



MUSCLESOUND®
Take Charge Of Muscle Health

Division I Football Team 2013 Season

Purpose

The purpose of this case study is to gain insight into how muscle glycogen in the rectus femoris can fluctuate during a competitive season in a NCAA FBS college football team and how nutrition and training interventions can influence muscle glycogen stores on a position-specific and team-wide basis.

Subjects

An average of 56 NCAA FBS college football players were evaluated each week for muscle glycogen content in their rectus femoris using high-frequency ultrasound and cloud-based software. Scans were obtained once per week, two days before game day, throughout a 12-week season, with the exception of weeks 3 and 4, which included a scheduled bye week and a game cancelled due to inclement weather.

MuscleSound® Scoring

An athlete's scanned muscle will receive a score on a range of 0 - 75. Each muscle will have a unique range on that scale. 10 points is a typical range for an individual muscle.

Results

In general, the team as a whole and each position group had a downward trend in their glycogen content throughout the season. The lowest team average score occurred during week 7 (team average 47.9), which coincided with mid-term examinations. The lowest glycogen scores during this time frame were in the offensive line and quarterbacks (See Appendix 2). There was an improvement in scores in week 8 (team average 52). Also, there was an improvement in scores from week 11 (team average 49) to week 12 (52.1), which was likely due to the athletic department's provision of three meals per day to the players. Classes were not held during this week, as it was the week of Thanksgiving. In a typical week, the players were only provided one meal per day. Although scores did improve to 52.1 in week 12, they did not improve to week 1 values (team average 56.8)

Conclusions

Players and the staff (coaches, trainers, sports scientists, strength and conditioning professionals, etc.) need to be diligent regarding players' nutritional intake during a competitive season, including the nutritional quality of meals, fueling strategies during training/competition, and recovery strategies following training/competition. Athletes and the athletic staff may underestimate the degree of diligence and difficulty required to maintain muscle glycogen, as an indicator of both adequate fuel and muscle recovery following exercise and mechanical loads, throughout a season. Additionally, the coaching staff may not appreciate how difficult it is for an athlete to regenerate from the high volume of loads associated with practice, conditioning, games and academics. The athletic department should make every effort to provide healthy meals as frequently as possible, as many players do not have the resources or discipline to obtain the quantity and quality of food their bodies require. Research studies show that athletes can spend more time at higher intensity levels and improve performance when they have high muscle glycogen content.

