New submission from ARC Award Final Report

webteam@langara.ca <webteam@langara.ca>

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To:Scholarly Activity <scholarlyactivity@langara.ca>

Name of Researcher

Brent Day

Department/Faculty

Kinesiology

Position in Department/Faculty

Faculty

Project Title

Examining the relationship between the reactive strength index and training load in female collegiate soccer players

Term of Project

Fall 2022 -Summer 2023

Please introduce yourself - include pertinent background information relating to the topic of your research project.

My name is Brent Day and I am faculty member in the Kinesiology department and lead investigator in the Applied Human Performance Lab located in T515. I started off as strength and conditioning coach and have recently shifted my research to the study of sports science. My ARC research topic was to look at how training load impacts multiple-rebound jump, which is a measurement of neuromuscular fatigue. My research in this topic was designed to help practitioners have a valid test to identify which of their athletes are fatigued.

Please discuss your educational background and your work experience that led you to taking on this research project. If possible, include a quote that helps define your interest in this project.

My educational background starts at Douglas College where I discovered their diploma in Sports Science. From there I moved to Trinity Western University where I completed my BHKin. After my studies at TWU I became a certified strength and conditioning specialist and started working with elite athletes. This is when I started becoming interested on how to manage athlete's fatigue to help them perform at their best. After working with athletes for awhile I decided to do my Masters in Exercise Science at Edith Cowan University in Perth Australia. This is where I had an opportunity to see sports science in action. It also gave me the opportunity to work with Professional and Olympic athletes. This when I developed an interested in sports science technology and how to could help athletes holistically.

Please summarize your project in plain language that others not in your field could understand.

My project aimed to try and use various technology to help athletes determine whether the amount of training and game play is creating detrimental fatigue. We used heart rate monitors to determine the athletes training load, which is derived from heart rate intensity, total distance covered and speed ran during practice and game. To determine if the athletes were fatigued or not we put them through a 10 second multi-jump test performed on force plates. The force plates gave us a key performance indicator called reactive strength index, which is how reactive the muscles and tendons are during a jump. Lower RSI means the athletes are fatigued, high RSI means they are not fatigued. The RIS test was done prior to the pre-season to develop a baseline, and twice during the season the morning after a night game. We expected to see the RSI drop for athletes that had high training load. Unfortunately this was not the case. So we looked at the athletes aerobic testing scores and found that the athletes with higher aerobic scores maintain

similar RSI scores to their baseline, while athletes with lower aerobic scores were seeing much lower RSI's. This suggests that aerobic conditioning plays a role in recovery from high training load events.

Identify the project goals and objectives. Explain how the results may be used to solve a problem or inform further research in the field.

The goals and objectives of this project was to provide practitioners with a way to monitor athletes fatigue with a simple and quick test. The research we conducted shows that the multi-rebound jump is a simple and valid test to help monitor and manage fatigue. It also highlights the importance of building an aerobic base in the sport of soccer. Further research I would like to conduct is to use heart rate variability and the multi-rebound test to give athletes an idea if they are recovered from training.

Briefly explain the steps taken (methods used) to conduct the research, and describe the key findings.

10 healthy, young female collegiate soccer players with an age of mean \pm SD) 19.2 \pm 1.0 y, and a body weight of 58.7 \pm 5.1 kg volunteered as participants for this prospective cohort study. Subjects participated in three separate fitness testing sessions: before pre-season, end of pre-season, and one month into the competition phase. At each testing session, RSI was assessed through the completion of two 10- second trials of multi-rebound jumps. Participants were instructed to jump upon a force plate (Hawkin Dynamics, USA®) with hands placed on hips. The formula [RSI= flight time (s)/ground contact time (s); mRSI = jump height (m)/ ground contact time (s)] was used to calculate peak RSI, average RSI, and the mRSI. Cardiorespiratory fitness was measured through the participants' last shuttle completed of the YoYo-IRTL-1 (m). The Polar Team Pro® system was used to calculate the pre-season training load. A multiple regressions analysis (R2) was used to determine the association between RSI indices and training load. Significance was declared as p < 0.05.

Who was involved in this project (eg. faculty, students, community partners)? How did their involvement contribute to the project's success? Were there any challenges to overcome?

Brent Day (Langara College), Andrew Perrotta (University of Windsor), Rachel Barker (Langara Student), Athena Garedakis (Langara Student), Anika Scott (Langara Student), and Kayla Seaborn (Langara Student). The participants in the study were from the Langara Women's Soccer team. Each member of the research team was involved with collecting data. Andrew analyzed the data. Our four student researchers wrote up the poster together and will be presenting the findings at the CSEP conference on October 13th.

Please share any personal stories that made this research experience memorable/valuable.

I was able to take our research and present our finding at the Hawkin Dynamics Sports Science conference in August. This allowed me to showcase Langara College and the kinesiology department to practitioners from across North America. My presentation went very well and the data and tests were well received my the attendees.

What are the next steps for this project and for you as a researcher?

The next step for this project is to present and publish the findings at the national CSEP conference on October 13th-15th. I plan on applying for the 2023-2024 ARC and explore other grants Langara has to offer. I also want to extend our lab and testing procedures to a community partner to continue giving students and athlete the opportunity to monitor and manage their fatigue.

Please upload any images that will help to showcase your project.

<u>CSEP-Poster-RSI.pdf</u>

Langara Institutional Repository Consent

By submitting, I consent to uploading my ARC Fund final report to the Langara Institutional Repository (The LaIR).