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

*Rebecca Kenny[1,2], *Allegra Passacantilli[4], Marko Elez[5], Sandra Wong[6], and Naznin Virji-Babul[1,3]

[1]Djavad Mowafaghian Centre for Brain Health, University of British Columbia; [2]Department of Rehabilitation Sciences, University of British Columbia; [3]Department of Physical Therapy, University of British Columbia; [4]Department of Psychology, University of British Columbia; [5]Department of Integrated Sciences, University of British Columbia; [6]Department of Kinesiology, University of British Columbia

**Contact information: Rebecca.Kenny@alumni.ubc.ca; allegrap@mail.ubc.ca*

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) and is associated with changes in brain structure as observed using neuroimaging, as well decreases in performance on cognitive tasks (Catenaccio et al, 2016).

However, there are inconsistent findings on the effects of heading, in part, due to the methods used to track the number of headers. Self-reports are commonly used to track the number of headers, however, such reports are often inaccurate, particularly in youth (Harriss, Walton & Dickey, 2018).

If self-report analysis is misinterpreted, this leads to a not accurate conclusion regarding the long term neurological consequences of heading.

We hypothesize that **self-reports of heading will not correlate with objective measures of heading using video analysis of play during games of varsity soccer players.**

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 varsity 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).

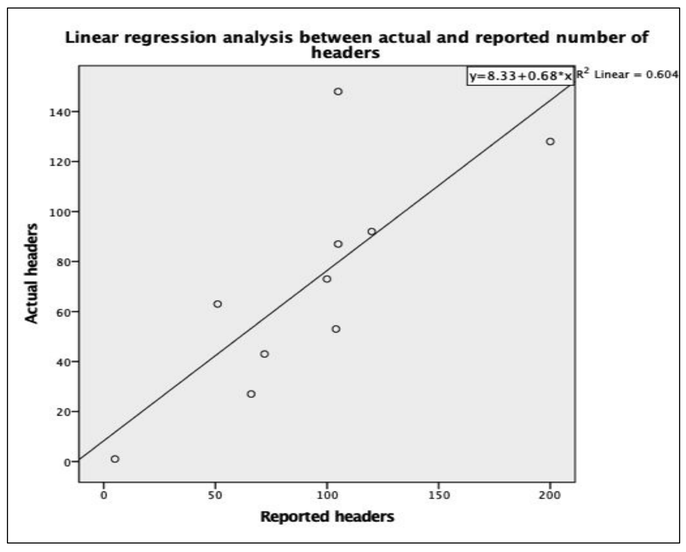

Figure 1: Linear regression analysis between actual and reported number of headers. The regression line indicates 60% of variance was in common between the two variables (R^2= 0.60). The slope of the linear regression indicates that the player self-reports overestimated the number of headers by 68% compared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

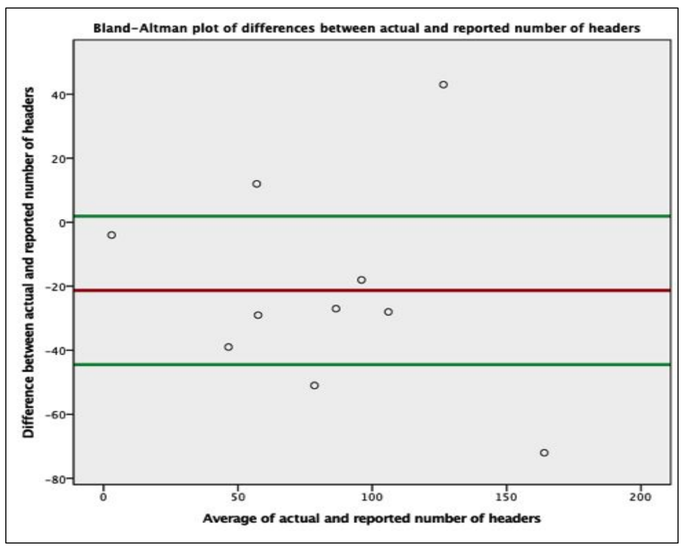

Figure 2: Bland-Altman plot of differences between actual number of headers (from video analysis) and reported number of headers (from self-reports) against the measurement of the two variables. The middle line represents the calculated mean (-21.3) between the two variables. The lower line is the lower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

CONCLUSIONS

Our data suggests that players self-reports do not correlate with the number of actual headers as observed during video analysis.

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

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

FUTURE RESEARCH

The sample size in the current study was small, and only included female soccer players. Future research should have a larger sample size, include male athletes as well as investigate multiple teams at a collegiate level.

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). This will give researchers a better insight on the effects that repetitive heading has at a neurological level.

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

REFERENCES

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