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〈Brief Report〉

Asymmetry in the Motor Performance of the Low and High Depression Groups

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The present study was designed to examine the effect of depressive mood on the functional asymmetry in motor performance. Participants were screened out of 360 college students on the basis of the BDI-II score: cut-off score of 14 for the High Depression Group (upper 20%) and 5 for the Low Depression Group (lower 20%). The participants in this study were all right-handed and matched for gender; 32 depressed students (16 males and 16 females) and 32 non-depressed students (16 males and 16 females). A hand dynamometer was used as a standardized measure of asymmetric motor function. The results showed that in males, there was a significant Group by Hand interaction effect. The mean grip strength of the right hand was significantly higher than that of the left hand for the Low Depression Group, whereas the High Depression Group did not show significantly greater right-hand grip strength. However, no such significant interaction effect was observed in females. The result of this study are consistent with the current neuropsychological model indicating relatively low activation of the left hemisphere in depression.

Key words : depression, motor function, hemispheric asymmetry of depression

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There has been increased interest in the cerebral lateralization of emotion and emotion related psychopathology (e.g., Davidson & Tomarken, 1989). Especially in the anterior cerebral system, the relative patterns of hemispheric activation associated with positive or negative affect have been supported in the literature (Davidson, 1993). Henrique & Davidson (1991) examined the activity of each hemisphere in the group of clinically depressed group by means of EEG (electroencephalography) and found that depressed subjects had relative right sided frontal activation as a result of hypoactivation in the left hemisphere.

Several imaging studies of patients with Major Depressive Disorder have disclosed hemispheric asymmetries in prefrontal cortical regions, with a relative reduction of glucose metabolism or cerebral blood flow on the left side (Baxter, Schwartz, Phelps, Mazziotta, Guze, Selin, Gerner, & Sumida, 1989; Martinot, Hardy, Feline, Huret, Mazoyer, Attar-Levy, Pappata, & Rota, 1990). If depressed individuals (or individuals with a depressed mood) experience relative right hemisphere hyper-activation or relative hypo -activation of left hemisphere, they should show a functional asymmetry on tasks which are affected by each hemispheric function. Motor functions of the right and left hand are known to be associated with the left and right frontal lobe functioning (Stuss & Benson 1984). So a measure of motor function can be used as an indicator of hemispheric functions. Among various motor tasks (i.e., Tapping test, Tactual Performance test, Hand dynamometer), the hand dynamometer was proved to have high sensitivity of lateralization in brain damaged patients (Dodrill, 1978). Thus it has been used as reliable measure of motor performance in populations with mood states (Emerson, Harrison, Everhart, & Williamson, 2001; Demaree, Higgins, Williamson & Harrison, 2002)

The present study was designed to examine the motor performance asymmetry using hand dynamometer measure in the Low and High Depression Group. Given current findings regarding functional anterior cerebral asymmetries among depressed individuals, it was hypothesized that the High Depression Group would show a weaker right-hand superiority in the grip strength asymmetry than the Low Depression Group. In addition, since previous studies have suggested a different pattern of cerebral activation in males and females (e.g., Kastrup, Li, Glover, Kruger, & Moseley, 1999) and recommended to explore male and female populations as distinct groups (e.g., Bell, Willson, Wilman, Dave, & Silverstone, 2006), we will consider gender difference in this analysis.

Method

Participants

All methods and procedures were fully

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approved by the Institutional Review Board and Human Subjects Committee of the Department of Psychology, Yonsei University. Participants were screened out of 360 college students on the basis of the BDI-II (Beck, Steer, & Brown, 1996) score: cut-off score of 14 for the High Depression Group (upper 20%) and 5 for the Low Depression Group (lower 20%) were used. Matched for sex, 32 students (16 males and 16 females) were selected for the High Depression Group (mean BDI-II score 21.06, SD 6.96) and 32 students (16 males and 16 females) were selected for the Low Depression Group (mean BDI-II score 2.41, SD 1.24). All were right-hand dominant as determined by scores on the EHI (Edinburgh Handedness Inventory; Oldfield, 1971), and had no history of head trauma or other neurological diseases.

Apparatus and Procedure

A Lafayette hand dynamometer (model 8010; Lafayette Instruments, Lafayette, IN, USA) was used as a standardized measure of asymmetric motor functioning. This measure has been associated with anterior frontal lobe brain functioning (Stuss & Benson, 1984). Poor performance may indicate anterior cerebral dysfunction contralateral to the hand tested, because distal extremities are controlled by the contralateral anterior hemisphere (Dodrill, 1978). The dynamometer records hand grip strength in kilograms (kg).

Subjects were administered the hand dynamometer to right and left hands. While standing with their hands at the sides, they were asked to squeeze the dynamometer as hard as possible with their right hand, and then with the other hand. This procedure was repeated 3 times without any rest. The examiner recorded the hand grip strength in kilograms and reset the dynamometer's needle to zero for every trial.