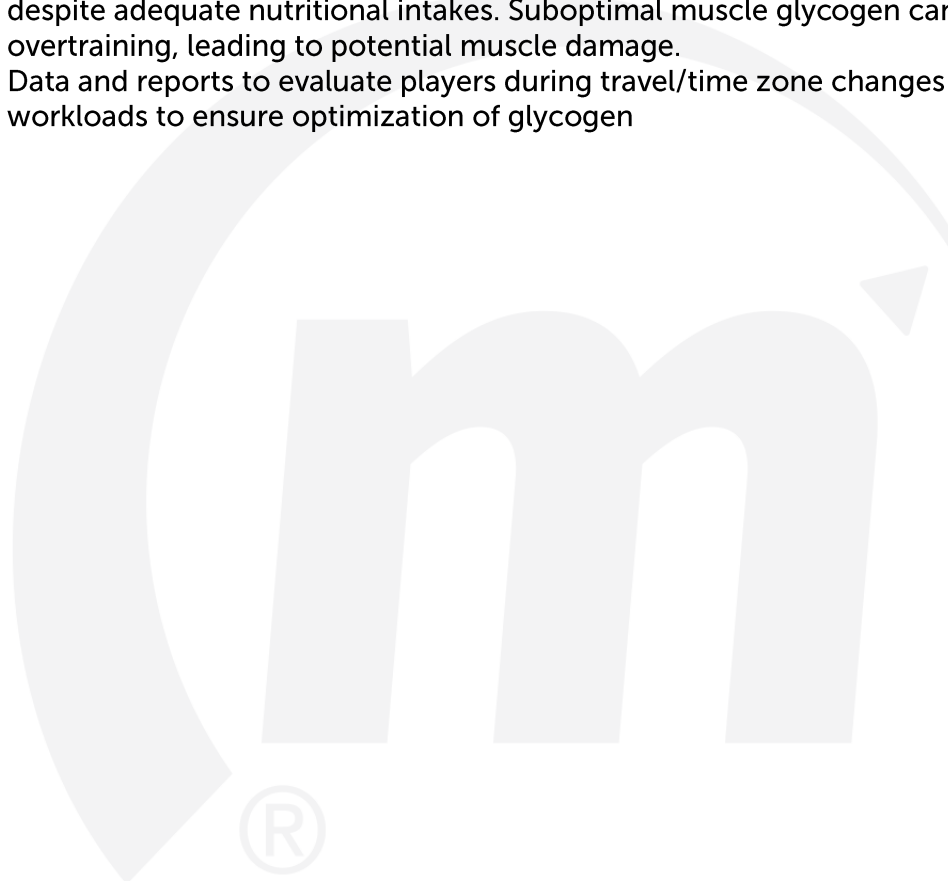


MUSCLESOUND®
Take Charge Of Muscle Health

Moving Forward

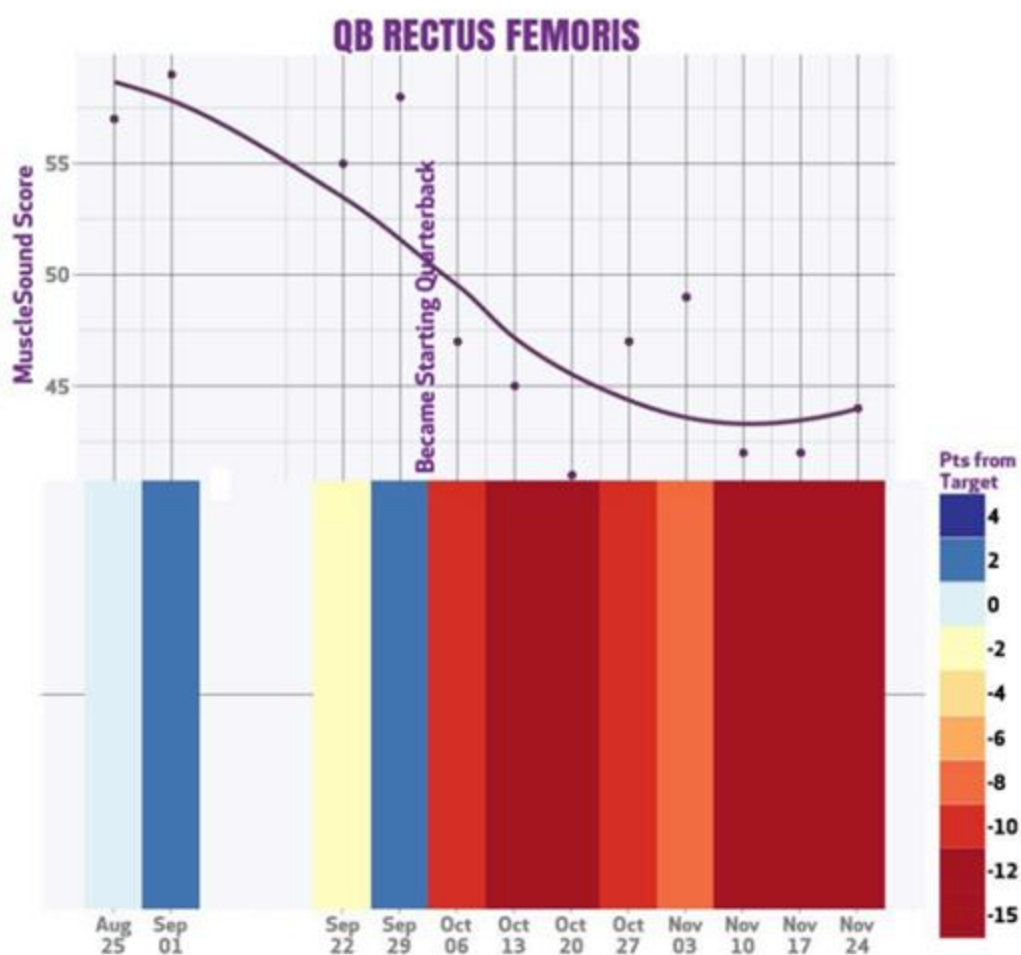
After monitoring glycogen levels over the course of a season for this Division I football team, MuscleSound® offers its Glycogen Measurement System to their athletic teams with the following benefits:

- Real-time data regarding muscle glycogen content to allow athletes to prepare, recover and refuel from training and competition, maximizing optimal performance.
- A methodology to frequently evaluate players throughout the course of a season to ensure individualized and team fueling strategies are effective to influence reduction of injuries and mental fatigue.
- Software tracking tools to monitor players for downward trends in their glycogen scores throughout the course of a season. It is known that mechanical loads can reduce a muscle's capacity for storing glycogen, thus causing decreased glycogen reserves despite adequate nutritional intakes. Suboptimal muscle glycogen can be an indicator of overtraining, leading to potential muscle damage.
- Data and reports to evaluate players during travel/time zone changes and heavy school workloads to ensure optimization of glycogen

