The Impact of Coaching Change on Team Performance in the English Premier League

By

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ABSTRACT

This study examined the effects of coaching changes on team performance in the English Premier League. There is currently discussion on the specific effect changing a head coach has on team performance (negative impact, positive impact, no impact). This study contributes to the on-going discussion by examining the timing of coaching changes (between-season, within-season) and its impact on team performance. Performance data were collected on soccer teams in the English Premier League between 2000/2001 and 2018/2019 that experienced coaching changes. A series of ANOVAs and t-tests were conducted in order to determine how team performance differed after a coaching change occurred. Results suggest that regardless of the timing of the coaching change, performance levels increased and stayed elevated for at least one-and-a-half seasons following the coaching change. Further research should be conducted to determine how long this effect lasts, and to determine which type of coaching change results is best.

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INTRODUCTION

Why is This Research Important?

The research conducted revolves around the effect changing coaches has on team performance in professional sports, specifically on professional soccer in the English Premier League. There are various reasons this research should be conducted. The first reason is that the resulting findings of this research may be applicable to executive succession in the corporate world. Research on top management turnover in business organizations is hard to come by and the hierarchical structure of some business organizations and sporting teams is similar (Maxcy, 2013). Of course, professional sporting teams are different than traditional businesses, but at their core, they are both organizations selling a service. Thus, conducting this research may be important to understanding executive succession as a whole and getting a clearer picture as to how such changes impact an organization's performance. In other words, conducting this research may be an acceptable replacement for the research (or lack thereof) on top management turnover in business organizations.

Another reason to conduct this research is because of the huge economic impact that winning has on professional soccer teams in Europe. Teams that finish at the bottom of the league are relegated to a lower league. These teams face substantial consequences in finances and personnel (Gómez-Haro & Salmeron-Gómez, 2015). To be relegated to a lower league is catastrophic and can have a long-lasting impact on the team. Rocaboy and Pavlik's (2020) research also addresses the enormous, and dramatic, impact soccer can have on the international economy. Better teams generate a larger fan base which means more ticket sales, merchandise sales, better and more lucrative television deals, etc.

Large-scale competitions such as the Union of European Football Association (UEFA) Champion's League or the Fédération Internationale de Football Association (FIFA) World Cup can be an incredible supplement to a country's revenue if the country is fortunate enough to host such a competition. Conducting research on this topic may help teams improve winning percentages and improve the fiscal condition of the team, the community, and in some cases, the country.

Finally, this research should be conducted because of the contradicting and mixed-findings in studies looking at the impact coaching changes have on team performance. As mentioned in greater detail later, researchers are torn over whether or not a coach actually has any impact on team performance. In fact, Scelles and Llorca (2020) conducted a meta-analysis and found a near perfect split in that some coaching changes brought about an *increase* in team performance, some a *decrease* in team performance, and some reported *no change* in team performance at all. There also exist three popular theories attempting to explain why coaches are fired when a team performs poorly. One theory suggests coaches impact team performance (so bringing in a new coach should improve performance), one theory suggests a coach does not impact team performance (and thus it does not matter if a new coach replaces the former), and the other suggests coaching changes worsen team performance (implying that coaches should not be changed if increased performance is desired). This research will attempt to lessen the confusion surrounding the effects coaching changes have on professional sports teams.

Leadership Effects on Performance

Leadership effects on team performance are typically viewed in a similar manner to the effects coaches have on team performance; leadership significantly affects organizational performance (Jing & Avery, 2016). There is ample research that looks at the effects leadership has both directly and indirectly on group performance and other group-level processes. For example, Judge and Piccolo (2004) conducted a meta-analysis that looked at the validity of transformational and transactional leadership. Transformational leadership is leadership that focuses on higher order intrinsic needs, whereas transactional leadership is leadership that focuses on proper exchange of resources (Judge & Piccolo, 2004). The two researchers found that transformational leadership had a significant positive relationship with follower job satisfaction (r = .58), follower satisfaction with leader (r = .71), and group or organization performance (r = .26). Contingent reward (one dimension of transactional leadership) showed a significant positive relationship with several key variables such as follower job satisfaction (r = .64), follower motivation (r = .59), and group or organization performance (r = .16). This study further provides evidence for the idea that leadership behavior has a direct and positive relationship with individual satisfaction and group performance.

Burke et al. (2006) also conducted a meta-analysis that analyzed the effects leadership behavior has on team performance outcomes. Leadership behavior was broken into two categories: behaviors dealing with task accomplishment (task-focused) and behaviors that facilitate team interaction and/or development (person-focused). Results showed a significant positive relationship between task-focused leadership and perceived team effectiveness (r = .33) and team productivity (r = .20). Further still, person-focused

leadership behaviors had a significant and positive relationship with perceived team effectiveness (r = .36), team productivity (r = .28), and team learning (r = .56). Once more, the evidence provided in this analysis indicates the relationship leadership behavior has on team performance and team outcomes.

Maynard et al. (2021) looked at how team leader coaching impacted team processes in a surgical context. Surgeons in the intervention group (i.e., surgeons that were coached) were given feedback on ways they could improve team effectiveness in their operating room. Researchers found a significant positive correlation between surgical teams whose leader was "coached" and team processes (transition, action, and interpersonal processes). In other words, coaching the leader had trickle-down effects that improved the effectiveness of the team.

This relationship has been analyzed from varying perspectives including focusing on different leadership behaviors and their respective impact on performance outcomes. For example, Judge et al. (2004) conducted a meta-analysis of the impact Consideration and Initiating Structure variables had on leader and follower outcomes. First, Consideration was defined as the degree to which a leader looks out for the welfare of their followers. Researchers found Consideration had a significant positive relationship with several notable variables such as follower job satisfaction (r = .40), follower motivation (r = .36), and group-organizational performance (r = .23).

Initiating Structure was defined as the degree to which a leader creates structure in their role and in the role of their followers and is goal-oriented. Researchers found Initiating Structure had a significant positive relationship with several key variables such as follower satisfaction with leader (r = .27), follower motivation (r = .26) and group-

organizational performance (r = .23). This study shows that leaders may indirectly improve performance through increasing job satisfaction, as well as directly improving group-organizational performance.

Yukl (1989) also developed the Multiple Linkage Model which shows how leader behavior impacts unit effectiveness. The general idea behind this model is that a leader's behavior impacts six key subordinate behaviors (subordinate effort, role clarity and task skills, organization of work, cohesiveness and cooperation, resources and support services, external coordination) which in turn influence the overall effectiveness of the group. This theory once again identifies the indirect effects leader behavior has on group-level performance.

There is also research that looks at more indirect ways leadership impacts performance. Judge et al. (2001) conducted a meta-analysis on the relationship between job satisfaction and job performance and found a correlation value of .30. This relationship can be used to help explain how leaders may indirectly impact team performance. In this case, job satisfaction could be a moderator for the leadership-performance relationship. Kuoppala et al. (2008) also found that leadership played an important role in job satisfaction and job well-being, which suggests leaders may have a more indirect role in changes in performance.

Hogan and Kaiser (2005) looked at predictors of organizational effectiveness and found "talented management" was one of five factors that impacted organizational effectiveness. Talented management was defined as individuals with high interpersonal, intrapersonal, business, and leadership abilities. In general, much of the existing literature agrees that leadership has a positive influence on group-level performance.

The Effects of Top Management Turnover on Organizational Performance

The comparison between coaching turnover in professional sports and turnover in corporate organizations is one that is frequently mentioned in previous literature (Brown, 1982; Gómez-Haro & Salmerón-Gómez, 2015; Kattuman et al., 2019; Maxcy, 2013; Soebbing et al., 2015; Wirl & Sagmeister, 2008). Whether it is due to the similarities in the responsibilities of CEOs and head coaches, the use of sports data to learn more about top management turnover (TMT) is common.

That being said, there is a smaller amount of research that has been conducted strictly focusing on TMT and organizational performance. This literature shows that, on average, top management turnover does not necessarily improve or worsen organizational performance after the succession is complete (Boyne et al., 2011; Hill, 2005; Khurana & Nohria, 2000; Lin & Li, 2004). However, several patterns were identified by researchers looking at variables that may contribute to a change in organizational performance. In one study, computer modeling methods were used to obtain data on TMT and organizational outcomes (Lin & Li, 2004). Researchers found that an industry that has a predictable environment tends to be negatively impacted (experiences a decline in organizational performance) after TMT. Further still, researchers found that when the successor was hired from within the company as opposed to outside the company, organizational performance tended to increase.

A second study by Boyne et al. (2011) found that TMT resulted in an increase in organizational performance if the performance levels of employees was low before the succession event. Conversely, it was also found that TMT was disruptive and resulted in a decrease in organizational performance if the performance levels of employees was

high before the succession event. Thus, Boyne and his colleagues propose that on average there is no change in organizational performance because the results are nullified by one another. This finding supports the idea that different variables moderate the TMT – organizational performance relationship.

A third study looking at superintendents in Texan school districts (Hill, 2005) echoes some of the findings outlined by the aforementioned Lin and Li (2004) study regarding organizational performance. Results showed that replacing a superintendent with an individual from outside the organization had a significant negative short-term effect on organizational performance. However, when the successor came from within the hierarchical structure of the organization, performance was not impacted. Hill also found that the longer the school stayed with a new manager, the more likely it was to see better results[1].

