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***Statistical Analysis of Eating Disorders Within the Adolescent Ballet Community***

The world of dance can be one of ruthless competition and unhealthy expectations. While great strides have been made in changing some destructive standards of the business, there continues to be a somber reality hiding behind the idealized beauty of, in particular, classical dance forms. Ballet has long been the most evident perpetrator of negative body image among dancers. Its taxing physical requirements paired with an aesthetic of long slender lines can easily promote unhealthy body objectification among girls. By no means do all ballerinas entertain injurious desires of unattainable body-shape, but there are, undeniably, many ballerinas that live in constant fear of gaining weight, panicked that they will distort their body lines, ruin their form, and thus, render themselves unable to perform professionally. This rationale appears blatantly disparaging and unrealistic to an outsider, but to the dancer who lives to perform through movement with a learned ethic of beauty, the fear of failure and inadequacy can easily distort attitudes about eating.

In the 1998 article “The eating attitudes test: Comparative analysis of female and male students at the Public Ballet School of Berlin” published in *European Child and Adolescent Psychology*, the researchers conducted a study hypothesizing the notion, widely acknowledged in the dance world, that female ballerinas or students of ballet are more apt to exhibit signs of an eating disorder than their non-dancer peers.

***Method***

The researchers selected a stratified sample of adolescents age 11-18. Thirty-seven of fifty-nine approached female ballet students agreed to take part in the study, and twenty of twenty-two male ballet students agreed. The selected ballet-students approached were all enrolled in the Public Ballet School of Berlin. The second group, which constituted the control group, was comprised of Berlin high school students matched by age to the participants from the Public Ballet School of Berlin. Ninety-five female students and sixty-one male students from the same high school participated in the study. The third group consisted of hospitalized female patients diagnosed with anorexia nervosa by the ICD-10 criteria for the disease. Nineteen subjects were selected from this group. The mean age of female ballet students was 15.27 with a standard deviation of 1.39. The mean age for male ballet students was 15.03 with a standard deviation of 1.24. The mean age for the female high school student group was 15.52 with a standard deviation of 1.43, and the mean age for their male counterparts was 14.96 with a standard deviation of 1.26. The mean age for the female patients diagnosed with anorexia nervosa was 14.89 with a standard deviation of 1.41. Thus, the three groups were relatively equal in both mean and variance of age.

Each group was given the EAT-40 survey (Eating Attitudes Test), a standardized test that measures the severity of an eating disorder or eating attitude. A test result exceeding 30 indicates eating disorder. Each subject’s weight and height were measured in order to calculate each participant’s BMI. The female participants were required to record their menstrual patterns. Of specific interest to the study, was if menstruation was absent for female participants, and if so, for how long. Mean values for the EAT-40 test results were interpreted using a t test, and the distribution of EAT test results between two sample groups was evaluated with the Mann-Whitney U-test.

 ***Results and Conclusion***

The data collected were interpreted in four tables. Recording t values the researchers arrived at these test statistic results from a two-sample t test for comparing two independent groups’ means. The first table compares the mean EAT score for ballet students of both genders to their respective control groups using t values. In the second table, the EAT data were broken up into three subcategories. The EAT test is based on three factors. Through the participants’ survey responses the researchers were able to calculate the subscores for each factor, allowing for further comparison between the eating attitudes of ballet dancers versus non-dancers. The first factor is characterized by “avoidance of fattening food and preoccupation with being thinner” (Neumärker et al. 22). “The second pertains to thinking about food and bulimic behavior” (Neumärker et al. 22). The third factor relates to controlling one’s eating and a “perceived pressure from others to gain weight” (Neumärker et al. 22). By comparing the results within these subcategories, the researchers could compare the differences and similarities between components that led to higher EAT scores. The third table records the means of total EAT scores and the means of individual EAT factors for those females scoring thirty or above on the EAT-40 test. This table includes result from all tested female groups: the ballet students, non-dancing high school students and admitted patients. The fourth table lists the individual questions from the EAT survey that represented significant differences between the girls in the tested groups who scored a 30 or above on the EAT test.

With the data provided by the EAT surveys, the researchers first compared female dancers with their complementary control group (female high school students) and the men dancers with their complementary control group (male high school students.) The patients were excluded in this comparison because the researchers were interested in determining if EAT scores were higher for dancers compared to their presumably average, non-dancing peers. In this situation the researches employed a two-sample t test. The null hypothesis for the female group was that female dancers and non-dancers would have the same mean scores on the EAT test, and the alternative hypothesis was that the female dancers would have a higher mean score on the EAT test than their non-dancer peers. The data was collected and stratified by age group. With p values lower than .05, the samples of females age sixteen to seventeen and the aggregate results of females age thirteen suggest that the dancers statistically significant higher scores on the EAT test. Thus, the researchers rejected the null hypothesis in favor of the hypothesis that the female ballet students had a higher rate of anorexic behavior than their non-dancing peers. The t value for the mean of the total sample of female ballet students minus the mean of the total sample of female high school students was 2.78 with 130 degrees of freedom, and a p value of less than 0.005.

