



Objective measurement of head impacts through video observation is required for accurate assessment of head exposure in female collegiate

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INTRODUCTION

Soccer is one of the most played sports in the world and there is growing concern about the effects of heading on long term brain health (Moore, Lepine & ElleMBERG, 2017).

Heading exposes soccer players to concussive and sub-concussive repetitive head impacts (Catenaccio et al, 2016). This repetitive behavior is associated to changes in brain structure observed using neuroimaging, as well as a decrease in performance on cognitive tasks (Catenaccio et al, 2016). However, inconsistent findings have been found on the effects of heading exposure.

Quantitative methods of evaluating the number of headers is essential to determine the exposure of headers on players throughout the season and on their careers.

Quantifying heading is also crucial to determine the exact risk that is associated with heading in soccer players.

Self-reports are commonly used to assess the number of headers performed by each player; however, such reports are often inaccurate, particularly in youth (Harriss, Walton & Dickey, 2018).

Self-report analysis would then be misinterpreted leading to a not accurate conclusion regarding heading risks and long term neurological consequences.

Based on prior research, it is hypothesised that **self-report is not an accurate assessment of heading exposure at the collegiate level.**

METHODS

Participants

- 10 women Varsity soccer players (aged 18-23)

Protocol

- Demographics collected at the start of the season
- Video was collected for a total of 21 games over the course of a single competitive season, including playoff and cup games
- At the end of the season, a heading questionnaire was administered

Questionnaire

- The questionnaire used was based off of the 12 month HeadCount Questionnaire (Catenaccio et al., 2016)
- Players were asked "on average, how many times did you head the ball during a single game?" and "how many games total did you play".
- The number recorded was the multiplied by the number of games played to get an total number of headers per season

Video Analysis

- Each game video was analysed to determine the number of actual headers per player
- One researcher watched the whole game and time stamped each header while a second researcher confirmed player identity

OBJECTIVE

To compare direct player observation using video analysis with self-report questionnaires in collegiate soccer.

RESULTS

TABLE 1: Participants demographics

N	10
Age (Years)	20.1 ± 1.45
Height (cm)	170.94 ± 5.09
Weight (kg)	64.28 ± 4.80
Start of soccer (age in years)	4.85 ± 1.00
Average Number of Games	15.95 ± 5.61

RESULTS

TABLE 2: Cumulative number of headers obtained from video analysis and self-reports

	Range	Mean
Video Analysis	1- 148	71.5 ± 42.29
Self-reports	5-200	92.80 ± 48.28

TABLE 3: Player Positions

Position	Number of Players
Defenders	5
Midfielders	2
Forwards	3

TABLE 4: Total number of actual versus reported headers during single competitive season

	Games played	Actual	Reported	Difference
Participant 1	21	148	105	43
Participant 2	11	27	66	-39
Participant 3	20	128	200	-72
Participant 4	16	53	104	-51
Participant 5	20	73	100	-27
Participant 6	1	1	5	-4
Participant 7	15	92	120	-28
Participant 8	17	63	51	12
Participant 9	21	87	105	-18
Participant 10	12	43	72	-29

A Shapiro-Wilk test of normality indicated that actual number of headers (**W=0.98, P= 0.98**) and reported number of headers (**W=0.93, P=0.94**) were normally distributed. The mean intraclass correlation coefficient (**ICC= 0.87**) reveals a good agreement between actual and reported number of headers, demonstrating good reliability.

A linear regression analysis (see Figure 1) revealed a **moderate positive linear relationship** between the variables.

A Bland-Altman plot (see Figure 2) indicates that most player's self report overestimated the number of actual heading exposure (21.3 ± 30.41).