Results

Table 1 displays means and standard deviations by Group and Gender for each Hand. A three -factor, mixed design ANOVA was conducted for the fixed factor of Group (2) and Gender (2) by Hand (2). There was a significant Group by Hand interaction ($F(1, 60) = 7.28$, $p < .01$) and a Gender by Hand interaction ($F(1, 60) = 4.45$, $p < .05$). Also a main effect of Hand ($F(1, 60) = 32.58$, $p < .01$) and Gender ($F(1, 60) = 135.32$, $p < .01$) were significant. But neither significant main effect for Group ($F(1, 60) = .48$, $p > .05$) nor an interaction for Group by Gender by Hand ($F(1, 60) = .75$, $p > .05$) was significant. Since there was a significant Gender by Hand interaction, follow-up analysis was done separately for males and females. In males there was a significant Group by Hand interaction ($F(1, 30) = 5.24$, $p < .05$), whereas there was no significant Group by Hand interaction ($F(1, 30) = 2.13$, $p > .05$) in females. Figure 1 graphically depicts

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Table 1. Means(Standard Deviations) of Grip Strength of Right and Left Hand for the Low and High Depression Groups by Gender

	Low Depression Group			High Depression Group		
	Male	Female	Total	Male	Female	Total
Right Hand	38.40(6.72)	22.46(4.81)	30.43(9.93)	36.21(6.76)	21.19(3.17)	28.70(9.23)
Left Hand	34.77(5.96)	20.73(3.74)	27.75(8.65)	34.85(6.39)	20.63(2.43)	27.74(8.65)

the asymmetry of the Low Depression Group in comparison to the symmetry of the High Depression Group (i.e., Group × Hand interaction) in males.

Discussion

The purpose of the present experiment was to examine the effects of a depressive mood on the functional asymmetry in motor performance of college sample. Based on the neuropsychological model of emotion (Davidson, 1993; Davidson & Henrique, 2000), it was predicted that the High Depression Group would show a weaker right -hand superiority for the grip strength asymmetry than the Low Depression Group. In this study, this hypothesis was supported in males but not in females.

The present results are consistent with a previous study conducted with depressed boys aged 9-11 (Emerson et al., 2001). Another study with depressed patients also reported hemispheric asymmetries in frontal cortex activities by methods of transcranial magnetic stimulation (TMS) (Lefaucheur, Lucas, Andraud, Hogrel, Bellivier, Del Cul, Rousseva, Leboyer, & Paillere-Martinot, 2007). The decreased motor performance asymmetry in the High Depression Group can be attributed to the less power of right hand compared to the Low Depression Group (as depicted in Figure 1), suggesting that the negative affect such as depression is related to the hypo-activation of left frontal area.

On the other hand, in their study which examined the asymmetry of the grip strength in low and high hostile men, Demaree et al. (2002) reported an interaction between the hand

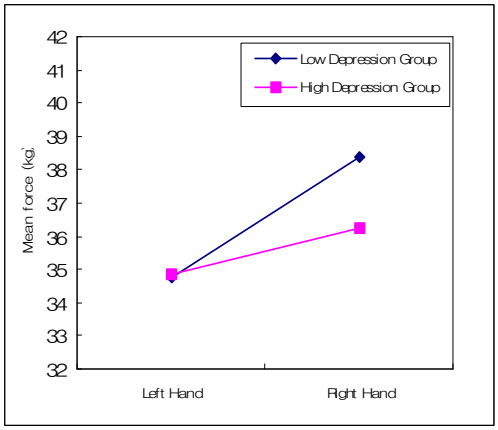

Figure 1. Mean of grip strength (kilograms) for the Low and High Depression Group in Male

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asymmetry and the hostility level. Thus it is unclear whether the decrease in the grip strength asymmetry is specific to depression or related to the negative emotions in general. Further research will be necessary to clarify the results.

Reasons for gender difference in the pattern of motor asymmetry associated with depression are not clear either. Kang's study (1997) also reported a gender difference on the asymmetry of intermanual grip strength in normal population, suggesting a possibility that such gender difference is specific to the motor-grip task used. It is also possible that a difference in the cortical functional lateralization on cognitive task for each sex played a role (e.g., Kastrup et al., 1999). In future studies, it would be worth to have the gender effect in consideration when conducting a study with a lateral asymmetry task.

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〈Brief Report〉

우울 집단과 비우울 집단의 양손 운동 수행 능력 차이 비교

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본 연구는 우울감이 양손의 운동 수행 능력의 차이에 미치는 효과를 검증하기 위하여 수행되었다. 연구 대상은 360명의 대학생 중 BDI-II 점수에 따라 14점 이상(상위 20%)을 얻은 학생을 우울 집단으로, 5점 이하(하위 20%)를 얻은 학생을 통제 집단으로 선정하였다. 각 집단의 성비가 동일하도록 선정된 32명의 우울 집단(남학생 16명, 여학생 16명)과 32명의 통제 집단(남학생 16명, 여학생 16명)이 연구에 참여하였고, 모두 오른손잡이였다. 양손의 운동 기능 차이를 측정하는 표준화된 도구로는 악력 측정 도구를 사용하였다. 그 결과, 남학생의 경우, 우울 집단과 양손 수행의 유의한 상호작용효과를 나타냈는데, 즉, 비우울 집단에서는 오른손의 악력이 왼손의 악력에 비하여 유의하게 높았으나, 고우울 집단에서는 오른손과 왼손의 악력에 유의한 차이가 나타나지 않았다. 여학생의 경우에는 이러한 상호작용 효과가 유의하지 않았다. 이러한 결과는 우울 집단의 상대적인 좌반구 기능 저하 가설에 부합되는 것으로 논의하였다.

주요어 : 우울, 운동 기능, 우울의 반구간 비대칭성

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