Contents

Introduction

Video analysis enhances performance by improving training effectiveness and understanding match dynamics. It bridges the gap between potential and performance through careful examination, helping athletes leverage strengths and address weaknesses [1]. It also aids in identifying mechanisms behind injuries, for example, ACL injuries [2], [3], which is important to enable the development of more effective strategies for prevention, treatment and performance optimisation. In tennis, video analysis uses advanced image processing to identify key events, like shot types, to give insights into decision-making during rallies [4] and track player positioning [5].

For my presentation, I analysed Nick Kyrgios's return of serve during his 2019 Wimbledon match against Rafael Nadal. This aspect of Kyrgios's performance was chosen for its relevance in understanding how return effectiveness contributes to match outcomes in elite tennis [6]. This match was a tactical and psychological display, contrasting Nadal's consistency with Kyrgios's unpredictability. Using Nacsport software, I examined return patterns, focusing on metrics such as placement, success rates and comparative performance between sets. This essay critically reflects on the selection, analysis, and reporting stages, addressing challenges like limited footage and subjective event interpretations.

Data Selection Rationale

The 2019 Wimbledon match was selected due to set-specific patterns, such as Kyrgios winning the second set on returns. This provided insights into factors behind his success and demonstrates how improvements in return performance can shift momentum. The return of serve was identified as a key area to analyse due to its influence on match dynamics and outcomes [6]. It is pivotal, identified alongside the serve as one of the two most crucial strokes in tennis [7]. The high frequency of short points and their substantial correlation with winning Wimbledon matches led to the selection of this match for serve-return analysis [8]. Research on men's and women's Wimbledon matches revealed that points won within two shots – the third most common rally length – were strongly associated with victories, particularly in the men's game, where winners outscored losers in 77% of matches. This underscored the critical role of the serve-return stroke at Wimbledon [9]. This match offered actionable insights for training drills, highlighting moments of Kyrgios's frustration, which suggested a need for mental conditioning.

However, publicly available footage lacked detailed statistics, including ball speed, spin, player movements, reaction times, and psychological markers such as heart rate. Consequently, conducting in-depth analyses of these metrics or their potential relationships was not possible. Broadcast angles further restricted observations of off-the-ball movements, such as preparation between points, thereby limiting tactical insights – for instance, observing players who excel at movement by effectively "reading the play" [10]. To address these limitations, I focused on

observable metrics such as shot selection, placement, success rates, and counts of forced and unforced errors. However, it is important to acknowledge that forced and unforced errors can be subjective [11]. Supplementing footage with ATP Tour leaderboards provided comparative data. To minimise broadcast angle impact, I prioritised analysing point outcomes during visible in-play moments.

Other matches, such as Kyrgios's 2016 Wimbledon loss to Andy Murray, one of the best returners in the game [12] were considered, providing an opportunity to analyse his ability to handle defensive play – a key aspect of serve-return dynamics. Its one-sided nature however, limited analytical value. In contrast, the match against Nadal offered a more statistically rich context with set-specific insights, making it a more suitable choice despite its limitations.

Analytical Approach

Nacsport video analysis software was employed to analyse Kyrgios's return patterns. Widely recognised and frequently used in sports research, Nacsport's validity and reliability – especially in analysing serve-return patterns – are supported by its extensive adoption in the field. Research has demonstrated strong intra-tester reliability with Pearson correlation coefficients exceeding $r>0.96$ and low error rates (10.1%) [13]. Another study reported an average Intraclass Correlation Coefficient of 1.000, with a 95% confidence interval of .999 to 1.000, indicating near-perfect consistency [14]. Though primarily tested in football, it has demonstrated excellent reliability in tennis, with Cohen's kappa coefficient reaching $k=0.99$ [15]. These findings underscore Nacsport's robustness as a video analysis tool across various sports and demonstrate its value in supporting coaching and performance reviews to drive improved outcomes.

Using Nacsport, I tagged returns by placement, serve type (first or second), and outcomes including successful returns and errors. Placement analysis was informed by research suggesting returns should target middle zones beyond the service line for effectiveness [16]. While this research focused on female tennis players, I sought to explore its applicability in men's tennis. Additionally, I analysed Kyrgios's performance on second serves, which are typically slower and more predictable [6]. This gives the returning player additional time to position themselves effectively and execute an aggressive serve-return [9]. Since both forced and unforced errors have been linked to losing games for both sexes, they were also included [15]. Finally, I analysed return points won by set, revealing patterns contributing to Kyrgios's success in the second set.