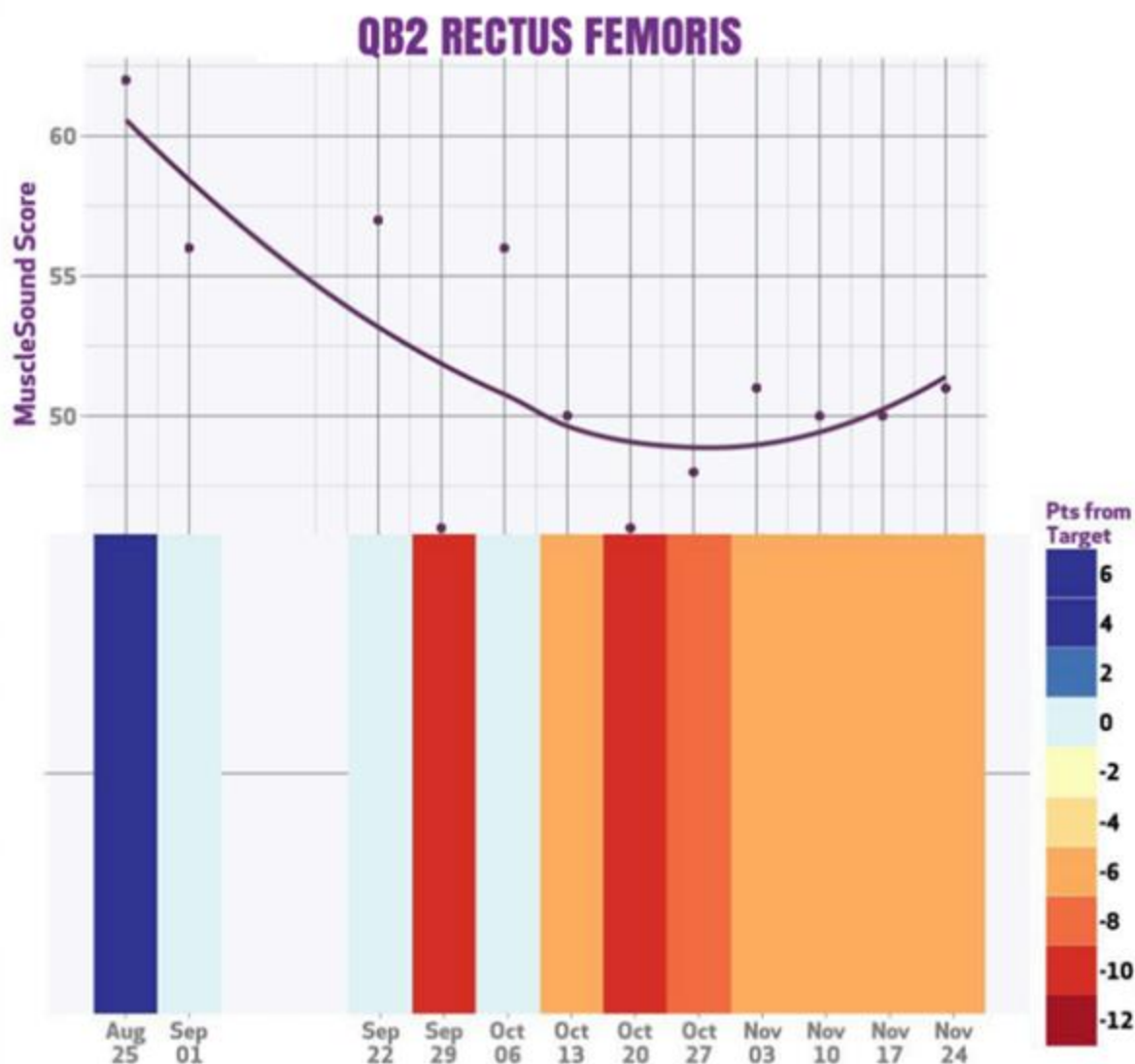




APPENDIX 1 Individual Case Studies



QB This player took over the starting QB job in week 7. In weeks 1, 2, 5 and 6, he averaged a score of over 56. In week 7, his score dropped to 46, likely due to the increased workload in practice. Additionally, beyond the additional physical workload, the increased psychological and emotional demands of starting at QB could have contributed to a lower score, likely through the neurohormonal and neuroemotional utilization of glucose. In weeks 7 through 14, he averaged a score of 42.6. Obviously, his muscle glycogen content did not return to the higher levels he scored before taking over as the team's starting QB.

