In order to have a better understanding of the nuances of RSI and the relationships it has with athletic performance, different studies have been referenced. These sources shed light on how RSI is an effective predictor of athletic performance in the short term but is potentially not nuanced enough to fully understand the relationship between heavy load on athletes and long term fatigue. With this, while RSI gives lots of insight into neuromuscular fatigue levels, it potentially can fail to account for differences in mechanics which may lead to misleading results.

A study done by Kristof Kipp explored biomechanical characteristics and RSI during drop jumps performed by 12 different NCAA Division I men's basketball players. Participants performed drop jumps from 30, 45, and 60cm onto force plates, measuring RSI values along with key biomechanical variables, including vertical stiffness. Vertical stiffness is the ratio of the force applied to the ground to the vertical movement of the body, showing how stiff or spring-like an athlete is during activities like jumping or running. The results of the study revealed a significant positive correlation between vertical stiffness and RSI, indicating that greater RSI values were associated with greater stiffness. Athletes who produced higher forces quickly and with less joint flexion during ground contact generally demonstrated higher RSI. Additionally, the results showed that drop jump performance (RSI, contact time, and jump height) did not change across the three drop jump heights, suggesting that assessing RSI at multiple heights may not be necessary.

This study emphasizes the importance of analyzing the underlying biomechanical techniques and force production strategies in achieving RSI. Highlighting that two athletes may produce similar RSI values, but achieve these values through very different movement mechanics. Therefore, understanding these mechanics is critical for accurate performance evaluation. It is important to note that participants in this study were permitted to use an arm swing during their drop jumps rather than keeping their hands at their hips.

According to research done on how RSI changes as a result of intense load on athletes, there is a somewhat complex relationship between fatigue measured through RSI and the load placed on athletes. A study done on elite soccer players over the course of a 4 day tournament where a game was played each day demonstrates how fatigue sets in over time. The study found that there was not a statistically significant difference in the RSI values of the team before each game. Despite this, the study showed that while each game had similar intensities, fatigue set in more during the last 3 games than it did in the first game, especially for players who played for the entire game the last 3 games. The athletes who played for the entire game showed statistically significant drops in RSI values from before to after the game for the last 3 games where there was no detectable drop in the first game. This fast recovery but quick drop off over time suggests that there may be a relationship between fatigue onset and the intensity of effort interacting with the amount of rest in between each effort where the body is able to recover from fatigue quickly but fatigue sets in quicker when exacerbated through lack of sufficient rest.

The same study also references a case where a team of the same calibre participated in a tournament over the course of 19 days but only 6 games were played. This study found that there were no statistically significant drops in RSI before and after each game. In fact, the study found that there was a statistically significant increase in RSI values measured before the first and sixth games. This, like shown before, highlights the potential relationship between RSI and the intensity of effort interacting with rest duration suggesting that insufficient rest times may be

associated with long-term fatigue recovery. These studies, though, did not give us any information into how well the teams played overall in the tournaments, just their measured fatigue levels.

One study by Adam Petway looked into how RSI is related to individual performance. This study focused on Division I Basketball players' RSI measurements before and after practice the day before a game. This study found that games where players reached a maximum speed that was greater than their median maximum speed in games for the season were associated with a higher increase in RSI in practice the day before. This suggests that RSI can potentially be used as a predictor for individual performance in a game. Since RSI is a measurement of fatigue and explosivity, RSI may also be a strong predictor of explosive in-game statistics such as rebounds, steals, or points, not just in-game speed.

This study found that the increase in the RSI measurements from before to after practice had a roughly normal distribution with a mean of 0.164m/s and a standard deviation of 0.272m/s. This does not give any indication of what the minimum threshold is to be statistically significant in predicting in game performance. But, this does give some idea of what a meaningful change in RSI could be and will be used as a starting point for this project.

This same study used the same methodology to see if there was a similar relationship between jump height difference in practice and in game performance. The study found that there was not a statistically significant relationship between jump height before and after practice and in game speed. This lack of a relationship is supported by other research that suggests that despite fatigue being present, athletes have been found to achieve the same jump height as when they are not fatigued due to them changing their jumping technique subconsciously to achieve the same height.

Although not a research study, an informational article written by Devan McConnell, the High Performance Director for the Utah Mammoths, provides valuable background on reactive strength index (RSI), with a particular emphasis on its application in a team setting. As previously discussed, RSI is a quantifiable measure of an athlete's ability to effectively utilize the stretch-shortening cycle (SSC) during dynamic movements. This article delves deeper into the rationale for using RSI as a reliable tool to monitor athlete fatigue.

One key point highlighted is that athletes are generally able to maintain consistent jump heights regardless of whether they are fatigued or well-rested. As a result, jump height alone may not be a reliable metric for monitoring an athlete's fatigue or overall performance status. Instead– when fatigued, athletes often subconsciously modify their jump technique– maintaining jump height by increasing ground contact time to produce sufficient force. This is known as 'loading' the jump. This increased ground contact time results in a lower RSI value, which can serve as an indicator of neurological fatigue.