A fourth study by Khurana and Nohria (2000) looked at the effects of natural versus forced turnover, and outsider versus insider hiring. They found that organizational performance improved 4.4% when a forced turnover was followed by an outside successor. Additionally, they found that a natural turnover followed by an outsider lead to a 5.5% decline in firm performance. Typically, forced turnovers occur in more negative contexts, and natural turnovers occur in a more neutral or positive context. That being said, these findings would support the notion that firms perform better when an outsider comes in after a negative leadership experience, and worse when an outsider comes in after a neutral or positive leadership experience.

[1] An alternative argument could be made however that well-performing superintendents are not fired, which accounts for their length of tenure.

The Effect of Change

It goes without saying that change often has consequences. Elrod and Tippett (2001) looked at the effect change and transition has on human beings. The authors initially looked at five change models including Lewin's (1952) three-phase model of change and Kubler-Ross's (1965) five-phase model of dealing with trauma or serious illness. In three of the five models they reviewed, the change period involved "some degree of chaos, crisis, or distortion" (Elrod & Tippet, 2001, p. 279). In simpler terms, the change in the environment of the person resulted in some sort of "dip" or negative emotion before rebounding. The study then compared a number of organizational change models and found that a loss of performance often occurred after, or during, the change process. The study as a whole looked at 15 total change models and noticed a "dip" in 13 of them. In other words, most researchers agree that there is some sort of initial drop in performance, emotion, etc. before correcting and returning to normal (or improving).

Common Coaching Change Theories

Prior research on the impact of coaching changes has led to the formulation of three general theories about coaching changes in professional sports. There also exists a fourth theory that relates to how performance is typically affected after a coaching change occurs. These theories each have their own respective support and logic behind them, and attempt to answer the question: "why are coaches fired?" The first is the "common sense" theory. This theory suggests that "new coaches positively impact team performance" (Pierce, Johnson, et al., 2017). In this instance, a board of directors might opt to fire a coach and replace him/her in order to improve team performance. Per the

name of this theory, it makes sense that a coach that is performing poorly should be removed, and in doing so, an improvement of team performance could be expected.

A second opposing theory to the common sense theory is the "vicious circle" (aka vicious cycle) theory. This theory differs in that it is based on the assumption that coaching changes negatively impact team performance. The vicious circle theory posits that poor performance increases the likelihood of a coaching change, which in turn leads to poorer performance, restarting the cycle once more (Brown, 1982). A study by Kattuman et al. (2019) suggests that coaching changes might disrupt routines, causing performance to worsen, thus creating the need to hire a new coach. This theory would not promote firing a coach with the sole purpose of improving team performance. Instead, the vicious circle theory might promote alternative methods of improving team performance (i.e., changing personnel). It should be mentioned however that there are few studies beyond the two mentioned above that support this theory (Rowe et al., 2005). Nonetheless, it should still be taken into consideration when discussing the true relationship between coaching changes and team performance.

The third theory regarding coaching succession is the "ritual scapegoating" theory. This theory posits that coaching changes do not impact team performance at all (neither improve nor worsen). Instead, ritual scapegoating theory suggests that the main reason coaches tend to be fired after a bout of poor performance is, as the name suggests, because they are being used as a scapegoat (Audas, et al., 2002). In other words, the main reason teams fire their coaches is to appease fans, players, the board of directors, investors, etc. The coach is in charge of (among other things) the tactics, play-style, and placement of personnel. Due to the amount of "control" the coach has over the team, and

because it is easier to replace a single coach as opposed to an entire team, the coach is a likely subject for relevant parties to direct their frustration.

In contrast to the three aforementioned coaching change theories, Rowe et al. (2005) chooses to take a more neutral stance in the "which theory is correct?" debate. These researchers speculate that all three may be useful in understanding how leader succession affects organizational performance. Rowe and his colleagues also point out that a majority of the research that exists around these three theories typically supports ritual scapegoating theory.

Finally, there is a fourth theory that is discussed beyond common sense, vicious cycle, and ritual scapegoating theory known as the shock effect (aka new manager bounce). The shock effect is a phenomenon in sports that occurs immediately after a new coach takes charge (i.e., after a coaching change occurs). When a new coach comes in to a team, there is often an immediate *positive* spike in performance before falling back down to normal. Such an occurrence is in direct contrast to the research done by Elrod and Tippett (2001) that identifies how human beings and organizations alike typically experience a *negative* drop in performance before returning to normal.

Support of this shock effect can be found in Koning's (2003) study on the impact of coaching changes in the Dutch Premier League (the top professional soccer league in Netherlands). Koning found that forced turnover followed by an outside successor significantly and immediately improved team performance (albeit only temporarily). The existence of the shock effect is further supported by McTeer et al. (1995). In this study, researchers looked at the effect of mid-season coaching changes on team performance in professional team sports. The study looked at four major sports in North America:

National Hockey League (1938 – 1988), MLB (1900 – 1989), NBA (1952 – 1988), and NFL (1960 – 1988). Researchers found that in the NBA, MLB, and the National Hockey League (NHL), team performance improved immediately following a mid-season coaching change. In the NBA and MLB, performance then decreased and returned to a more normal or average level the following season. In the NHL however, team performance continued to significantly increase the next season. No changes in team performance were found following a midseason coaching change in the NFL.

Finally, researchers Wirl and Sagmeister (2008) made the statement that a "coach effect" (aka new manager bounce or shock effect) is very common, and it can almost be expected that a new coach comes in and wins their first game (or at least does not lose). Although this statement is not necessarily made with any specific statistical or experimental backing, it is a commonly agreed upon idea by many soccer fans. The existence and support of these four theories illustrates the complex nature of identifying the true relationship between coaching change and team performance, and further strengthens the importance of the current study.

Coaching Changes in Sports: Mixed Results

A large body of literature exists that studies the impact of coaching changes in professional sports. One of the earliest studies that studied the effects of coaching changes on team performance was Brown's (1982) study that challenged the belief that replacing a leader in an organization would result in an increase in team performance. Brown suggested that a) once other relevant factors were accounted for, the effects of coaching on team performance would be nullified, and b) the "tensions and instabilities" that come with a change of leadership may actually make performance worse.

Referring back to the three coaching change theories, Brown was suggesting that the common sense theory held no merit, and that in actuality the vicious circle and/or ritual scapegoating theory might be more accurate. Brown looked at teams in the National Football League (NFL) and found that the appearance of a "succession effect" (shock effect) is due primarily to the exceptionally poor performance under the prior coach. In other words, there was nowhere to go but up. Additional analysis found that the successors of fired-coaches experienced a similar recovery/increase in performance as those teams that had a similar decline in performance but did not fire their coach. This finding supports the scapegoating theory of succession.

A similar type of study conducted by Goff et al. (2019) found that across the NFL, the National Basketball Association (NBA) and Major League Baseball (MLB), team performance increased following a coaching change. In the NFL, a new coach appeared to "boost winning by 3.3 percentage points during the initial season." This effect increased to 7.3 percentage points during the second season and began declining for the following three seasons until the "new coach" effect ceased to exist. In the NBA, a similar pattern was identified where a new coach increased the winning percentages of a team for five full seasons following the coaching change. Finally, in the MLB, the effect is slightly smaller and lasts only for three seasons following the coaching change, but the results still support the idea that a new coach increases team performance.

A study conducted by Scelles and Llorca (2020) paints a more holistic image on the conflicting findings of coaching changes on team performance. The researchers identified 32 studies across 12 countries that looked at how coaching changes impacted team performance in men's professional soccer. The results showed that of the studies

reviewed, 11 studies found coaching changes had no significant impact on team performance, 11 studies found a coaching change had a significant negative impact, and 10 studies found a significant positive impact. In other words, there is not yet an agreement on how coaching changes impact team performance. It appears that the best way to explain such variation may depend on the methodology of the researchers' study and the time-period analyzed (Rocaboy & Pavlik, 2020).

Research Questions

The research conducted on how leadership behavior impacts performance outcomes is quite clear in that there is a significant and positive relationship (direct and/or indirect) between the two constructs. However, some of the research on coaching changes and their impact on team performance would not necessarily share that same conclusion (Brown, 1982; Scelles & Llorca, 2020; Audas et al., 2002). Additionally, Lin and Li (2004) found that TMT resulted in an increase in organizational performance if the performance levels of employees was low before the succession event. This situation (low performance preceding a leadership change) is exactly what is often seen in the English Premier League.

Finally, evidence of a shock effect is in direct contrast with change research which suggests that performance typically decreases following a change before increasing, as opposed to the other way around (Elrod & Tippett, 2001). The first three research questions attempt to address these ambiguities by identifying if, and how, changing a head coach of a sports team significantly impacts team performance. This study will look at coaching changes that occurred before the season begins (between-

season) and during the season (within-season) in England's most elite professional soccer league- the English Premier League (EPL; Premier League).

Research Question 1: What is the average effect of a within-season coaching change on team performance in the English Premier League?

Research Question 2: What is the average effect of a between-season coaching change on team performance in the English Premier League?

Research Question 3: Does a within-season coaching change have a larger or more significant impact on team performance than a between-season coaching change?

The final research question stems from the ample research that looks at how team performance is impacted over time following a coaching change. Some studies have found that team performance often returns to a more neutral state over time following a coaching change (McTeer et al., 1995; Goff et al., 2019; Brown, 1982). Within these studies though, the length of time it takes for teams to regress to the neutral state of performance varies. Thus, the fourth research question attempts to identify how each type of coaching change (between-season and within-season) impacts team performance over time.

Research Question 4: Does one coaching change type result in a better team performance level over time?