For males, similar data resulted. Mean EAT totals were higher for male ballet students than their non-dancing counterparts. When interpreting the sum of all of the age groups, there is strong statistical evidence that male ballet students have higher mean scores on the EAT test than the male high school control group. The t value for the two sample t test comparing male dancers’ EAT scores with the control group’s was 2.84 with 55 degrees of freedom and a p value of less than 0.005

 In Table 2, researchers determined that, for males, the overall higher mean EAT score can be credited to a higher vale of Factor 3 that is statistically significant. When comparing the mean scores of Factor 3 for male ballet dancers and male non-dancers, the two-sample t test yielded a t value of 2.1, with 79 degrees of freedom and a p value of less than 0.05. Regarding females in Table 2, female ballet students had statistically higher mean EAT scores for all three factors compared to the control group of female non-dancers. Factor 1 resulted in a t score of 2.43 and a p valueless than 0.05. Factor 2 produced t value of 2.73 and a p value of 0.005, and Factor 3 generated a t vale of 2.2 and a p value f less than 0.005. Thus, the differences were all statistically significant, rejecting the null hypothesis for a two-sample t test that the non-dancers’ and dancers’ responses to the factors was the same. The dancers’ scores were significantly higher than the control group. When comparing male and female ballet students with a two-sample t test, the female dancers produced higher scores for Factors 1 and 2 with statistical significance (for Factor 1, a t value of 3.87 with 55 degrees of freedom and a p value of less than .0005 was achieved, and for Factor 2, a t value of 2.94 with 55 degrees of freedom and a p value of less than 0.005 was achieved.) These differences between genders for the ballet student group were also recorded for the high school student control group. Thus, the discrepancies between genders appear to be consistent across groups.

 In Table 3, the responses for the three factors between dancing females and non-dancing females with EAT scores above 30 (indicating anorexia nervosa) appear similar. There is not evidence to indicate a statistically strong difference between the two groups. The results of two-sample t tests result in high p values, subsequently causing the researchers to not reject the null hypothesis that mean values for the three factors are the same between female ballet students and the female control group. However, in Factor 3, the female dancers and female control group differed with statistical significance from the anorexia nervosa patients with a two-sample t test between dancers and anorexia nervosa patients producing a t value of 6.55 with 25 degrees of freedom, and for a two-sample t test between the control group and anorexia nervosa patients a t value of 6.92 with 24 degrees of freedom and a p value of less than 0.0001 results.

 With regards to Table 4, the article states, “Significant differences in response behaviour were more frequently established between female ballet school students, on the one hand, and female A.n. patients, on the other (eleven questions), than between the control group and female patients (five questions)” (Neumärker et al. 21). However, the article does not provide test statistics or p values to support this claim.

 Based on the data, the researchers determined that, while mean EAT scores are higher for ballet students than the control group, the ballet group does not statistically produce more subjects with eating disorders than the control group. In fact, none of the ballet students or students in the control group were anorexic based on ICD-10 criteria. Additionally, from the responses to individual factors, the eating attitudes of female dancers were much closer to the control group than to the female anorexic patients. The researchers concluded that the higher mean EAT scores within the ballet student group were most likely a result of “their specific living conditions” (Neumärker et al. 22). The researchers did not believe that the higher EAT scores within the dancing population were not necessarily associated with psychological disorders but rather a product of the culture. However, the researchers stressed that their study did reaffirm the hypothesis that eating disorders are higher among females than males in populations. Additionally, due to the data’s stratification by age, the researches asserted that eating disorders seem to peak around age sixteen. Acknowledging the possibility of error, the researchers contended, “the low specificity of the EAT when screening the general population, the high evidence of elevated EAT scores within the control group compared with the reported incidence of A.n…may support [the] conclusion that the female controls with suspicious EAT scores rather were falsely positive cases” (Neumärker et al. 22).

***Critique***

 I have some serious concerns with this study. First, the small sample size, in conjunction with the selection of participants from two schools and one hospital does not bode well for applying the results of this study to the general population. All of those tested lived in Berlin, the ballet students all attended the same school, and the control group came from one high school. The article itself states that the ballet school from which the participants were selected is one of the premier ballet schools in Europe and is unique in its approach. This uniqueness is troubling. I don’t think the results of these ballet students can be applied to ballet students everywhere. For the results to be representative of the general population, the sample would need to be much larger and include ballet students from many different schools from various parts of the world. Similarly, the control group would need to be a more diverse population of high school age students, and the anorexia nervosa patients would have to be selected from many different hospitals from many different countries and regions.

 There, too, is evidence of non-response bias. Not all of the approached ballet students agreed to the study. Additionally, the reader is not informed of how the researchers selected the participants comprising the control group or the anorexia nervosa group, leaving room to question if the two samples were truly random.

 It is also unnerving that the researchers admit to the possibility of attaining false positives through the low specificity of the EAT survey when testing a large, average population. Perhaps the researchers should not have used a test that has the possibility for producing false positives when applied to general populations.

 The researchers appear to have used accurate statistical methods. Their use of a two-sample t test is appropriate, as is their utilization of p values in comparing inequalities between groups. However, their last assertion that the data found in Table 4 shows strong differences in response for individual factors between the female ballet students and anorexia nervosa patients is unsupported by any reported p values.

Work Cited:

Neumärker, et al. "The eating attitudes test: Comparative analysis of female and male students at the Public Ballet School of Berlin." European Child & Adolescent Psychiatry 7.1 (1998), 19 - 23.