Nacport facilitated precise tagging and generated statistics that I imported into RStudio for data visualisation, facilitating a detailed analysis of return placement and outcomes. For example, bar charts and pie charts were used alongside Nacsport's paintbrush feature, which allowed me to annotate footage directly. This functionality helped to clearly highlight strengths and weaknesses in Kyrgios's return of serve.

Initially, I intended to analyse all return points equally. However, patterns in the data prompted a focus on second serve returns and the set Kyrgios won. This adjustment highlighted the significance of concentrating on key moments and outcomes for a more meaningful analysis, as well as the need for adaptability in analytical approaches. While Nacsport proved invaluable for tracking and visualising return patterns, integrating additional sources, such as Hawkeye for precise ball speeds and tracking, or player-specific statistics, such as heart rate to infer stress levels, would have enriched the analysis.

Insight and Reporting Decisions

Winning return points emerged as critical to match outcomes. In the set he won, Kyrgios secured 50% of return points, compared to Nadal's 39.3%, highlighting the impact of tactical adjustments. This analysis underscored the importance of consistency and adaptability, key traits for successful returners [6]. This set-by-set analysis reinforced the value of sport psychology sessions to maintain composure and sustained focus under pressure. It further highlighted the importance of serve-return analysis in revealing strengths and weaknesses to inform coaching practices.

Deeper returns by Kyrgios correlated with greater success. Returns within the service box yielded a 24% win rate, while those landing in the back quarter achieved 48%. The decision to prioritise deep returns as a key insight stemmed from its direct correlation with Kyrgios's success in neutralising Nadal's serve. This finding emphasises the application of return placement strategies in training, particularly targeting an opposition's defensive zones to disrupt opponent's rally dominance, thereby mitigating serve advantage. However, Kyrgios struggled to capitalise on Nadal's second serves, committing numerous unforced errors. Addressing this vulnerability with actionable advice for mental and technical preparation was recommended. For example, using controlled aggression drills and shot selection scenarios to seize such opportunities more effectively.

Insights were presented using a combination of visual aids, including bar charts and pie charts, chosen for their clarity and accessibility [17]. To complement these visuals, relevant footage was enhanced with illustrations to emphasise strengths and weaknesses, supported by evidence that video yields strong learning benefits (Hedge's g=0.80) [18]. Additionally narrative storytelling was employed to further engage the audience.

The use of a more advanced Nacsport package could have significantly enhanced data visualisation. For example, generating heatmaps – which are far more eye-catching – from footage would have effectively illustrated Kyrgios's tendency to place deep returns, whereas bar charts had to suffice in this case.

In the future, analysis could incorporate Nadal's service strategies, examining whether Kyrgios adapted his return tactics in response to changes in Nadal's serve. For example, identifying if Kyrgios recognised and countered strategic alterations by Nadal. Additionally, observing

psychological metrics in greater detail – beyond obvious frustrations such as Kyrgios's reaction to Nadal's time-consuming serves – could yield valuable insights. For instance, analysing player behaviours and body language, as well as subsequent performance following standout reactions, could provide a richer understanding of the psychological dynamics in elite matches.

Conclusion

Video analysis proved invaluable for assessing Kyrgios's return of serve during his 2019 Wimbledon match against Nadal, offering critical insights into his performance and areas for improvement. By leveraging Nacsport software and focusing on key metrics such as return placement and success rates, the analysis highlighted the tactical significance of deep returns and the importance of consistent execution. It also stressed the challenges posed by limited publicly available data and the subjective nature of some metrics, which constrained the depth of analysis.

Despite these limitations, the findings demonstrated the potential for targeted training interventions, such as controlled aggression drills to address weaknesses like unforced errors on second serve returns. Moreover, the analysis asserted the value of psychological conditioning in enhancing composure during high-pressure moments. Future analyses incorporating advanced technologies and psychological metrics could further deepen understanding, reinforcing video analysis as an essential component of performance optimisation in elite sports.

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