METHOD

Participants

In this study, coaching change data for the English Premier League, or the "Premier League" was pulled primarily from www.transfermarkt.us as well as other data bases such as www.goal.com, www.bbc.com, and www.premierleague.com. These are public databases with large, in-depth records of the events of the Premier League. All relevant coaching changes in the Premier League from 2000 until 2019 were analyzed. Varying criteria for inclusion were identified within the description of each analysis below. A control group of teams that did not have a coaching change was included for both within-season and between-season coaching changes. The primary demographic of the coaches studied was men of predominantly white ethnicity. Additionally, most coaches played professionally, and all have some sort of formal soccer-based education.

The English Premier League is widely considered the most popular soccer league in the world (Khan, 2021), and as such, brings in the most revenue each season (Lange, 2020). The league is the most competitive professional soccer league in England and consists of 20 teams from England. A single league season consists of 38 games where every team plays every other team twice- once at the opposition's home stadium (away) and once at their own stadium (home). The season starts in August and ends in May. There are two "transfer windows" during the calendar year, once during the month of January and once during the "off season" (i.e., June – August). During these windows, players can be bought from and sold to other teams. This league was chosen specifically for this study due to the level of interest it draws on a global scale from players, coaches, and fans alike. Additionally, due to its profitability, coaches are offered handsome

contracts to coach these teams. This means that changing a coach is a difficult and expensive decision. If proper coaching decisions are made, teams could save tens of millions of dollars that could be used elsewhere (i.e., facility or personnel). There are four other lucrative leagues (La Liga in Spain, Ligue 1 in France, Serie A in Italy, and Bundesliga in Germany) in Europe as well. The results of how coaching impacts team performance in the English Premier League is anticipated to generalize across these four additional leagues. Beyond that, the results may not generalize to other leagues in Europe and around the world as there are large gaps in skill of players (https://www.globalfootballrankings.com/), money invested (Lange, 2020), and public interest (Khan, 2021).

Materials

The three primary variables of interest are: 1) the timing of the coaching change (within-season, between-season, no change), 2) the number of games the new coach was in charge, and 3) team performance.

The timing of the coaching change refers to whether the coaching change occurred during a season (within-season) or after a season has concluded (between-season). A yoked control group was used for each individual coaching change for the first three analyses (analysis 1a, analysis 1b, analysis 2) to account for regression to the mean. To qualify as a control coach, the coach must have been in charge of their respective team for the entirety of the prior season (the season before the coaching change occurred) as well as the entire duration of time being analyzed. For example, if John Doe is hired in January of 2012 (a within-season coaching change) in analysis 1a, he will be paired with the coach of a similarly skilled team (a team that finished within two places of the team

with the coaching change the prior season) that did not have a coaching change during the 2010/2011 season, nor the 2011/2012 season.

Generally speaking, if a coaching change occurred during the season (i.e., August – May), then it was considered a within-season coaching change. If a coaching change occurred outside of this time frame (i.e., June – July), then it was considered a between-season coaching change. There is one stipulation for a coaching change to be classified as a within-season coaching change. Within-season coaching changes are ones that occur at least 10 games after the season has begun or at least 10 games before the season ends. In other words, only coaches who were in charge for at least 10 games, but no more than 28 games *in their initial season* were classified in this group. This 10-game cushion on either side of the coaching change was selected because 10 games represents roughly 25% of the season. If a new coach came in before the 10 game mark at the beginning of a season, or after the 28 game mark near the end of the season, there would not be enough games to accurately compare performance levels between the old coach and the new coach.

The second variable of interest is in respect to a coach's entire tenure at their new club. In order to be included in this study, a new coach must have coached at least 10 consecutive games at their new club. For newly hired coaches with longer tenures, only their first 57 games in charge were included in these analyses. The value 57 was chosen as this represents one-and-a-half seasons (38 games in one season, 19 games in half a season). This value was also chosen as it allowed the most coaches to be included in the analysis while trying to maximize the quantity of games analyzed per coach.

Team performance was measured by looking at league points awarded per game (three points for a win, one point for a tie, and zero points for a loss). This performance value is referred to as "points per game", or PPG. To clarify what is meant by "league points awarded per game", consider the following example. If Team A defeats Team B by a score of two goals to zero, Team A is awarded three points since they won and Team B is awarded zero points since they lost. If Team A and Team B had drawn the game by each scoring two goals however, they would each be awarded one point for a tie. These points accumulate over the course of a season and determine league placement. Whichever team has the most points at the end of the season wins the league. With regard to a team's PPG, the higher the PPG, the higher the team's performance level.

Procedure

The main goal of the following analyses was to identify in what situations, if any, team performance differs based on when a coaching change occurs. In order to achieve this goal, five analyses were conducted.

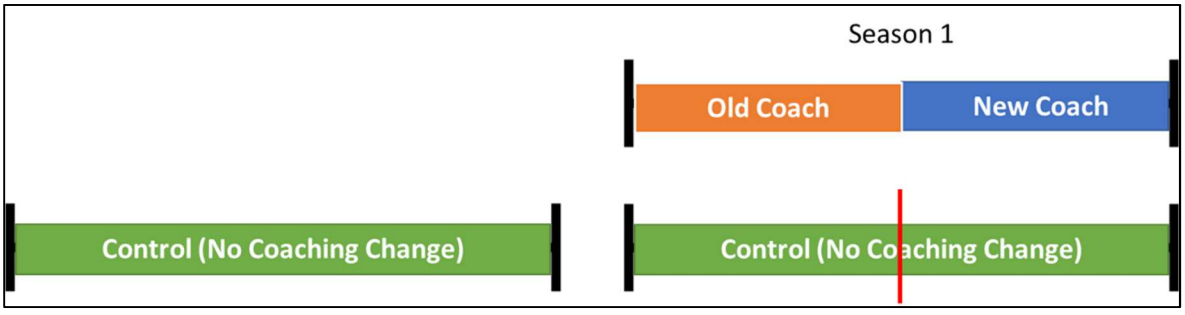
Analysis 1: Within-Season Coaching Changes

To answer the first research question, (What is the average effect of a within-season coaching change on team performance in the English Premier League?) two 2x2 repeated-measures ANOVA analyses were conducted. The first analysis (1a) used performance data from teams that had within-season coaching changes and teams that had no coaching changes (control group). Pre-change performance (performance before the coaching change) and post-change performance (performance after the coaching change) data *for the remainder of that season* were compared to determine the average effect of a within-season coaching change. To clarify this process, consider the following

example. Coach A coaches a team from the beginning of the season in August through January and is then replaced by Coach B who coaches the team until the end of the season (i.e., February – May). Analysis 1a compared the performance level of the team under Coach A (pre-change performance) and under Coach B (post-change performance) to determine if there were any significant differences in performance. These results were then compared to a control group consisting of a team that did not have any coaching changes during the prior season *and* the current season. The control group's "pre-performance" and "post-performance" levels were dependent on the exact date the within-season coaching change occurred. In other words, if Coach B replaced Coach A on February 1st, then the performance of the control group before February 1st and after February 1st will be calculated and recorded. In order to be included in analysis 1a, the new coach must have remained at the club for the entirety of the remaining season. For example, a new coach that was hired in January must have remained the coach at that respective team until the end of the season in May. A series of t-tests were conducted to further examine these relationships. Refer to **Figure 1** below for additional explanation of this analysis.

Figure 1

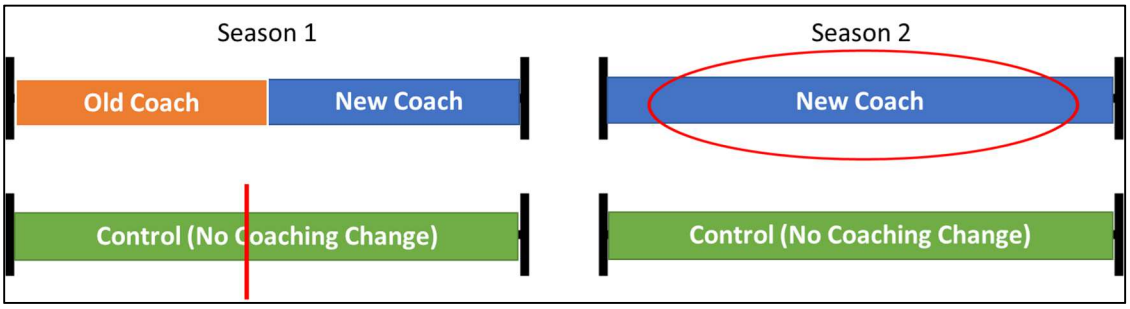
Analysis 1a: 2x2 Repeated-Measures ANOVA for Within-Season Coaching Changes (Rest of Season)



Analysis 1b looked at the effect of a within-season coaching change on pre-change performance and post-change performance during the new coach's *first full season in charge*. A yoked control group (teams with no coaching change) was used for each individual coaching change to control for regression to the mean. The same criteria used in analysis 1a to define a "within-season coaching change" are used in analysis 1b. However, in order to be included in this analysis, new coaches must have stayed at their new team for the entire duration of the following season. To give an example, if Coach B replaced Coach A in January 2012, Coach B must coach the rest of the 2011/2012 season, as well as the *entire* 2012/2013 season to be included in analysis 1b. Refer to **Figure 2** below for additional explanation of this analysis. These analyses (1a and 1b) allowed both the short-term and long-term effects of a within-season coaching change to be analyzed. As in analysis 1a, t-tests were conducted to further examine this relationship.

