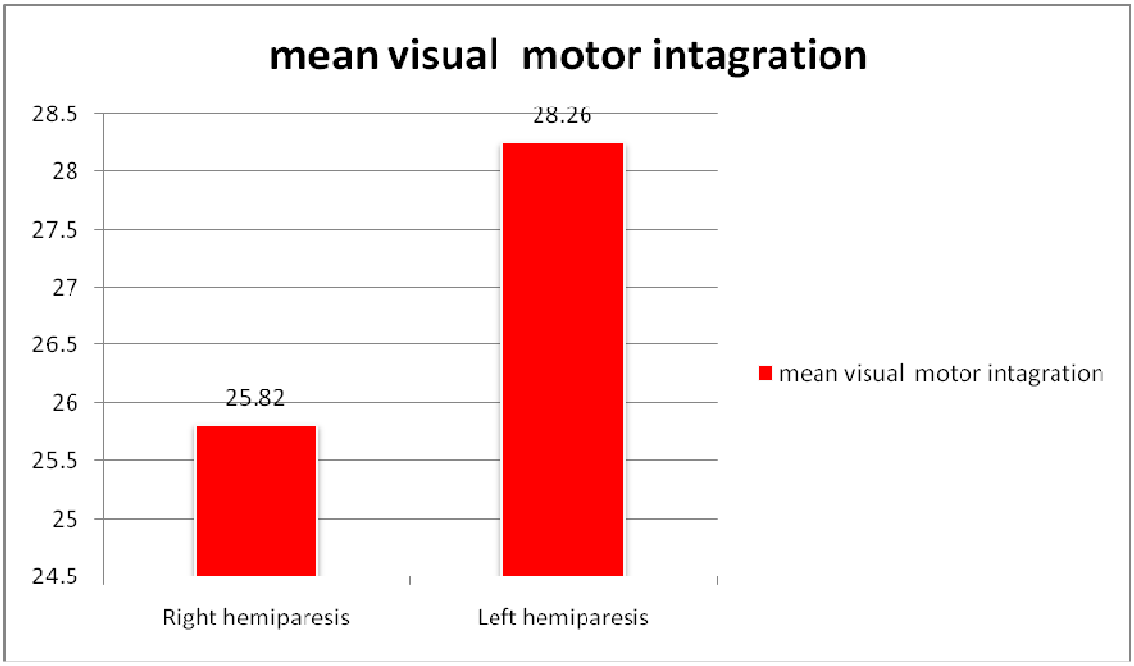
The mobility items as such have no significant correlation with visual perception table 2 and motor coordination table 3, but these items together in the form of VMI shows significant correlation table 4

Table 5

Comparison of Mean Group variances between Right Hemiparesis and Left Hemiparesis in terms of seven FAM measures

Group Statistics					
	Diagnosis	N	Mean	Std. Deviation	Std. Error Mean
Self Care	Right Hemiparesis	17	29.94	1.749	.424
	Left Hemiparesis	19	30.84	1.893	.434
Sphincter Control	Right Hemiparesis	17	13.59	1.064	.258
	Left Hemiparesis	19	13.58	.692	.159
Mobility Items	Right Hemiparesis	17	25.24	1.480	.359
	Left Hemiparesis	19	25.37	1.012	.232
Locomotion	Right Hemiparesis	17	18.88	.993	.241
	Left Hemiparesis	19	19.37	.831	.191
Communication Items	Right Hemiparesis	17	29.41	2.320	.563
	Left Hemiparesis	19	32.00	2.000	.459
Psychosocial Adjustments	Right Hemiparesis	17	23.12	1.495	.363
	Left Hemiparesis	19	24.79	2.200	.505
Cognitive Function	Right Hemiparesis	17	32.82	1.286	.312
	Left Hemiparesis	19	32.32	1.701	.390

Graph 1
Comparison of Mean VMI between Right Hemiparesis and Left Hemiparesis



DISCUSSION

First objective is to correlate visual perception, Motor coordination and visual motor integration. The results in table1 indicate that there is a strong positive correlation between the variables of visual perception and motor coordination. This study is consistent with the research of Jennifer et al., (2003) who suggested that visual analysis and motor coordination can affect performance on a test of visual motor integration[11]. The table 1 shows that visual perception and motor coordination together constitute VMI which is the output of an activity. This is in agreement with the study conducted by Robert et al., (2011) that, visual perceptual abilities improve motor coordination in patients with acute stroke[12]. To study the relationship between the variables of visual perception, motor coordination and visual motor integration in table1 the, r values of all these variables are correlated. The r values in the results suggests that, the influence of visual perception is high towards visual motor integration r= 0.7 than with that of the relationship of motor coordination with the visual motor integration r= 0.8 The second objective is to correlate visual perception with ADL. The results in table 2(graph 1 & 2) indicates the relationship between the visual perception and each of the seven components of ADL in FAM measure. The correlation results indicate that out of seven variables the influence of visual perception is significantly correlated with the components of self care, locomotion and communication item. Lincoln et al (2008) concluded that motor deficits had a larger impact than did perceptual deficits on the ADL[13]. However, they admitted that their measure of motor capacities was much more refined than was their measure of perceptual deficits, which might explain why they did not find a strong relationship between perceptual deficits and the ADL. Whereas, item communication (r= 0.5 p= 0.01) shows moderate positive correlation with that of the visual perception. The components of psychosocial items (r= 0.3) and cognitive items (r=0.3) have low positive correlation with visual perception .Srikanth et al., (2004) in their study related to quality of life after stroke suggested that ,Depression is a common complication after stroke and is associated with poor ADL in chronic Hemiparesis[14]. Whereas, Cognitive and visual-perceptual testing performed by a psychologist revealed no differences between

