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## Inhibitory control in elite young soccer players: a propensity-score matched cross-sectional study

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**INTRODUCTION:** Inhibitory control is suggested to be critical for success in soccer since players are required to stop inappropriate or ongoing movements, to suppress irrelevant or interfering information and to keep their attentional focus on what is most important. A few studies have in fact found that adult and youth elite players outperform non-elites in response inhibition ranging from medium to large effects. In order to further substantiate these findings, we compared the Stop-Signal Task performance of the top Austrian youth soccer players with a carefully matched sample of lower-league players within the framework of an fMRI study.

**METHODS:** The study included 28 (16.9±0.5 yrs of age) out of 32 male field players of the highest national soccer talent program and 30 (16.9±0.5 yrs) non-elite peers. For the reference sample, 115 players of 21 local-league clubs were preselected and 71 of them who regularly trained and competed but never had been part of any development program were matched by the logistic propensity score according to their exact age, training years, education and video gaming. The Stop-Signal Task created and evaluated in accordance with the consensus paper (1) was conducted during the fMRI scans. To get familiar with the tracking procedure, all subjects completed the same task more than 4 weeks prior to the scans in an online version and another 1-2 weeks prior to that in a shorter version without stop-signals to get the baseline RT.

**RESULTS:** During task-based fMRI, elite and non-elite players showed similar stop-signal RT (183±32 ms vs 188±24 ms:  $p=.505$ ) and RT on go trials (340±34 ms vs 344±27 ms:  $p=.695$ ) with trivial effects (SSRT:  $d=0.176$ ; RTgo:  $d=0.104$ ). Two-sided Bayesian t-tests (with a Cauchy prior centred at zero and a scaling parameter of 0.707) revealed moderate evidence in favour of H0 (SSRT:  $BF_{01}=3.1$ ; RTgo:  $BF_{01}=3.5$ ). In contrast, elite players outperformed non-elites during familiarization with 23 ms faster SSRT (228±41 ms vs 250±32 ms:  $p=.037$ ;  $d=0.622$ ;  $BF_{10}=1.8$ ) and 28 ms faster RTgo (390±59 ms vs 418±41 ms:  $p=.058$ ;  $d=0.561$ ;  $BF_{10}=1.3$ ) and showed a trend towards faster baseline RT (348±39 ms vs 367±36 ms:  $p=.071$ ;  $d=0.496$ ;  $BF_{10}=1.1$ ).

**CONCLUSION:** The comparable response inhibition performance of the best national youth soccer players and their matched non-elite peers contradicts previous findings of better stop-signal inhibitory control in elite players than in lower-level athletes. Such differences were only apparent in our study when the players completed the task for the first time, despite the fact that detailed instructions, block-based feedback and a practice block prevented proactive, progressive and post-error slowing. In this first run, the included matching variables did not eliminate the group effect. We expect the analysis of the fMRI data to provide insights on whether the behavioural outcomes of the first run are also evident at the neural level in the second test run.

1 Verbruggen et al. 2019

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