Figure 2

Analysis 1b: 2x2 Repeated-Measures ANOVA for Within-Season Coaching Change (First Full Season)

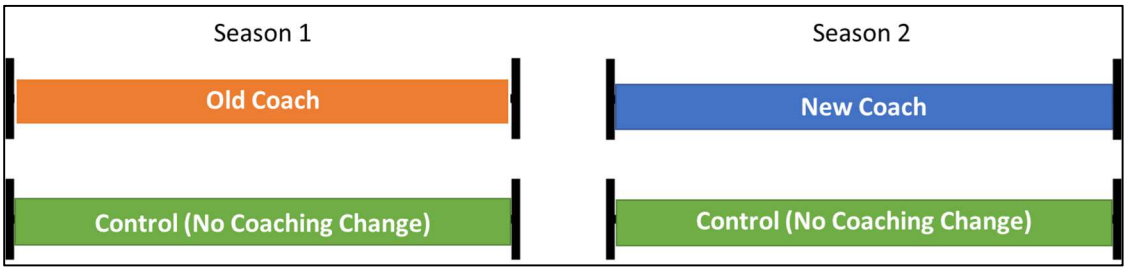


Analysis 2: Between-Season Coaching Changes

The second analysis serves the purpose of answering the second research question (What is the average effect of a between-season coaching change on team performance in the English Premier League?) Similar to the first set of analyses, analysis 2 consisted of a repeated-measures 2x2 ANOVA looking at the effect of between-season coaching changes and no coaching changes (control group) on pre-change performance and post-change performance *of the next season*. **Figure 3** (below) depicts this analysis more clearly. To be considered a between-season coaching change, a new coach must have replaced the prior coach after the season is over, and before the next season begins. For example, if Coach B replaces Coach A in July 2012 (between seasons), Coach B must coach the entirety of the upcoming 2012/2013 season to be included in this analysis. T-tests were conducted to examine this relationship further.

Figure 3

Analysis 2: 2x2 Repeated-Measures ANVOA for Between-Season Coaching Changes



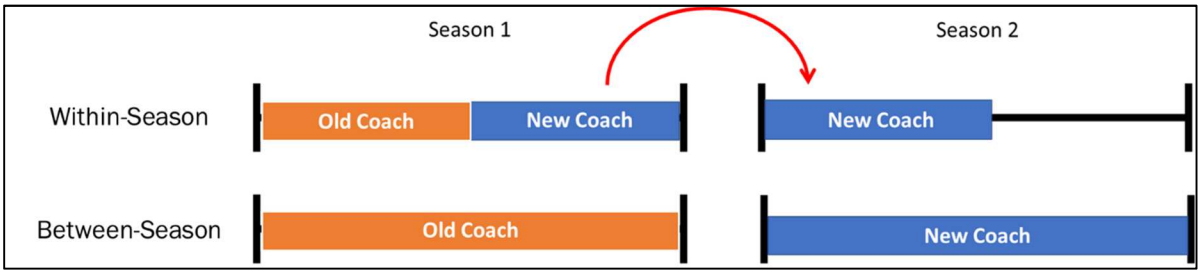
Analysis 3: Comparing Within- & Between- Season Coaching Changes: First 38

To answer the third research question (Does a within-season coaching change have a larger or more significant impact on team performance than a between-season coaching change?), a 2x2 Mixed ANOVA was conducted to analyze performance across

the new coach's first 38 games following the coaching change. In this analysis, performance levels of within-season coaches were compared to performance levels (pre-change and post-change) of between-season coaches based on their respective team's PPG from their *first 38 games in charge*. For a between-season coaching change, this concept is relatively straightforward (i.e., the new coach's first 38 games is their first season in charge). However, for a within-season coaching change, this means that a coach who is hired in February (for example) had the remaining of that season included in this analysis, as well as a portion of their next season. **Figure 4** (below) may explain this analysis more clearly. Although this is a seemingly unorthodox method, both coaches would have been at the club for two transfer windows each to bring in their desired players and both coaches would have had the same number of games compared. To be included in this analysis, all new coaches must have coached at least 38 games. A series of t-tests were conducted to further examine this relationship.

Figure 4

Analysis 3: 2x2 Mixed ANOVA (First 38 Games)

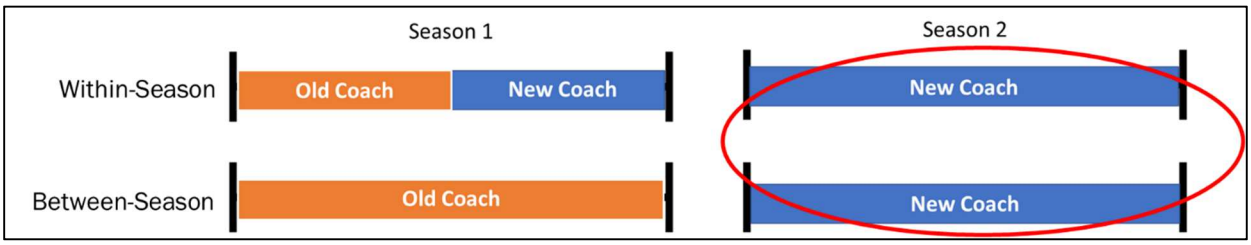


Analysis 4: Comparing Within- & Between- Season Coaching Changes: First Full Season

Analysis 4 also served the purpose of addressing the third research question, to see which coaching change results in a better overall team performance level on average. Additionally, this analysis answers another important question- when is the best time to make a coaching change? In this analysis, nearly the exact same procedure was followed as in analysis 3. The only difference is that instead of looking at the first 38 games a coach is in charge, the analysis focused on the first full season the manager was in charge. Refer to **Figure 5** below for further explanation of this analysis. For between-season coaching changes, this is the same value as used in analysis 3. For within-season coaching changes however, the coach's initial "remainder of the season" was excluded, and only their team's performance level from their first full season in charge was included. This process may appear to give within-season coaches an unfair advantage as they get more time with their team and have a better idea of what players they need to buy in the summer transfer window. However, as stated above, this analysis may help answer the question, "when is the best time for a team to change their coach?" Should they wait until the season is over or should they bring in a new coach immediately? To be included in this analysis, both coaching change types must have coached a full season in its entirety (from beginning to end). A series of t-tests were conducted to further examine the nature of these relationships.

Figure 5

Analysis 4: 2x2 Mixed ANOVA (First Full Season)

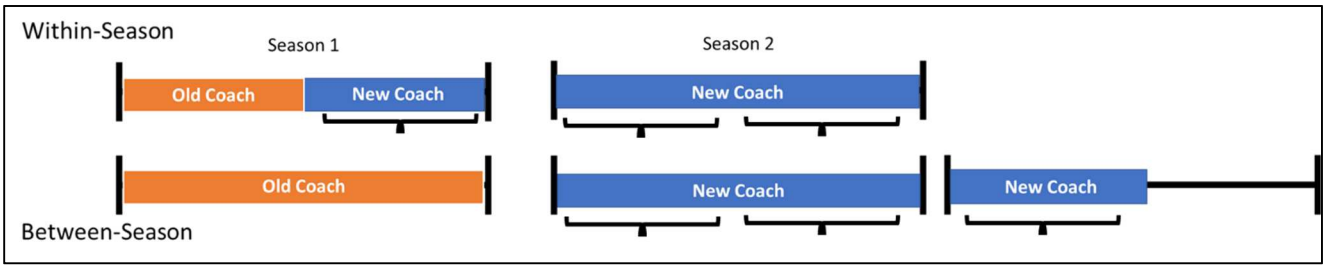


Analysis 5: Comparing Within- & Between- Season Coaching Changes: 57 games

Finally, to answer the fourth research question (Does one coaching change type result in a better average team performance level over time?), a 2x3 Mixed ANOVA was conducted to compare the performance levels of the two coaching change types across three, 19 game windows. As a reminder, one season in the Premier League consists of 38 games and half of a season is 19 games. That being said, 57 games equates to one-and-a-half seasons in the Premier League. In this analysis, the first 57 games of each coach's tenure were broken up into three isolated 19-game periods of time with their own respective PPG value. **Figure 6** (below) depicts this analysis more clearly. This allowed for a rudimentary analysis of performance trends to be conducted between the two coaching change types. To be included in this study, only Premier League coaches who coached at least 57 games were included. Those coaches that coached longer than 57 games only had their first 57 games analyzed.

Figure 6

Analysis 5: 2x3 Mixed ANOVA (19-Game Periods)



RESULTS

Analysis 1

Analyses 1a and 1b both examine the effect of a within-season coaching change on team performance. Analysis 1a looks at the impact of change on the remainder of the season, while analysis 1b examines the impact of change on the next season.

Analysis 1a: Impact of Within-Season Coaching Change on Team Performance for the Rest of the Season

This analysis examined the impact of a within-season coaching change on team performance for the remainder of the season in which the coaching change occurred. In analysis 1a, a 2x2 repeated-measures ANOVA was used to compare performance levels of the within-season coaching change (Change) and no coaching change (Control) across time (Pre, Post). Four variables were used in the ANOVA: Change PPG Pre (performance levels of a team before their within-season coaching change occurred), Change PPG Post (performance levels of a change team for the remainder of the season), Control PPG Pre (performance levels of the control team before their within-season coaching change occurred in the corresponding change group), and Control PPG Post (performance levels of the control team for the remainder of the season). Additionally, paired samples t-tests were conducted to examine the nature of the interaction.

