

Network Physiology Approach to Assessing Emotion Regulation Workshop Effects on Mental Toughness in Collegiate Swimmers

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ABSTRACT

Mental toughness (MT), comprising a constellation of eight key dimensions (e.g., emotion regulation) that share the commonality of *purpose*, *efficiency*, and *flexibility*, is pivotal for athletic performance. MT research is predominantly observational, and females are underrepresented. Psychological skills training (PST) workshops are common practice in sport psychology. The new field of Network Physiology focuses on coordination and network interactions rather than on the structural organization and dynamics of individual organ systems. Applying this framework to sport psychology could offer innovative insights into the systemic relationships among MT dimensions. **PURPOSE:** To examine the systemic impact of an *emotion regulation* (ER) intervention on the interconnections of MT dimensions on collegiate female swimmers, utilizing a network analytical model. **METHODS:** The sample consisted of NCAA Division I female collegiate swimmers ($n = 18$). The Mental Toughness Index (MTI) served to quantify the eight key dimensions of MT (each question represents one key dimension; Q3 is for ER; range 1-7). Athletes were administered the MTI pre- and post-workshop. ER was chosen for targeted team PST due to its lowest average team score ($M = 4.47$; $SD = 1.22$). Network analysis entailed MATLAB (2023b)-based calculations of *degree* and *betweenness* centrality metrics and visualization of the pre- and post-intervention correlation matrices (representing the dimensions of MT as *nodes/organs* and the correlations between them as *edges*). Heatmaps detailed changes in correlation strengths, with a focus on the targeted dimension of ER. **RESULTS:** Centrality analysis revealed no change in degree or betweenness centrality, with all dimensions maintaining a pre- and post-workshop centrality score of 0. Heatmap analysis identified a range of changes in correlation strengths: from -0.46 to +0.33. **CONCLUSION:** Drawing from the framework of Network Physiology, this ER workshop did not alter the structural centrality over time within the network of MT, pointing to a robust and well-integrated system, which might support the notion of a unidimensional construct. However, variations in correlation strengths signal selective effects on certain interactions, implying ongoing differentiation, a key characteristic of a flexible system.