Schweizerische Anorexia Nervosa Stiftung
Fondation Suisse d'Anorexie Nerveuse
Fondazione Svizzera d'Anoressia Nervosa

Boys with Anorexia nervosa: Neurobiological correlates and clinical outcomes
(project no. 53-15)

Authors
B. Herpertz-Dahlmann, K. Konrad, J. Seitz, T. Vloet,
Doctoral students: J. Offermann, L. D. Lotter, L. Schlösser

Introduction
Human eating behavior and physiology naturally differ between genders.1 Discovering the underlying mechanisms may have important implications for our understanding of gender-specific causes of Anorexia nervosa (AN). Despite of gender-specific body composition ideals in healthy individuals,2 eating disorder severeness is largely comparable between males and females with AN.3 However, to date, potential gender differences in long-term clinical and neurobiological outcomes of juvenile AN remain largely unexplored.

In our study, we collected clinical, behavioral, hormonal and brain-imaging data in a sample of young adult males and females recovered from AN (recAN) to identify gender-specific neurobiological trait-markers and potential "biological scars" of AN.

Methods
Overall, 76 subjects were included in the final analyses of this study: 26 female and 11 male patients recovered from AN aside with the same number of age-, weight-, sex- and education-matched healthy controls (HC). Recruitment of male participants is still ongoing. All participants completed detailed clinical and hormonal assessment and multimodal (functional) magnetic resonance imaging.

Results
Whilst, in general, eating disorder psychopathology as well as body weight normalized, male recAN subjects exhibited less body weight concerns but increased excessive exercising and drive for muscularity compared to females recovered from AN and HC. In line with the normalization of psychopathology, we observed a general pattern of hormonal restitution, except for decreased testosterone levels in male recAN which were correlated negatively with drive for muscularity.

Using resting-state functional magnetic resonance imaging in an extended datatset, we discovered severe and widespread neural alterations in acute patients with AN. These alterations were not evident in the recAN subjects, indicating neural recovery after long-term weight-normalization. Exploratory analyses of male recAN subjects, however, pointed towards male-specific long-term alterations in temporal, thalamic and frontal brain regions, possibly involved in emotional and cognitive processing.

Preliminary conclusions

Taken together, we found similar or slightly less general eating disorder symptoms in male recAN compared to their female counterparts, however, a higher male-specific drive for muscularity. Lower testosterone in male recAN compared to male HC of similar body weight and its association with this higher drive for muscularity could be related to underlying pathophysiologic mechanisms. Considering that all male recAN subjects included in our study initially presented in underweight state, the shift towards increased drive for muscularity and the association with lower testosterone levels might indicate gender-specific “strategies” of recovery or neurobiological scars from AN. Thus, further investigations of the role of exercise and drive for muscularity in the development, maintenance and remission of male AN seems highly relevant, in line with the suggestions to consider muscle dysmorphia diagnostically through the lens of an eating disorder.

While widespread functional (resting state) brain changes found in acute AN normalized with weight recovery in female patients with AN in line with previous studies 4, potential differences were found in male recAN. These results show that psychopathology, pathophysiology and related brain alterations appear to differ between male and female patients with AN necessitating separate research approaches and potentially ensuing differential treatment regimes.

References

1. Asarian L, Geary N. Sex differences in the physiology of eating. *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology.* 2013;305(11):R1215-R1267.
2. Brierley M-E, Brooks KR, Mond J, Stevenson RJ, Stephen ID. The Body and the Beautiful: Health, Attractiveness and Body Composition in Men’s and Women’s Bodies. *PLoS One.* 2016;11(6):e0156722.
3. Strobel C, Quadflieg N, Voderholzer U, Naab S, Fichter MM. Short- and long-term outcome of males treated for anorexia nervosa: a review of the literature. *Eat Weight Disord.* 2018;23(5):541-552.
4. Seidel M, Geisler D, Borchardt V, et al. Evaluation of spontaneous regional brain activity in weight-recovered anorexia nervosa. *Transl Psychiatry.* 2020;10(1):395.

The project was funded by the Swiss Anorexia Nervosa Foundation.