An initial t-test looked at the relationship between Change PPG Pre and Control PPG Pre in order to determine whether change and control teams differed in initial performance. Results of this paired samples t-test indicated that there was a significant difference between performance levels of Change PPG Pre and Control PPG Pre, $t(44) = -5.428$, $p < .001$. This means that prior to any coaching change, control teams performed

significantly better than teams that experienced a within-season coaching change. Descriptive statistics showed that Change PPG Pre (M = 1.008, SD = .384, n = 45) performed more poorly than Control PPG Pre (M = 1.433, SD = .505, n = 45). To determine the similarity between pairs of change and control teams, a correlation was calculated. Results indicated that performance of change and corresponding control teams were significantly moderately correlated (r(43) = .325, p = .029). This suggests that, although the matching of change and control teams was not perfect, the matched change and control pairs did tend to perform at moderately similar levels of performance.

The results of the 2x2 repeated-measures ANOVA showed a significant change effect (F(1, 44) = 17.938, p < .001), indicating that performance was higher for the control teams (i.e., teams that did not change coaches). Results also indicated a significant time effect (F(1, 44) = 17.754, p < .001), demonstrating that performance was higher in the "Post" conditions. Finally, a significant interaction effect (F(1, 44) = 14.026, p = .001) was also found, indicating that the main effects of time differ depending on whether a coaching was made. A series of t-tests was conducted to further examine these effects.

One t-test looked at the relationship between Change PPG Pre (M = 1.008, SD = .384, n = 45) and Change PPG Post (M = 1.336, SD = .444, n = 45). Results of this paired samples t-test indicated that there was a significant difference between performance levels of Change PPG Pre and Change PPG Post, t(44) = -5.834, p < .001. This indicates that performance increased for teams that experienced a within-season coaching change.

The third t-test looked at the relationship between Control PPG Pre (M = 1.433, SD = .505, n = 45) and Control PPG Post (M = 1.426, SD = .460, n = 45). Results of the

paired samples t-test indicated that there was not a significant difference between performance levels of Control PPG Pre and Control PPG Post, $t(44) = .117$, $p = .907$. These data indicate that the performance levels for the control teams stayed consistent over time while the performance of teams with a within-season coaching change improved.

Analysis 1b: Impact of Within-Season Coaching Change on Team Performance for the First Full Season

In analysis 1b, a 2x2 repeated-measures ANOVA was used to compare performance levels of the within-season coaching change (change teams) and no coaching change (control teams) across two time periods (the period before a change, and the first full season following the change). This analysis is similar to that of analysis 1a, except the post-change performance is assessed for the next complete season. It is important to note that fewer teams were available for analysis 1b than for analysis 1a, resulting in lower statistical power for this analysis.

An initial t-test looked at the relationship between Change PPG Pre ($M = 1.056$, $SD = .356$, $n = 11$) and Control PPG Pre ($M = 1.351$, $SD = .277$, $n = 11$) in order to determine whether change teams and control teams differed in initial performance. Results of this paired samples t-test indicated that there was a significant difference between performance levels of Change PPG Pre and Control PPG Pre, $t(10) = -2.472$, $p = .033$. This means that prior to any coaching change, control teams performed significantly better than teams that experienced a within-season coaching change. A correlation was computed to examine the similarity (of performance) between pairs of change and corresponding control teams. Results indicated that performance of change

and corresponding control teams were not significantly correlated (r(9) = .238, p = .481). These results indicate that despite using the best available data, the matching of change and control teams was not as close as desired.

The results of the 2x2 repeated-measures ANOVA showed there was no significant change effect (F(1, 10) = 3.617, p = .086), indicating there was no significant difference in performance level between "Change" and "Control" groups. Results also indicated there was no significant time effect (F(1, 10) = 3.961, p = .075), suggesting there was no change in performance after the coaching change. Finally, there was no significant interaction effect (F(1, 10) = 3.616, p = .086), indicating that the main effects of time do not differ depending on whether a coaching change was made.

Follow-up t-tests were conducted to provide additional detail. One looked at the relationship between Change PPG Pre (M = 1.056, SD = .356, n = 11) and Change PPG Post (M = 1.332, SD = .294, n = 11). Results of this paired samples t-test indicated that there was a significant difference between performance levels of Change PPG Pre and Change PPG Post, t(10) = -2.44, p = .035. This would indicate that the increase in performance that occurs after a within-season coaching change occurs is significant.

The third t-test look at the relationship between Control PPG Pre (M = 1.351, SD = .277, n = 11) and Control PPG Post (M = 1.373, SD = .213, n = 11). Results of the paired samples t-test indicated that there was not a significant difference between Control PPG Pre and Control PPG Post, t(10) = -.260, p = .800. These data indicate that controls teams performed at a consistent level over time, but the performance of change teams increased.

Analysis 2

In analysis 2, a 2x2 repeated-measures ANOVA was conducted to analyze team performance of teams that experienced a between-seasons coaching change (change teams) and no coaching change (control teams) across time (the period of time before the coaching change occurred, and the first full season after the change). This analysis is nearly identical to that of analysis 1b, except performance levels for between-season (as opposed to within-season) coaching changes were analyzed.

An initial t-test was conducted to determine whether Change PPG Pre and Control PPG Pre teams differed in initial performance. Results of this paired samples t-test indicated that there was a significant difference between performance levels of Change PPG Pre and Control PPG Pre, $t(27) = -3.296$, $p = .003$. Descriptive statistics showed that performance was lower for Change PPG Pre ($M = 1.452$, $SD = .338$, $n = 28$) than Control PPG Pre ($M = 1.526$, $SD = .377$, $n = 28$). This means that prior to any coaching change, control teams performed significantly better than teams that experienced a between-season coaching change. A correlation was computed to examine the similarity between pairs of change and corresponding control teams. Results indicated high correlations ($r(26) = .950$, $p < .001$). The results of the t-test and correlation indicate that, although the matching between change and control was similar, control teams still outperformed teams experiencing the coaching change.

The results of the 2x2 repeated-measures ANOVA showed there was no significant change effect ($F(1, 27) = 0.024$, $p = .878$), indicating there was no significant difference in performance level between "Change" and "Control" groups. Results also indicated there was no significant time effect ($F(1, 27) = 0.347$, $p = .561$), suggesting

there was no change in performance after the coaching change. However, there was a significant interaction effect ($F(1, 27) = 4.756$, $p = .038$), indicating that the main effects of time differs depending on whether a coaching change was made.

The second t-test looked at the relationship between Change PPG Pre ($M = 1.452$, $SD = .338$, $n = 28$) and Change PPG Post ($M = 1.559$, $SD = .454$, $n = 28$). Results of this paired samples t-test indicated that there was not a significant difference between performance levels of Change PPG Pre and Change PPG Post, $t(27) = -1.927$, $p = .065$. This would indicate that the increase in performance that occurs after a between-season coaching change occurs is not significant.

The third t-test looked at the relationship between Control PPG Pre ($M = 1.526$, $SD = .377$, $n = 28$) and Control PPG Post ($M = 1.471$, $SD = .457$, $n = 28$). Results of the paired samples t-test indicated that there was not a significant difference in performance levels of control teams before and after the between-season coaching change occurred in the change teams, $t(27) = 0.932$, $p = .359$. These data show that control teams tended to perform at a consistent level over time.

The significant interaction indicated that the effect of time depended on whether a between-season coaching change was made. The t-tests did not show a significant change in performance for either the change or control teams. Examination of cell means revealed that although there were observed changes in performance for both groups (change teams and control teams), neither effect was statistically significant. The interaction appears to be the result of a slight increase in performance in change teams, and a slight decline in performance in control teams, although neither change was statistically significant.

Analysis 3

In Analysis 3, a 2x2 Mixed ANOVA was conducted in order to analyze changes in team performance for teams that experienced the two types of coaching changes (within-season, between-season) over time (the period of time before the coaching change occurred, and the first 38 games with the new coach in charge). This analysis primarily differs from those prior in that there is no control group. Instead, changes in performance are directly compared between coaching change types in order to determine if one results in higher levels of performance than the other.

The results of the 2x2 Mixed ANOVA showed there was a significant time effect ($F(1, 60) = 41.193$, $p < .001$), indicating that performance levels were impacted by the timing of the change (performance was higher after the coaching change). There was also a significant change type effect, ($F(1, 60) = 14.641$, $p < .001$), indicating that across both pre- and post-change time periods, teams with between-season coaching changes performed higher than teams with within-season coaching changes. Finally, results indicated there was a significant interaction effect ($F(1, 60) = 7.832$, $p = .007$), indicating that the main effects of time depends on what type of coaching change was made (within-season or between-season). A series of t-tests was conducted to further examine these effects.

Independent samples t-tests were conducted to determine if, prior to the coaching change, the differences in performance levels between coaching change types were significant. The first t-test looked at PPG Pre Change- Between ($M = 1.424$, $SD = .342$, $n = 37$) and PPG Pre Change- Within ($M = 0.999$, $SD = .304$, $n = 25$). Results of this t-test indicated that there was a significant difference between performance levels of PPG Pre

Change- Within and PPG Pre Change- Between, $t(60) = 5.011$, $p < .001$. This indicates that teams with between-season coaching changes were performing at a significantly higher level than teams experiencing within-season coaching changes before the coaching changes occurred.

The second independent samples t-test looked at PPG First 38- Between (M = 1.563, SD = .437, n = 37) and PPG First 38- Within (M = 1.354, SD = .264, n = 25). Results of this t-test indicated there was a significant difference between performance levels of PPG First 38- Between and PPG First 38- Within, $t(60) = 2.148$, $p = .036$. This indicates that between-season coaching changes had higher levels of performance after the first 38 games than teams with within-season coaching changes.