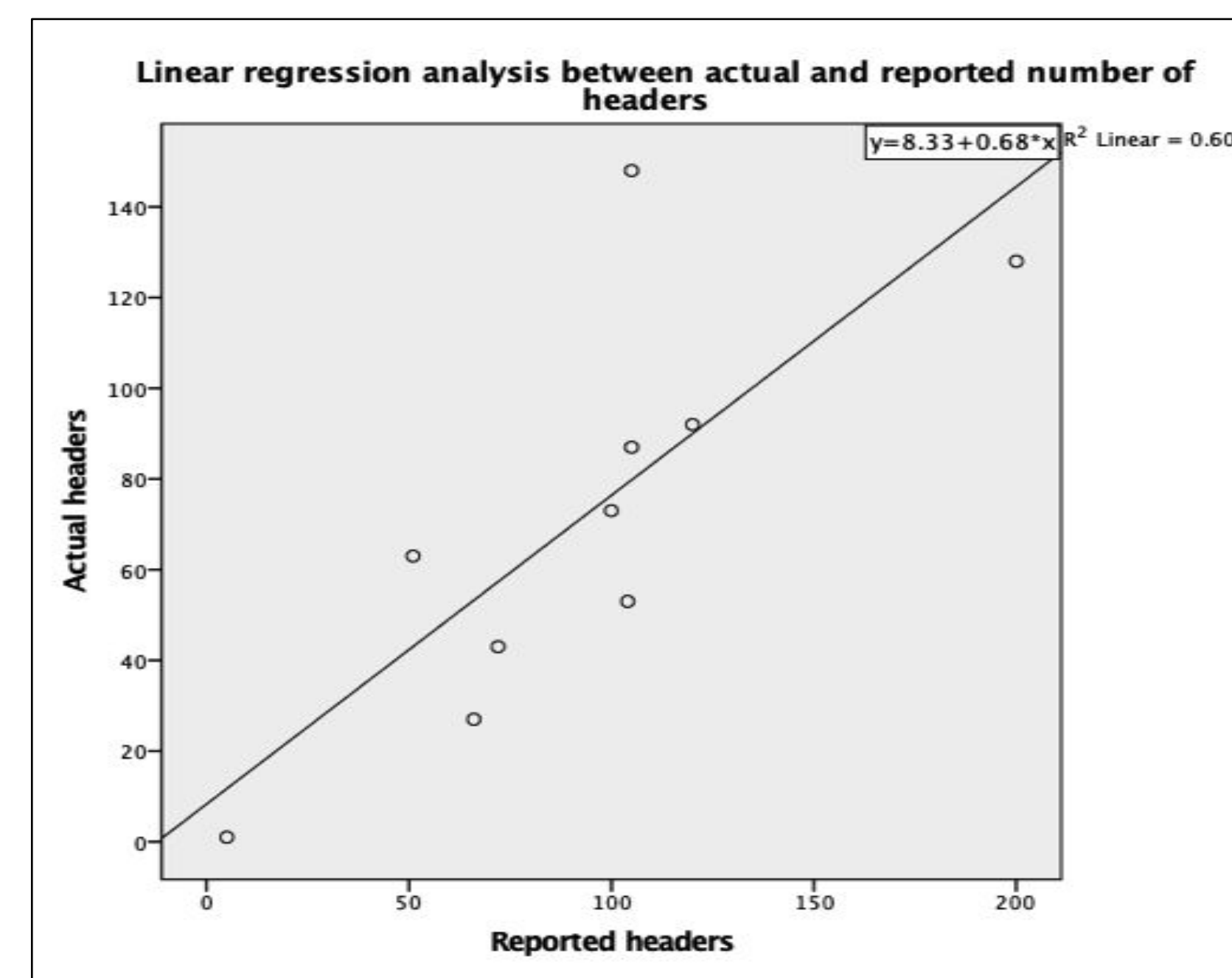


Figure 1: Linear regression analysis between actual and reported number of headers. The regression line indicates 60% of variance was in common between the two variables ($R^2 = 0.60$). The slope of the linear regression indicates that the player self-reports overestimated the number of headers by 68% compared to the game video analysis.

