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NEWS

Subconcussive Head Impacts May Alter Metrics Associated with Normal Pruning in Youth and High School Football Players

Monday 10:50-11:00 AM | SSC11-03 | Room: S402AB

PURPOSE

To determine whether exposure to repetitive subconcussive impacts affects fMRI metrics associated with normal pruning in youth and high school football players over a single season.

METHOD AND MATERIALS

Youth and high school football players are exposed to high numbers of head impacts over the course of a season [1]. The spectral power of resting state networks typically decreases as a function of age and has been interpreted as a sign of normal Gray Matter (GM) pruning [2]. We hypothesized that a season of contact sports will alter this relationship. Specifically, there will be an increase in power of the DMN and consequent change in GM volume (GMV) associated with normal pruning.Sixty age matched players without history of developmental, neurological, or psychiatric abnormalities and no history of concussion during or prior to the season were split into high impact (HI) (24) and low impact (LI) (36) groups, respectively based on each player's risk-weighted cumulative exposure (RWEcp)[3,4]. The RWEcp represents the summed risk of concussion for each impact over the season as derived by the Head Impact Telemetry System (HITS) data [1]. High order ICA (n=60) was performed to extract independent components using the GIFT toolbox [5]. Subject specific time courses for each subject were converted into a power spectrum through power spectral decomposition. Five components of the DMN were identified and changes in the power of the network were computed as post-season minus pre-season values (ΔPSD). Following bonferroni correction, only the anterior cingulate network demonstrated a significant difference in ΔPSD and was used as a mask to determine GMV using VBM8. A two-sample t-test was performed to determine significant changes in ΔPSD and ΔGMV between the groups.

RESULTS

The frontal DMN (FDMN) demonstrated a significant increase in power in the HI group (p-value: 0.00018). A significant increase in GM volume was found in the same frontal regions of the DMN (p-value: 0.005) (Fig.1) for HI group.

CONCLUSION

Our results suggests that normal GM pruning is affected in the HI group, over a single season of contact sport. Longitudinal studies are needed to understand the long-term changes in resting state networks and effects on functional brain health.

CLINICAL RELEVANCE/APPLICATION

This work demonstrates that playing a season of contact sports may affect normal GM pruning in high school and youth football players.