Pairwise samples t-tests were conducted in order to look at the two coaching change types individually. The first t-test looked at PPG Pre Change- Between (M = 1.424, SD = .342, n = 37) and PPG First 38- Between (M = 1.563, SD = .437, n = 37). Results of this paired samples t-test indicated that there was a significant difference between performance levels of PPG Pre Change- Between and PPG First 38- Between, $t(36) = -2.776$, $p = .009$. This indicates that the increase in performance during the first 38 games following a between-season coaching change is significant.

The second t-test looked at PPG Pre Change- Within (M = 0.999, SD = .304, n = 25) and PPG First 38- Within (M = 1.354, SD = .264, n = 25). Results of this paired samples t-test indicated that there was a significant difference between performance levels of PPG Pre Change- Within and PPG First 38- Within, $t(24) = -6.225$, $p < .001$. This indicates that the increase in performance during the first 38 games following a within-season coaching change is significant.

Examination of the cell means reveals the nature of the significant interaction identified in the initial 2x2 ANOVA. Although performance improved following both a within- and between-season coaching change, the magnitude of the change was more than twice as large following a within-season coaching change.

Analysis 4

In Analysis 4, a 2x2 Mixed ANOVA was conducted in order to analyze changes in team performance by coaching type (within-season, between-season) over time (the period of time before the coaching change occurred, and the first full season where the new coach was in charge). This analysis, albeit similar, is different from Analysis 3 in that it looks at the first full season of the new coach's tenure as opposed to their first 38 games in charge. It is important to note that in this analysis, a between-season coach's first 38 games (analysis 3) and their first full season in charge (current analysis) is the same thing. However, for a within-season coach, their first full season in charge does not include the partial season they completed when they were initially hired. Rather, it looks at the performance of their first season they coached from the beginning of the season (August) to the end (May): their first full season in charge. Differences in performance were directly compared by coaching change type to determine if one resulted in a higher level of performance than the other.

The results of the 2x2 Mixed ANOVA showed there was a significant time effect ($F(1, 55) = 29.211$, $p < .001$), indicating that performance levels were impacted by the timing of the change (performance was higher after the coaching change). Additionally, results showed a significant change type effect ($F(1, 55) = 15.130$, $p < .001$), indicating that across both time periods (pre-change and post-change), teams with between-season

coaching change performed at a higher level than teams with within-season coaching changes. Results also indicated there was a significant interaction effect ($F(1, 55) = 4.524$, $p = .038$), indicating that the main effects of time depends on what type of coaching change was made (within-season or between-season). A series of t-tests was conducted to further examine these effects.

Independent samples t-tests were conducted to determine if, prior to the coaching change, the differences in performance levels between coaching change types were significant. The first t-test looked at PPG Pre Change- Between ($M = 1.424$, $SD = .342$, $n = 37$) and PPG Pre Change- Within ($M = 0.984$, $SD = .295$, $n = 20$). Results of this t-test indicated that there was a significant difference between performance levels of PPG Pre Change- Within and PPG Pre Change- Between, $t(55) = 4.854$, $p < .001$. This indicates that teams with between-season coaching changes were performing at a significantly higher level than teams with within-season coaching changes before the coaching changes occurred.

The second independent samples t-test looked at PPG First Full Season- Between ($M = 1.563$, $SD = .437$, $n = 37$) and PPG First Full Season- Within ($M = 1.304$, $SD = .271$, $n = 20$). Results of this t-test indicated there was a significant difference between performance levels of PPG First Full Season- Between and PPG First Full Season- Within, $t(55) = 2.412$, $p = .019$. This indicates that between-season coaching changes had higher levels of performance at the completion of their first full season than teams with within-season coaching changes.

Pairwise samples t-tests were conducted in order to look at the two coaching change types individually. The first t-test looked at PPG Pre Change- Between ($M =$

1.424, *SD* = .342, *n* = 37) and PPG First Full Season- Between (*M* = 1.563, *SD* = .437, *n* = 37). Results of this paired samples t-test indicated that there was a significant difference between performance levels of PPG Pre Change- Between and PPG First Full Season- Between, $t(36) = -2.776$, $p = .009$. This indicates that the increase in performance during the first full season following a between-season coaching change is significant.

The second t-test looked at PPG Pre Change- Within (*M* = 0.983, *SD* = .295, *n* = 20) and PPG First Full Season- Within (*M* = 1.304, *SD* = .271, *n* = 20). Results of this paired samples t-test indicated that there was a significant difference between performance levels of PPG Pre Change- Within and PPG First Full Season- Within, $t(19) = -4.646$, $p < .001$. This indicates that the increase in performance during the first full season following a within-season coaching change is significant.

Comparison of the cell means explains the significant interaction identified by the initial 2x2 ANOVA. Although performance improved following both types of coaching changes (between-season and within-season), the magnitude was more than twice as large following a within-season coaching change.

Analysis 5

In Analysis 5, a 3x2 Mixed ANOVA was conducted in order to analyze changes in performance by coaching change type (between-season, within-season) over time (PPG 1st 19 games, PPG 2nd 19 games, PPG 3rd 19 games). This analysis allows performance levels to be analyzed over three 19-game, or half-season, chunks. In other words, instead of having a single average performance value that represents a coach's first 57 games in charge (equivalent to their first season-and-a-half in charge), there are three performance values representing this period of time. This allows performance to be

analyzed more closely in order to identify potential trends in performance. Descriptive statistics are listed in **Table 1.**

The results of the 3x2 Mixed ANOVA showed there was not a significant time effect ($F(2, 35) = 2.340$, $p = .111$), which indicates that post-change performance levels were not impacted by time since the coaching change. Additionally, a significant change type effect was identified ($F(1, 36) = 4.906$, $p = .033$), indicating that teams with between-season coaching changes tended to outperform teams with within-season coaching changes across all three time periods analyzed. Results also showed there was no significant interaction effect ($F(2, 35) = 0.702$, $p = .502$), indicating that the main effects of coaching change time was consistent across the three post-change time periods. These results suggest that although there were differences in post-change performance between teams with between-season and teams with within-season coaching changes, the changes did not significantly vary across time.

Table 1

Analysis 5: Descriptive Statistics

Period of Time	Between-Season (n = 26)		Within-Season (n = 12)	
	M	*SD*	*M*	*SD*
PPG 1st 19 Games	1.597	.489	1.211	.304
PPG 2nd 19 Games	1.690	.451	1.329	.344
PPG 3rd 19 Games	1.597	.617	1.386	.291

DISCUSSION

The aforementioned literature was generally split on the notion that coaching changes had an effect on performance levels in sports teams. As Scelles and Llorca (2020) indicated, there was a near-perfect split in existing research debating how coaching changes impacted team performance (no impact, positive impact, negative impact). Additionally, change literature suggests that performance typically decreases following a change before improving (Elrod & Tippett, 2001). Finally, some research supported the existence of a shock effect where performance immediately, albeit temporarily, increased following a coaching change (Koning, 2003).

In the current study, the results generally supported the stance that coaching changes have a significant positive impact on performance regardless of coaching change type (between-season, within-season). Results from analysis 1a show that within-season coaching changes clearly led to a significant positive change in performance for the remainder of the season. In fact, results from analyses 1a, 3, and 4 all show that following a within-season coaching change, there is a significant positive change in performance. Analysis 1b on the other hand was more difficult to interpret. This primarily stems from the fact that there were only 11 coaches (with appropriate control group teams) that remained in-charge of a team for the entirety of the following season. Another interesting finding was that the interaction effect was not significant. However, follow up t-tests showed that there was a significant positive change in performance following a within-season coaching change for the respective coach's first full season. This finding, in tandem with analyses 1a, 3, and 4, suggests that within-season coaching changes do lead

to improved performance in both the immediate season (the rest of the coach's initial season when hired) and their next full season in charge.

For between-season coaching changes, results from analyses 3 and 4 indicated that following this type of coaching change, significant positive changes in performance occurred. It should be noted that these analyses looked at the first 38 games of a new coach's reign and their first full season in charge. For a between-season coaching change, these two periods of time are the exact same, which would make sense that both analyses showed the same results.

Conversely, Results from analysis 2 indicated that between-season coaching changes did *not* significantly impact performance $t(27) = -1.927$, $p = .065$. What is most interesting about this finding is that when nearly the same dataset was analyzed in analysis 3, a significant positive change in performance *was* calculated for between-season coaching changes, $t(36) = -2.776$, $p = .009$. One possible explanation for this could be that analysis 3 had nine extra coaches included in the analysis which altered the data and increased the degrees of freedom. In analysis 2, the nine between-season coaching changes were omitted as there was no control team in which to match them with.

These results echo findings from the Pierce et al. (2017) study where new basketball coaches were hired and an increase in performance was observed. More specifically, this research supports the common sense theory (Pierce et al., 2017); when a team is performing poorly, dismissing (and replacing) the head coach will result in an improvement in team performance. With regard to the first two research questions, the

average result following a within- and between-season coaching change was significantly positive.

The third and fourth research questions that guided this study revolved around determining which (if either) coaching change type resulted in a larger or more significant impact on team performance in the short-term, and over time. Analyses 3, 4, and 5 were conducted in order to answer these questions. Analyses 3 and 4 both resulted in very similar findings. This is primarily due to the fact that, as mentioned before, a between-season coach's first 38 games and their first full season in charge are the same thing. Thus, the main difference between the two analyses was the period of time examined for within-season coaching changes. In both analysis 3 and analysis 4, results showed that between-season coaching changes performed at a higher level than within-season coaching changes. More specifically, teams with between-season coaching changes were performing at a higher level both before the coaching change occurred, and after. However, in both analyses, there was a larger increase in performance following a coaching change for within-season coaching changes than between-season coaching changes. This muddles the interpretation of these results as it is not entirely clear whether the data suggests within-season coaching changes are better, or if there was simply more room for improvement since their pre-change performance levels were lower.