groups, two subjects in the experimental group and one subject in the control group were not tested initially. The third objective is to correlate FAM variables with the motor coordination. Motor coordination is in strong positive correlation with self care in the present study, which is shown in table 3 (graph 3).This findings is contradict with studies of Henk etal.,(2002) who both found that most of the overall improvement in motor recovery continued in some patients for up to 6 months, especially in the initially severe subgroups[1]. The systematic reviews in his study states that motor components in stroke have negative functions outcome. Motor coordination has significantly correlated with self care table3(graph 3), this statement adds evidence to the study conducted by karatas et all.,(2004) in which functional independence measures have been used as an outcome measure to assess the functional ability including toileting, they concluded that sphincter controls is affected in hemiparateic patients[15]. The forth objective of the study is to correlate VMI and ADL,the table 4 suggests that visual perceptual and VMI have comparatively similar r values that the r values between motor coordination and VMI variables related to FAM items. The mobility items as such have no significant correlation with visual perception table 2 an motor coordination table 3, but these items together in the form of VMI shows significant correlation in table 4.This is in controversy with the study conducted by Jeffery et all.,(2001) in which visual deficits have no significant correlation with mobility after stroke patients with chronic hemiparasis[16]. Final objective in this study is to compare the visual perceptual deficits on ADL between right hemiparesis and left hemiparesis in table 5 , the mean differences of visual perceptual deficits and motor coordination on ADL is comparatively high in patients with left hemiparesis than in patients with right hemiparesis. The results suggest that difficulties in ADL due to VMI deficits in left hemiperesis are more evident than with the right hemiperesis table 5(graph 4).This statements was critiqued by the study conducted by visual perceptual deficits are most notably present in self care, locomotion and communication. The influence of visual perceptual deficits on ADL is comparatively high in patients with left hemiperesis that with the right hemiperesis. Assuming that each hemisphere is specialized for controlling different aspects of voluntary actions, unilateral brain damage to the left and right hemisphere was expected to result in distinct deficits depending on the side of the lesion with more specifically abnormalities in the control of the ipsilesional arm[17,18,19,20] . Indeed, lesions in the hemisphere controlling the dominant arm was found to mainly produce deficits in the spatio-temporal features of motor trajectories, suggesting a deficit in the on-line control of voluntary action[21]. Contrasting with this result, stroke patients with lesions in the hemisphere controlling the non-dominant arm was found to mainly produce deficits in final position accuracy of the dominant arm, suggesting a specific deficit in the accurate planning of the initial parameters of voluntary action, with no impairment in on-line control[21]. Consistent with this, recent studies compared right-handed patients with age- matched controls in a manual-reaching task and reported that patients with left hemisphere lesions were characterized by specific decreases in movement speed and increases in trajectory curvature, with also lower smoothness [20]. These findings strongly suggest that the left hemisphere plays an important role in the integration of visual and motor information during the execution of voluntary motor action and the control of complex motor skills[22]. (By contrast, right-handed patients with right hemisphere lesions showed larger reaction times and increased final position errors[20], suggesting a specific deficit in the early motor planning and/or programming processes of accurate actions[22]. In support of this, right-hemisphere damaged patients show more visual perceptual deficits when performing a voluntary action in an open loop than in a closed loop condition, the latter offering more opportunities for visual on-line correction[23]. They also show specific deficits when requested to plan an action according to predefined cognitive constraints (e.g., off-line compared to on-line action control)[23] Rossit,

Duncan, and Harvey, 2011). Moreover, right-handed patients with right hemisphere lesions also showed longer response times in motor imagery tasks, with less temporal congruency between temporal aspects of real and imagined movements[24]. Thus, the difficulty in planning functional abilities seems to correlate with the difficulty in imagining the same action[25]. Coello et al. (2006) stated that patients with a right hemisphere insult leading to left hemiparesis revealed a reduced perception of the peripersonal space, with a reduction that reached 31% compared to that measured in the two other groups, whether the estimates were provided in reference to the healthy or hemiplegic arm. This indicates that a brain damage in the right hemisphere resulting in left hemiplegia affected widely the visual spatial relationship which is a component of Visual perception[26]

CONCLUSION

The purpose of this study is to examine the relationship between visual perceptual deficits and ADL in CVA. The sample of 36 patients with acute Hemiparesis used in this study demonstrated a wide range of visual perception and ADL difficulties. The visual perceptual deficits influence VMI which is considered to be the pre requisites for ADL. Visual perceptual deficits are most notably present in self care, locomotion and communication. The influence of visual perceptual deficits on ADL is comparatively high in patients with Left Hemiparesis than with the Right Hemiparesis. Limitation of the study is it is not possible to predict ADL deficits solely on the basis of Visual perception or the side of lesion, many factors other than these variables may contribute to ADL performance. Recommendations in this study are to conduct similar studies in more diverse and large participant groups. This study could also be preceded further with Instrumental Activities of Daily Living in a population of chronic hemiparetic patients resulting from CVA.

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