Implications of Starvation-Induced Change in Right Dorsal Anterior Cingulate Volume in Anorexia Nervosa

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 McCormick et al. (2008) conducted a study to determine if volume of the anterior cingulate cortex (ACC) was affected by starvation of an individual, such as an individual suffering from anorexia nervosa. A second area of interest in the study was if the volume of the anterior cingulate cortex would return to normal size following weight restoration of the individual. The third area of interest in the study was to examine the relationship between volume of the anterior cingulate cortex and scores on performance and verbal tests. The study was done to confirm results of previous studies which had suggested that individuals suffering from starvation had a smaller anterior cingulate cortex, and the anterior cingulate cortex was the only area that was still abnormally small after recovery in anorexic individuals. Previous research also showed that individuals diagnosed with anorexia nervosa had lower performance scores then verbal scores.

The study conducted by McCormick et al. (2008) studied thirty-six different individuals. Of the individuals studied, eighteen were Caucasians who met the criteria of the DMS-III for anorexia nervosa and were receiving treatment at the University of Iowa Hospitals and Clinics for their eating disorder. Of the eighteen individuals, six were males and twelve were females. The other eighteen individuals were selected from a reserve of research volunteers. These individuals, who served as the control group, were not suffering from anorexia nervosa. The eighteen individuals in the control group were matched in terms of sex, age, and height with the individuals in the anorexia nervosa group.

The individuals suffering from anorexia nervosa were given an MRI within one to nineteen days after admission to the hospital for their eating disorder. Of the eighteen individuals in this group, ten were given another MRI one year after weight restoration was achieved. Weight restoration was defined as the individual maintaining a body mass index of 18.0 or higher. The individuals who did not achieve weight restoration were not given a follow up MRI. The control group was also given one MRI when they were chosen to participate in the study. Next, individuals in both groups were given the Wechsler Adult Intelligence Scale test. These tests measured areas such as comprehension, arithmetic, similarities, and vocabulary scores.

McCormick et al. (2008) first compared the MRI scans of the anorexia nervosa group and the control group. They found that at the time of admission to the hospital, those suffering from anorexia nervosa had significantly smaller volume in their right dorsal anterior cingulate cortex then individuals in the control group. This finding was consistent with prior research results. McCormick et al. also found that those individuals who had sustained a body mass index of 18.0 or higher had greater normalization of the right dorsal anterior cingulate cortex. This was also consistent with results found in prior research. Furthermore, McCormick et al. found that normalization of the right dorsal anterior cingulate cortex helped to predict if the individuals would relapse. Those individuals whose anterior cingulate cortex had not gotten closer to normal all had body mass index of lower then 18.0. Those whose anterior cingulate cortex had gotten closer to normal had successfully maintained a body mass index of 18.0 or higher for at least one year.

Next, McCormick et al. (2008) examined the results of the Wechsler Adult Intelligence Scale. The results showed that the patients with anorexia nervosa actually scored higher on the verbal part then the performance part. This contradicts previous research, which indicated the opposite. Results also showed a significant difference in scores of the control group and the anorexia nervosa group on the performance portion with the control group scoring higher. However, there was not a significant difference in performance scores between the two groups.

There were several areas of this study that I felt were done exceptionally well. First, by matching age, sex, and heights of individuals with anorexia nervosa to individuals in the control group, they insured that results would be an effect of anorexia nervosa and eliminated the possibility of differences in the MRI due to those three variables. Second, McCormick et al. (2008) obtained an age-adjusted scale of scores for the Wechsler Adult Intelligence Test. By doing so, they eliminated the possibility that higher scores were a result of more knowledge from being older.

There were also areas of the study that could have used improvement or could have been done differently for more accurate results. First of all, the sample size was small. They started with only eighteen patients suffering from anorexia nervosa. When they looked at the effect of weight restoration on the anterior cingulate cortex, they were only able to measure MRI results of ten of the patients as the others had failed to complete weight restoration, a body mass index of 18.0 or higher. To further test their hypothesis and prove credibility, they need to conduct additional studies with larger sample sizes. Another problem with the study is the changes in the brain could have been from other variables. Six of the patients suffering from anorexia nervosa had a history of comorbid depression. Ten of the patients in the anorexia nervosa group had either obsessive-compulsive disorder or cluster C personality traits. The volume of the right dorsal anterior cingulate cortex could have been due to one of those disorders rather then anorexia nervosa. Eliminating this factor would prove to be difficult as eating disorders often coincide with other types of disorders such as depression. Finally, there were no MRI images of patients’ brains before they suffered from anorexia nervosa. It would be nearly impossible to obtain images of the brain prior to anorexia nervosa as there is no way to predict who will develop anorexia nervosa. Because of this, we do not know what the right dorsal anterior cingulate cortex looked like prior to the onset of anorexia nervosa. It is possible that an individual had a smaller right dorsal anterior cingulate cortex to begin with and the volume was not directly affected by anorexia nervosa.

McCormick, L. M., Keel, P. K., Brumm, M.C., Bowers, W., Swayze, V., Anderson, A., et al. (2008). Implications of starvation-induced change in right dorsal anterior cingulate volume in anorexia nervosa. *International Journal of Eating Disorders, 41* (7), 602-610.