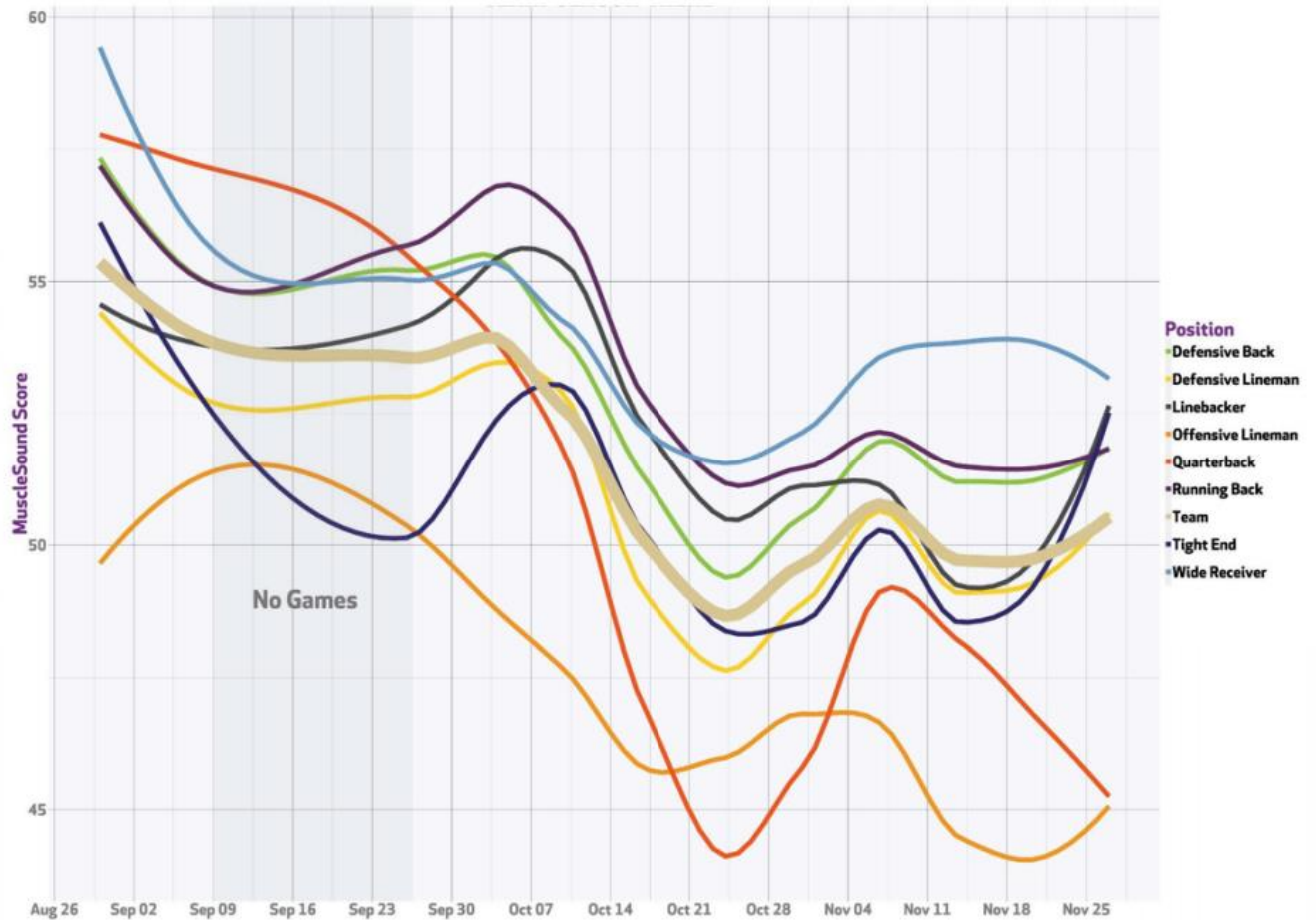


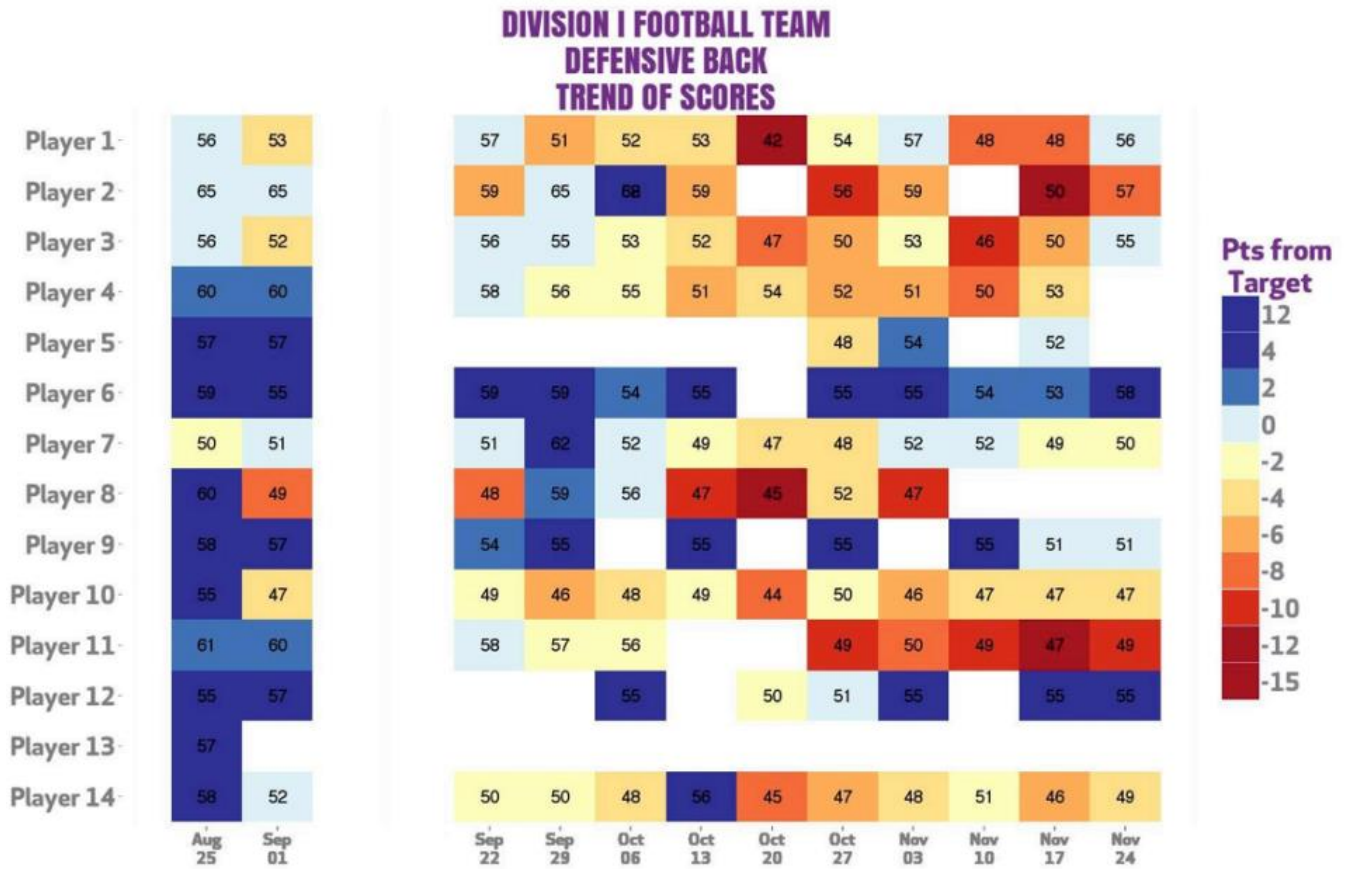
QB2 In week 6, QB2 had his lowest score of the season, scoring a 43. This player's previous three scores were 62 in week 1, 55 in week 2, and 55 in week 5. The low score was probably a result of a broken nose that he suffered two days before being scanned in week 6. Injuries and their healing can cause an accelerated utilization of glucose, which would reduce the glucose available for glycogen synthesis in the rest of the body. In week 7, QB2's glycogen score recovered to a score of 54.