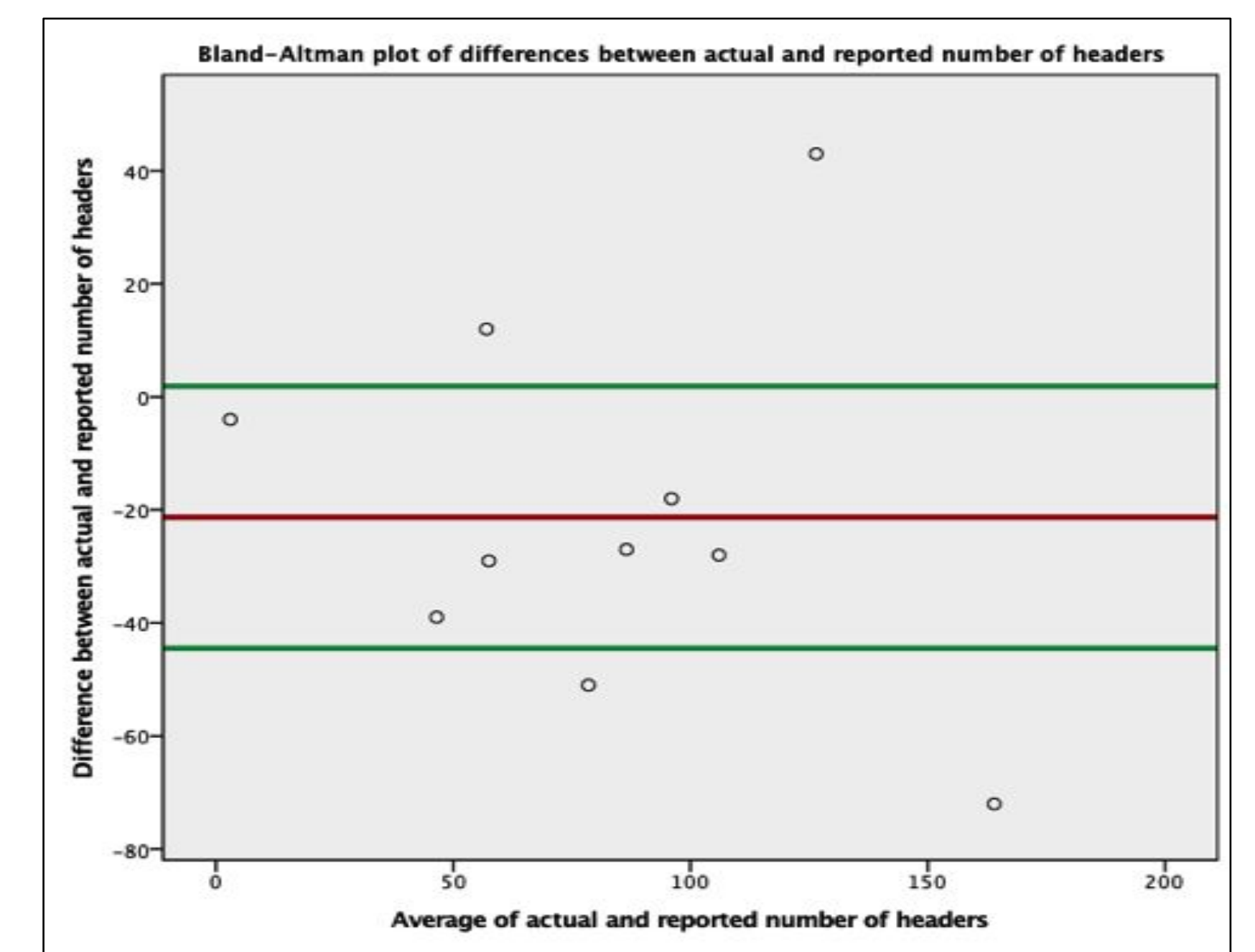


Figure 2: Bland-Altman plot of differences between actual number of headers (from video analysis) and reported number of headers (from self-reports) against the measurement of the two variables. The middle line represents the calculated mean (-21.3) between the two variables. The lower line is the lower limit of agreement (-44.49) and the upper line is the upper limit of agreement (1.89).

CONCLUSIONS

Self-reports is one of the most common methods to evaluate heading exposure in soccer.

However, self-report questionnaires may not be a reliable source when gathering data regarding heading exposure.

Our data suggests that players self-reports do not provide an accurate assessment of the number of actual headers performed by players during a soccer season.

Our findings demonstrate that players both significantly overestimated and underestimated the number of headers performed. This suggests that in soccer, self-report questionnaires is not enough.

Direct player observation using video analysis should be incorporated along with self-reports in order to have a more thorough and objective evaluation of the effects of heading on long term brain health.

FUTURE RESEARCH

The sample size in the current study was small, future research should increase sample size as well as investigate multiple teams at a collegiate level.

Additionally, it is important to investigate if there are any differences between male and female collegiate athletes.

As self report has been used to investigate long-term effects of heading, it is important to continue comparing self-report and video analysis over longer periods of time, such as an entire year of playing (including practices).

Another interesting avenue may be exploring players confidence levels when reporting their estimated number of headers per soccer game/season to understand the discrepancies.

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