Finally, analysis 5 focused on the new coach's first three 19-game (half-season) periods of time individually to identify potential trends in performance. Results from this analysis showed that there were no significant changes in performance between the 19-game periods for either coaching change type. Thus, performance tends to be relatively consistent for both coaching change types over their first 57 games in charge.

Although the findings of analysis 5 were not significant, they are important to the discussion of the shock effect theory. As a reminder, this theory suggests that there is an immediate, but temporary, increase in performance following a coaching change. The data from the current study does not support the shock effect. To clarify, results from analyses 1a and 3 *do show* there was an immediate and significant positive change in performance following within-season coaching changes. However, the reason the shock effect theory is not supported is that performance levels did not appear to significantly decrease or return to pre-change levels for at least 57 games (one-and-a-half-seasons) following a coaching change. This can be seen more clearly in analysis 5. Results from this analysis show that after a new coach's first 19 games in charge, performance tends to stay at that level for the next 38 games (57 games total). There were no significant differences between the first, second, and third set of 19 games of a new coach's tenure. In other words, in the aforementioned analyses, performance *increased* following a within-season coaching change, but did not *decrease*. Similar results can also be seen for a between-season coaching change, although the shock effect focuses more on within-season coaching changes.

This finding, where performance increases and is maintained over time, aligns closely with the study on TMT by Boyne et al. (2011). The results of this study showed that top management turnover tended to result in a significant increase in performance when employee performance was low (before the change occurred). In the Premier League, coaches are typically fired when performance is low and then a new coach is hired. Further still, Boyne and their colleagues did not report a decrease in performance following the changes. This trend can be seen in the results of the current study where

both teams with within-season and between-season coaching changes were performing poorly, experienced a coaching change, and then performed at a sustained and significantly higher level. These findings, as mentioned before, are consistent with the common sense theory (i.e., performance can be expected to increase following the dismissal, and replacement, of a head coach).

There is also another interesting implication that can be drawn from analysis 5. From this data, it can be concluded that, on average, a new coach's first 19 games is representative of their next 38 games. This may be extremely useful information to a board of directors or team officials in determining whether or not to remove a coach. For example, if during the new coach's first 19 games they underperform, this may be an indicator that the team will continue to underperform under the new coach. Having access to this information may save the team time and money in the long-term.

Finally, from this research it can be concluded that coaching changes tend to have a significant positive impact on team performance in the English Premier League. This information may be important for teams that are underperforming and are considering how to improve their team's performance levels. Further still, both between-season and within-season coaching changes tended to result in significant positive changes in performance. This finding implies that other contextual factors (e.g., games left in season, place in league table) may be more important in determining whether to engage in a between-season or within-season coaching change (as opposed to one being better than the other). Most importantly however, this study contributes to the existing discussion on how coaching changes affect team performance and offers direction and clarity in making coaching changes in sports.

Limitations

There are several limitations to this study that need to be addressed. First, there is the small sample size (n = 11) for analysis 1b. In this analysis, there were only 11 coaches that fit the within-season coaching change criteria that remained at the club for at least 57 games (one-and-a-half seasons) and had an appropriate control group. Elsewhere, there were also relatively small sample sizes (e.g., analyses 4 and 5). Archival data were used for this study so it was not possible to increase the sample size within the confines of this study. Although this results in a lower statistical power, the results still act as an indicator of where future research could be conducted.

The second limitation to this study is that the matching of control (no change) and change teams was not fully successful. Although a yoked control team was selected for each team included in analyses 1a, 1b, and 2, the performance levels between the pair was not perfectly matched. More specifically, control teams tended to perform at a higher level than change teams. This makes sense in the larger context of the sport because if a team is performing well, there is no reason to change the coach. That being said, for the sake of the study, regression to the mean was not fully addressed and may still be a confounding factor in these results.

The third notable limitation is the stark contrast in financial resources available to each club. Put simply, generally the richer a club is, the better they are. This can be seen in clubs such as Arsenal, Chelsea, Liverpool Manchester City, Manchester United, and Tottenham (Big 6). These six teams have been in the English Premier League (avoiding relegation to a lower league) for the past 20 years. These are six of the wealthier clubs in the world, and as such tend to bring in better players, better coaches, wealthier investors,

and larger quantities of fans. A more specific case of this occurring is in the club Manchester City. In the 2001/2002 season, Manchester City was a smaller club in England's second professional league (comparable to "minor leagues" in the United States). The club was purchased by a wealthy family from the Middle East in 2008 with a net worth of more than $1 trillion. Over the next decade or so, more than $2 billion were poured into Manchester City making them a titan in the soccer community and now one of the most successful teams in the modern soccer era (https://www.bbc.com/sport/football/45372362). This limitation means smaller clubs with less money to buy experienced coaches/players, will have a more difficult time competing with these giants. This then makes it difficult to determine if the teams' performance levels are due to coaching or other variables (i.e., wealth).

Building off this point, it is also important to note that some teams do not have the luxury of deciding whether or not to engage in a within-season or between-season coaching change. The results showed that typically the lower-ranked (poorer performing) teams engaged in within-season coaching changes. This is due to the fact that in order to avoid relegation, they are forced to make a change sooner rather than later at the risk of losing millions of dollars in revenue (among other consequences). On the other hand, higher-performing teams can wait until a season has concluded to change their coach (i.e., between-season coaching change) because there are not as serious consequences of average/high levels of performance. Due to this distinction, it may be beneficial for future research to incorporate the financial health of teams in their decision to make coaching changes.

A fourth limitation to this study is that there is a broader context to what "good team performance" means to wealthier and poorer clubs. To a wealthy club like Manchester City, a good season is winning the league. To a smaller club like Brighton Hove Albion, a good season is simply surviving relegation (not being demoted to a lower-level league). It may make sense from a research standpoint to quantify team performance in the sense of points acquired per game, but to each team good performance is different. For example, if Brighton were to record one loss and two ties against better opposition, this might be viewed as a positive. However, a loss and two ties against those same teams would not be a great result for Manchester City. This limitation means that although patterns in team performance may be found in the data sampled, that level of performance may have a different meaning to each club. Future research may find it beneficial to make the distinction between Big 6 and non-Big 6 teams in order to further dissect the data and determine how coaching changes impact teams in both groups. Despite this limitation, this study offers insight into the effects of within-season and between-season coaching changes and encourage teams to consider the best ways of improving team performance.

A final limitation to this study is the timing of the transfer window in respect to the timing of the coaching changes (within or between). In the English Premier League, players are only allowed to be bought and sold at two points in the year (the winter transfer window, and the summer transfer window). The winter transfer window typically involves transfers of players of a lower caliber due to a lack of funds, a shorter timeline, and the average player's desire to finish out a season rather than be transferred in the middle of one. When comparing a within-season coaching change to a between-

season coaching change, a within-season coaching change may not occur before or during a transfer window. This means that when the coach comes into the team, they are "stuck" with the players they have. However, a between-season coach is almost always hired while the summer transfer window is open and has immediate access to transfer funds and a catalog of higher-caliber players. This difference in timing with regard to the transfer windows is important because it may skew the data or account for some variance in differences between between-season coach and within-season coach performance levels.

Conclusion

The most notable finding from this study is that performance tends to increase following coaching changes regardless of when the coaching change occurs. This finding contributes to the broader discussion on how coaching changes impact team performance and may even offer insight on how changing leadership in other organizations may affect performance. Another key finding is that the observed improvements in performance do not seem to be a temporary occurrence (i.e., not a bounce). This is important information for teams looking to improve team performance but are not sure at which level to address (e.g., personnel, staff, facilities, etc.). Finally, there is evidence that within-season coaching changes may result in larger increases in performance, although this evidence should be examined further.

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APPENDICES

APPENDIX A: DATA FOR ANALYSIS 1A

Change Team	Control Team	Change PPG Pre	Change PPG Post	Control PPG Pre	Control PPG Post
Leicester City	Newcastle	1.25	1.70	1.11	1.40
Manchester United	Liverpool	1.53	1.90	2.65	2.48
Southampton	Brighton	0.60	1.30	1.40	0.65
Watford	Burnley	1.08	1.07	1.42	1.43
Everton	Manchester United	1.07	1.42	2.29	2.04
West Ham	Bournemouth	0.82	1.22	0.91	1.22
Leicester	Arsenal	0.84	1.77	2.00	1.92
Crystal Palace	West Brom	0.88	1.24	1.35	1.05
Hull City	Burnley	0.65	1.17	1.15	0.94
Swansea City	Stoke City	1.12	1.46	1.32	1.38
Chelsea	Manchester City	1.06	1.52	1.88	1.62
Queens Park Rangers	Burnley	0.83	0.73	0.87	0.87
Crystal Palace	Stoke City	0.85	1.72	1.30	1.56
West Brom	Hull City	0.90	1.44	0.95	0.84
Swansea City	West Ham	1.00	1.29	0.92	1.29
Cardiff City	Hull City	0.90	0.67	1.15	0.78
Tottenham	Arsenal	1.69	1.91	2.19	2.00
Southampton	West Ham	1.00	1.19	1.14	1.31
Chelsea	Newcastle	2.00	1.96	1.17	1.04
Chelsea	Manchester City	1.70	1.64	2.44	2.09
Wolverhampton	Wigan Athletic	0.84	0.31	0.76	1.85
Queens Park Rangers	Norwhich City	0.85	1.11	1.25	1.22
Sunderland	Newcastle	0.79	1.42	1.86	1.63
West Brom	Blackpool	1.04	1.62	1.28	0.85
Liverpool	Everton	1.25	1.83	1.10	1.78
Blackburn	Stoke City	1.24	1.05	1.24	1.19
Burnley	Birmingham City	0.43	1.80	1.54	0.70
Bolton	Stoke City	1.00	1.05	1.17	1.30
Manchester City	Tottenham	1.71	1.81	1.76	1.90
Chelsea	Manchester United	1.96	2.62	2.36	2.38
Blackburn	Aston Villa	0.76	1.33	1.82	1.48
Newcastle United	Middlesbrough	1.18	1.06	0.95	1.31
Bolton	Everton	0.50	1.14	1.20	1.89
Tottenham	Arsenal	0.70	1.39	2.60	2.04
West Ham	Everton	0.82	1.29	1.41	1.62
Sunderland	Wigan Athletic	0.36	0.50	1.43	1.10
Newcastle	Fullham	1.13	2.13	1.13	1.47
Portsmouth	Blackburn	0.67	1.22	1.20	1.96
Southampton	Middlesbrough	0.75	0.91	1.75	1.23
West Brom	Norwhich City	0.75	0.96	0.67	0.96
Southampton	Manchester City	1.23	1.25	1.04	1.17
Leeds	Birmingham	0.67	0.96	1.67	1.15
Aston Villa	Charlton Athletic	1.48	1.00	1.32	0.85
Southampton	Newcastle	1.00	1.25	1.70	1.93
Bradford	Derby County	0.50	0.79	0.71	1.33