MUSCLESOUND®
Take Charge Of Muscle Health

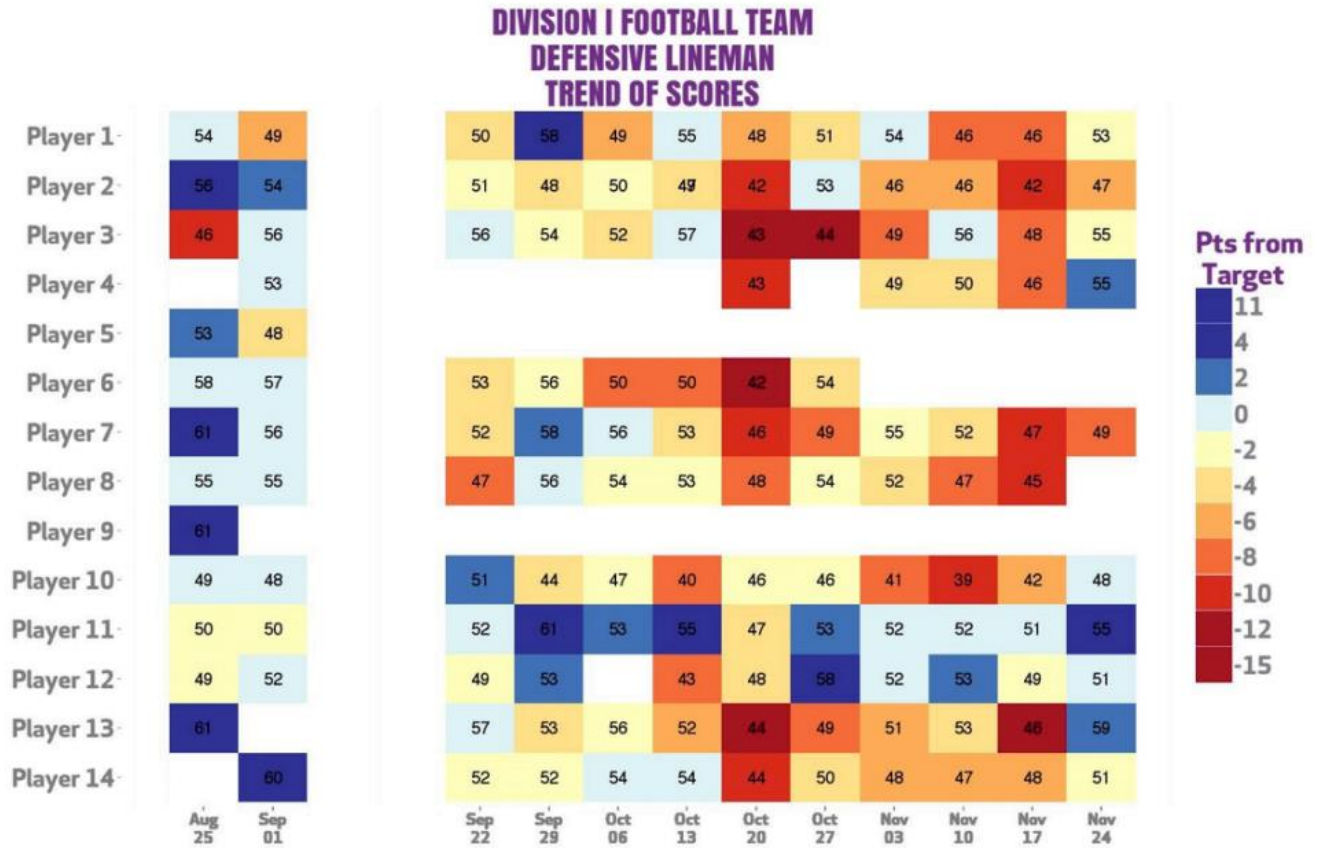
APPENDIX 2 Team and Position Group Graphs

