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A SCIENTIFIC ANALYSIS

OF RUNNING LINES IN RUGBY

by

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DEDICATION

This dissertation is dedicated to Leta, Oupa, Nanna, Michelle, my family, and all my friends who have supported me during the last two years.

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"I have strength for all things in Christ who empowers me, I am ready for anything and equal to anything through Him; I am self-sufficient in Christ's sufficiency."

Philippians 4:13

SYNOPSIS

TITLE	A scientific analysis of running lines in rugby
CANDIDATE	Ashley Evert
PROMOTER	Prof. P.E. Krüger
CO-PROMOTER	Prof. M. Spamer
DEGREE	MA (HMS)

The game of rugby has been played for over a century and yet its intricacies are still not fully understood. The key ingredient coaches are seeking is what can be added to a team's make-up that will result in an increase in that teams level of playing success.

The objective of this study is the exploration of the biomechanical aspects of movement in a rugby context specifically looking at the stages before, during and after contact. The hypothesis is that the optimal use of running lines in rugby union will lead to more successful breaches in the opposition's defensive lines thus an increase in linebreaks will occur.

In order to make a comparison based on scientific research principles, nine matches played during the 2001 season was compared with nine matches played during the 2002 season. For each match played in the 2001 and 2002 seasons the total number of linebreaks achieved in a match was calculated. In addition the total number of linebreaks achieved in the 2002 season was further subdivided into the specific categories of intervention in order to determine which intervention had the biggest impact on the total number of linebreaks achieved.

By means of video footage of the matches played notational analysis was performed and information was gathered in order to gain data for further evaluation. The actions regarding the execution of the linebreaks were evaluated manually in respect of the intervention that was imposed during the coaching of the team during the 2002 season.

Without exception a comparison between similar teams played during both seasons indicated that the total number of linebreaks achieved during the 2002 season was much higher than when the team competed against similar opposition during the 2001 season. The aggregate numbers indicated a significant increase in linebreaks from the 2001 to 2002 season.

This conclusion was achieved by means of a simple T-test. Firstly an applied F-test test was done to determine whether the two samples had equal variances or not. Under the null hypothesis we assume that the variances of the two samples are equal, while the alternative states that the two samples have different variances. A value for the test statistic that is greater than the critical value will lead to a rejection of the null hypothesis.

The test statistic was calculated and evaluated against the $F_{(8,8)} = 2.59$ critical value on a 5% level of significance. The value of 15.921 is greater than the critical value of 2.95 and therefore the null hypothesis cannot be accepted, concluding that the two samples do not have equal variances. We then proceeded to test whether the 2002 average linebreaks are significantly higher than the average linebreaks achieved in the 2001 season.

Under the null hypothesis the two sample averages are equal. Under the alternative, the 2002 average is higher than the 2001 average. In contrast to normal T-tests this specific test was a one-sided upper or right hand test due to the fact that we are testing whether the one average is greater and not equal to the other. Therefore, we would only reject the null hypothesis of equal sample averages if the test statistic were greater than the appropriate critical value.

The calculated test statistic is 4.4827 and was evaluated against the $t_{0.05,9} = 1.833$ critical value. Once again we cannot accept the null hypothesis. Therefore we can conclude that the average of the total linebreaks made during the 2002 season is statistically greater than the average of the total linebreaks made during the 2001 season.

The results of this study therefore indicate that the new techniques incorporated into the coaching of the team in 2002 did positively influence the number of linebreaks when compared to the 2001 season.

KEY WORDS: Rugby, coaching, biomechanics, running lines, defensive lines, linebreaks, video footage, notational analysis, null hypothesis.

SAMEVATTING

TITEL	‘n Wetenskaplikke analise van hardlooplyne in rugby
KANDIDAAT	Ashley Evert
PROMOTOR	Prof. P.E. Krüger
MEDE-PROMOTOR	Prof. M. Spamer
GRAAD	MA (MBK)

Rugby word reeds vir langer as ‘n eeu gespeel dog word die fyner aspekte van die spel nog nie heeltemal verstaan nie. Die belangrikste uitvindsel waarna afrigters strewe is dit wat sal veroorsaak dat daar ‘n verbetering is in die gehalte spel wat ‘n span kan speel.

Die doelwit van hierdie studie is die strewe na daardie biomeganiese aspekte van beweging in ‘n rugby konteks, en meer in besonder die verskillende fases voor, gedurende en na-kontak situasies. Die hipotese is dat die optimale gebruik van hardloop lyne in rugby sal veroorsaak dat daar meer suksesvolle breuke in die verdedigings lyne sal wees en dus sal daar ‘n hoë getal lynbreuke wees.

Ten einde ‘n vergelyking te kan maak wat gebaseer is op wetenskaplike beginsels, is nege wedstryde wat gedurende die 2001 seisoen gespeel is, vergelyk met nege wedstryde gedurende die 2002 seisoen. Vir elke wedstryd wat gespeel is gedurende die 2001 en 2002 seisoene is die totale lynbreuke in elke wedstryd geïdentifiseer en bymekaar getel. Daarna is die lynbreuke van 2002 verder opgedeel in spesifieke kategorieë van intervensie ten einde te bepaal welke intervensie die grootste invloed gehad het op die totale getal lynbreuke wat suksesvol was.

Deur middel van video opnames van die wedstryde wat gespeel is, was daar statistieke geneem en inligting bymekaar gemaak ten einde data te versamel vir verdere evaluasie. Die aksies wat gedurende die uitvoering van die lynbreuke

toegepas was, is met die hand geevaleur om vas te stel watter van die intervensies toegepas was in wedstrydsituasies gedurende die 2002 seisoen.

Sonder twyfel bewys ‘n vergelyking waar spanne wat gedurende die twee seisoene gespeel het, dat die totale hoeveelheid lynbreuke wat suksesvol bereik was gedurende die 2002 seisoen beduidend meer was as in die gevalle waar daar teen dieselfde opposisie gespeel is gedurende die 2001 seisoen. Die somtotaal toon ‘n beduidende verhoging in lynbreuke sedert die 2001 tot 2002 seisoen.

Hierdie aanname was bereik deur middel van ‘n eenvoudige T-toets. Eerstens was daar gebruik gemaak van ‘n toegepaste F-toets om vas te stel of die twee steekproewe gelyke afwyking het al dan nie. Onder die nul hipotese word daar aangeneem dat die afwyking van die twee steekproewe gelyk is, terwyl die alternatief toon dat die twee steekproewe verskillende afwykings het. ‘n Statistiese waarde vir die toets wat groter is as die kritiese waarde sal beteken dat die nul hipotese verwerp word.

Die toets statistiek is uitgewerk en geevalueur volgens die $F_{(8,8)} = 2.59$ kritiese waarde op ‘n 5% vlak van beduidendheid. Die waarde van 15.921 is meer as die kritiese waarde van 2.59 en dus die onaanvaarbaarheid van ‘n nul hipotese, met ‘n gevolgtrekking dat die twee steekproewe nie dieselfde afwyking het nie. Daarna is voortgegaan om te toets of die gemiddelde lynbreuke vir 2002 beduidend hoër is as die gemiddelde lynbreuke wat in 2001 bereik was.

As die nul hipotese gebruik is moet die twee gemiddelde steekproewe gelyk wees. In die geval van die alternatief, was die 2002 gemiddeld hoer as dié van 2001. In kontras met die normale T-toetse was hierdie spesifieke toets ‘n een kant regter hand toets as gevolg van die feit dat daar getoets word welke die een gemiddeld groter en nie gelyk is aan die ander nie. Derhalwe sou ons die nul hipotese van gelyke steekproef gemiddeldes verwerp indien die toets statisties groter was as die toepaslike kritiese waarde.

Die berekende statistiek is 4.4827 en was vergelyk met die $t_{0.05,9} = 1.833$ kritiese waarde. Weereens kan ons nie die nul hipotese aanvaar nie. Daar kan derhalwe tot die

gevolgtrekking gekom word dat die gemiddeld van die totale aantal lynbreuke wat gedurende die 2002 seisoen gemaak is, statisties beduidend groter is as die gemiddeld van dié wat gedurende die 2001 seisoen gemaak is.

Die resultate van hierdie studie het dus aangetoon dat die nuwe metodes wat toegepas is in die afrigting van die span in 2002 ‘n positiewe invloed gehad het op die aantal lynbreuke in vergelyking met die 2001 seisoen.

SLEUTEL WOORDE: Rugby, afrigting, biomeganika, hardloop lyne, verdedigings lyne, lynbreuke, video opnames, statistiese analise, nul hipotese.

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