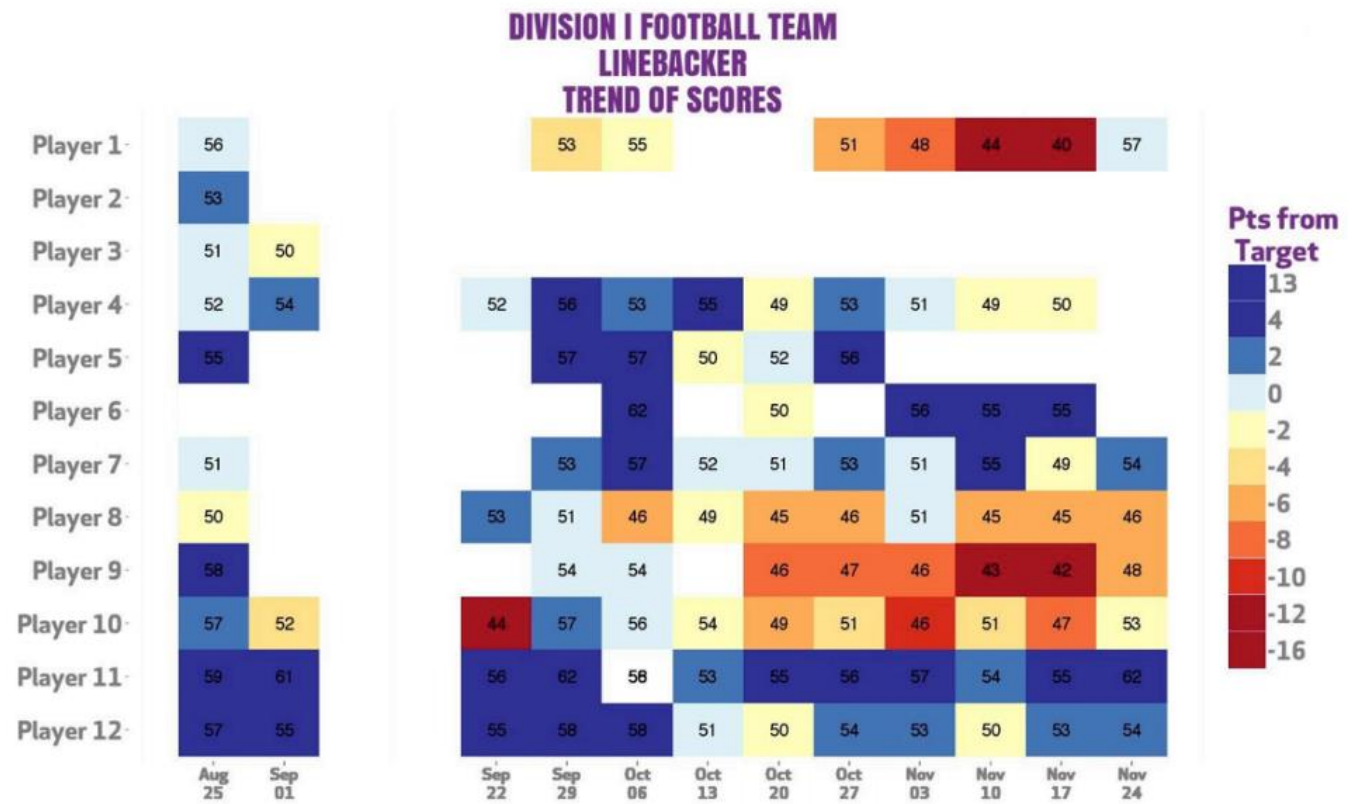


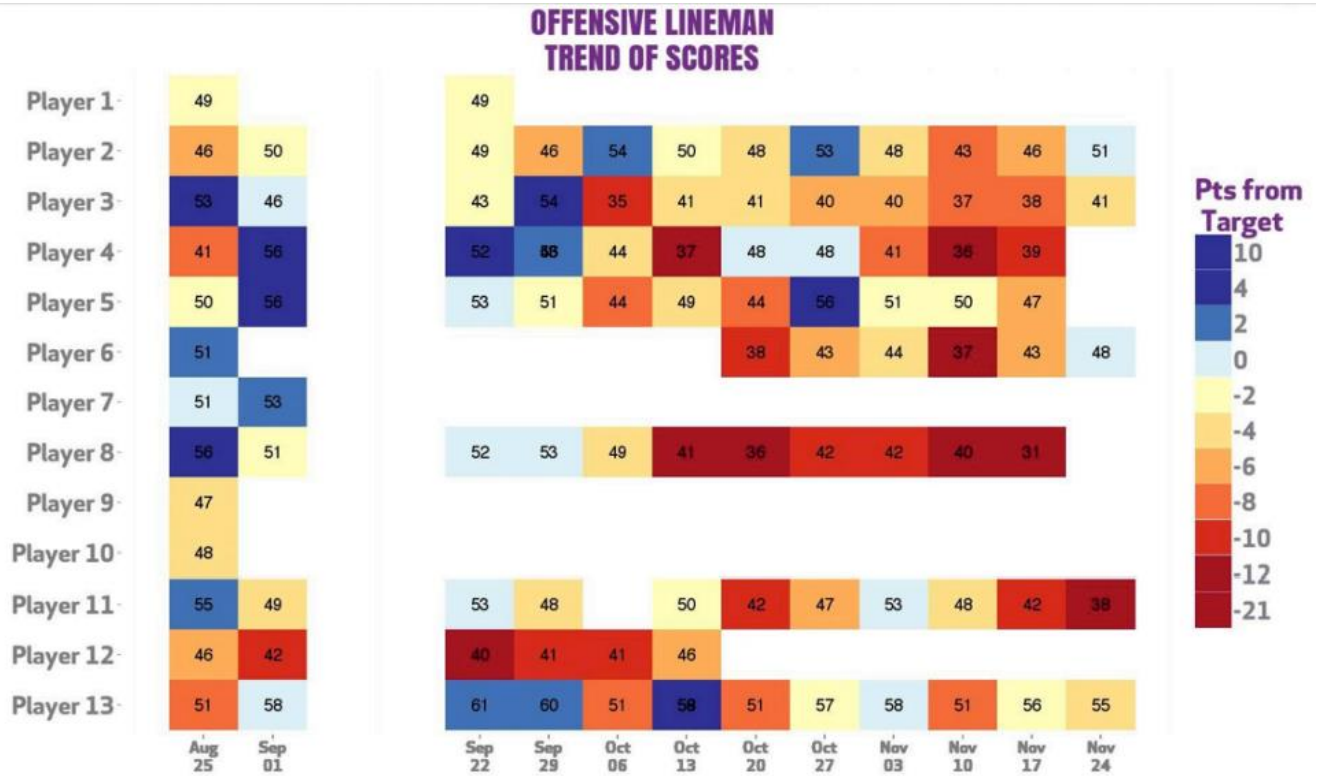




MUSCLESOUND®
Take Charge Of Muscle Health

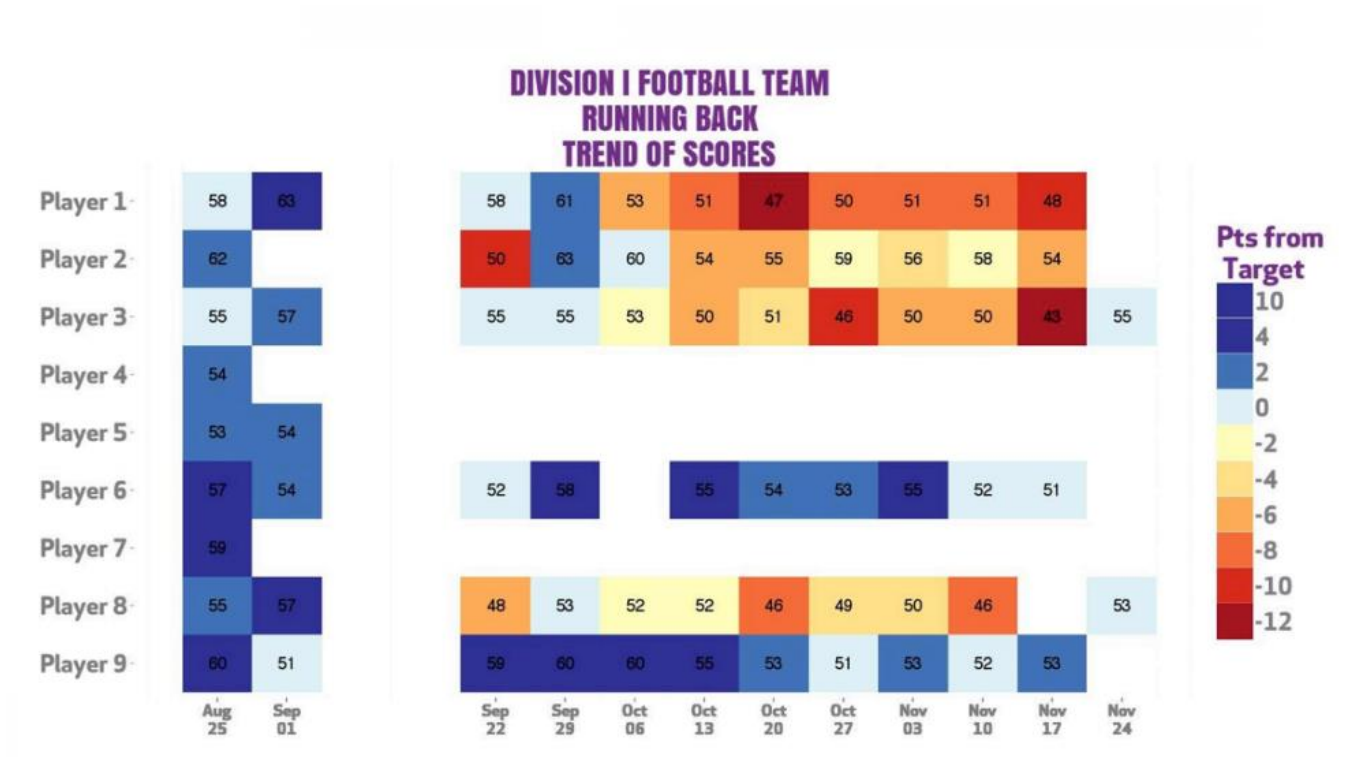






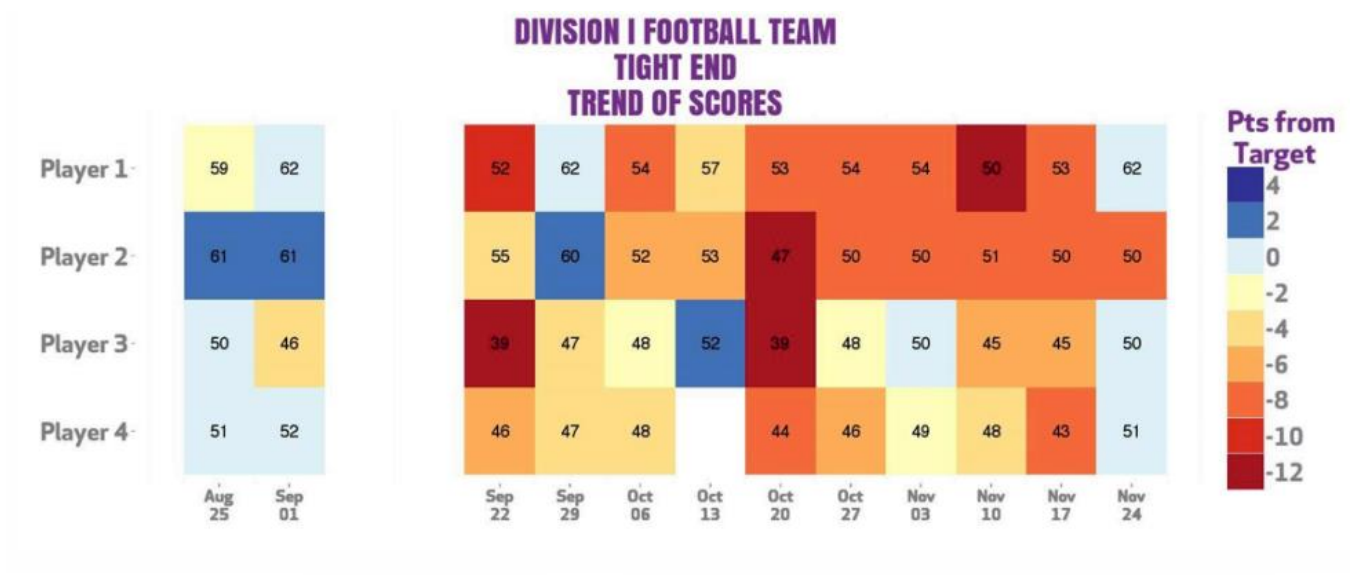


MUSCLESOUND®
Take Charge Of Muscle Health



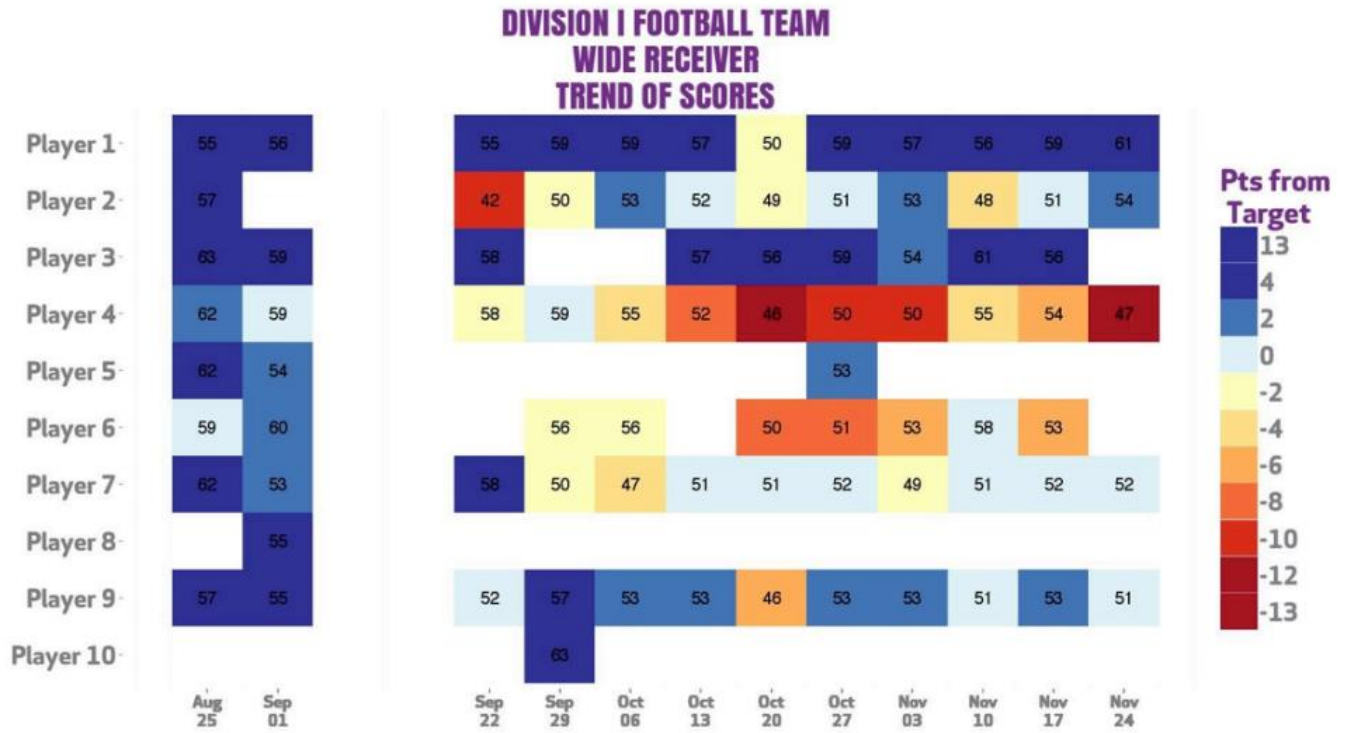


MUSCLESOUND®
Take Charge Of Muscle Health





MUSCLESOUND®
Take Charge Of Muscle Health





MUSCLESOUND®
Take Charge Of Muscle Health