APPENDIX B: DATA FOR ANALYSIS 1B

Change Team	Control Team	Change PPG Pre	Change PPG Post	Control PPG Pre	Control PPG Post
Watford	Burnley	1.08	1.32	1.42	1.05
Crystal Palace	Stoke City	0.85	1.11	1.30	1.34
Swansea City	West Ham	1.00	1.47	0.92	1.24
Liverpool	Everton	1.25	1.37	1.10	1.47
Blackburn	Stoke City	1.24	0.82	1.24	1.18
Manchester City	Tottenham	1.71	1.87	1.76	1.63
Blackburn	Aston Villa	0.76	1.32	1.82	1.68
Bolton	Everton	0.50	1.08	1.20	1.66
Portsmouth	Blackburn	0.67	1.42	1.20	1.37
Tottenham	Middlesbrough	1.08	1.71	1.58	1.18
Aston Villa	Charlton Athletic	1.48	1.18	1.32	1.29

APPENDIX C: DATA FOR ANALYSIS 2

Change Team	Control Team	Change PPG Pre	Change PPG Post	Control PPG Pre	Control PPG Post
Chelsea	Tottenham	1.84	1.89	2.03	1.87
Arsenal	Liverpool	1.66	1.84	1.97	2.55
West Ham	Bournemouth	1.11	1.37	1.16	1.18
Everton	Burnley	1.29	1.42	1.42	1.05
Sunderland	Bournemouth	1.03	0.63	1.11	1.21
Watford	West Brom	1.18	1.05	1.13	1.18
Southampton	West Ham	1.66	1.21	1.63	1.18
Manchester City	Tottenham	1.74	2.05	1.84	2.26
Chelsea	Stoke City	1.32	2.45	1.34	1.16
Southampton	Stoke City	1.47	1.58	1.42	1.42
Tottenham	Everton	1.82	1.68	1.89	1.24
Chelsea	Arsenal	1.97	2.16	1.92	2.08
Everton	Liverpool	1.66	1.89	1.61	2.21
Stoke City	Aston Villa	1.11	1.32	1.08	1.00
Tottenham	Newcastle	1.82	1.89	1.71	1.08
Liverpool	Everton	1.37	1.61	1.47	1.66
West Brom	Fullham	1.24	1.29	1.37	1.13
Norwhich	Stoke City	1.24	1.16	1.21	1.11
Aston Villa	Wigan Athletic	1.00	1.08	1.13	0.95
Aston Villa	Everton	1.26	1.00	1.42	1.47
Fullham	Stoke City	1.21	1.29	1.24	1.21
Chelsea	Liverpool	2.18	2.26	2.26	1.66
Manchester City	Middlesbrough	1.11	1.45	1.21	1.11
Aston Villa	Manchester City	1.11	1.32	1.13	1.11
Chelsea	Arsenal	2.08	2.50	2.37	2.18
Liverpool	Manchester United	1.58	1.53	1.97	2.03
Aston Villa	Bolton	1.18	1.47	1.16	1.39
Leicester City	Sunderland	1.45	1.26	1.53	1.50

APPENDIX D: DATA FOR ANALYSIS 3

Change Type	Coach Name	Club Coached	PPG Pre Change	PPG First 38
1	Maurizio Sarri	Chelsea	1.84	1.89
1	Unai Emery	Arsenal	1.66	1.84
1	Manuel Pellegrini	West Ham	1.11	1.37
1	Marco Silva	Everton	1.29	1.42
1	David Moyes	Sunderland	1.03	0.63
1	Walter Mazzarri	Watford	1.18	1.05
1	Claude Puel	Southampton	1.66	1.21
1	Ronald Koeman	Everton	1.24	1.61
1	Jose Mourinho	Manchester United	1.74	1.82
1	Pep Guardiola	Manchester City	1.74	2.05
1	Antonio Conte	Chelsea	1.32	2.45
1	Claudio Ranieri	Leicester City	1.08	2.13
1	Ronald Koeman	Southampton	1.47	1.58
1	Mauricio Pochettino	Tottenham	1.82	1.68
1	Louis van Gaal	Manchester United	1.68	1.84
1	Jose Mourinho	Chelsea	1.97	2.16
1	Manuel Pellegrini	Manchester City	2.05	2.26
1	Mark Hughes	Stoke City	1.11	1.32
1	Andre Villas-Boas	Tottenham	1.82	1.89
1	Brendan Rodgers	Liverpool	1.37	1.61
1	Steve Clarke	West Brom	1.24	1.29
1	Chris Hughton	Norwhich	1.24	1.16
1	Paul Lambert	Aston Villa	1.00	1.08
1	Alex McLeish	Aston Villa	1.26	1.00
1	Martin Jol	Fullham	1.29	1.37
1	Mark Hughes	Fullham	1.21	1.29
1	Steve Bruce	Sunderland	0.95	1.16
1	Carlo Ancelotti	Chelsea	2.18	2.26
1	Mark Hughes	Manchester City	1.45	1.32
1	Sven-Goran Eriksson	Manchester City	1.11	1.45
1	Martion Oneill	Aston Villa	1.11	1.32
1	Jose Mourinho	Chelsea	2.08	2.50
1	Rafael Benitez	Liverpool	1.58	1.53
1	David O'Leary	Aston Villa	1.18	1.47

1	Glenn Roeder	West Ham	1.11	1.39
1	Steve McClaren	Middlesborough	1.11	1.18
1	Peter Taylor	Leicester City	1.45	1.26
2	Brendan Rodgers	Leicester City	1.25	1.76
2	Ole Gunnar Solskjaer	Manchester United	1.53	1.71
2	Ralph Hasenhuttl	Southampton	0.60	1.18
2	Javi Gracia	Watford	1.08	1.26
2	Alan Pardew	Crystal Palace	0.85	1.63
2	Tony Pulis	West Brom	0.90	1.37
2	Garry Monk	Swansea City	1.00	1.37
2	Mauricio Pochettino	Southampton	1.00	1.32
2	Martin O'Neill	Sunderland	0.79	1.24
2	Roy Hodgson	West Brom	1.04	1.32
2	Steve Kean	Blackburn	1.24	0.84
2	Alan Pardew	Newcastle	1.19	1.42
2	Owen Coyle	Bolton	1.00	1.24
2	Sam Allardyce	Blackburn	0.76	1.24
2	Roy Hodgson	Fullham	0.74	1.26
2	Steve Bruce	Wigan	0.62	1.18
2	Gary Megson	Bolton	0.50	1.05
2	Alan Curbishley	West Ham	0.82	1.37
2	Glenn Roeder	Newcastle	1.13	1.61
2	Harry Redknapp	Portsmouth	0.67	1.37
2	Bryan Robson	West Brom	0.75	0.87
2	Martin Jol	Tottenham	1.08	1.55
2	Graham Taylor	Aston Villa	1.48	1.08
2	Kenny Dalglish	Liverpool	1.25	1.76
2	Roberto Mancini	Manchester City	1.71	1.84

APPENDIX E: DATA FOR ANALYSIS 4

Change Type	Coach Name	Club Coached	PPG Pre Change	PPG First Full Season
1	Maurizio Sarri	Chelsea	1.84	1.89
1	Unai Emery	Arsenal	1.66	1.84
1	Manuel Pellegrini	West Ham	1.11	1.37
1	Marco Silva	Everton	1.29	1.42
1	David Moyes	Sunderland	1.03	0.63
1	Walter Mazzarri	Watford	1.18	1.05
1	Claude Puel	Southampton	1.66	1.21
1	Ronald Koeman	Everton	1.24	1.61
1	Jose Mourinho	Manchester United	1.74	1.82
1	Pep Guardiola	Manchester City	1.74	2.05
1	Antonio Conte	Chelsea	1.32	2.45
1	Claudio Ranieri	Leicester City	1.08	2.13
1	Ronald Koeman	Southampton	1.47	1.58
1	Mauricio Pochettino	Tottenham	1.82	1.68
1	Louis van Gaal	Manchester United	1.68	1.84
1	Jose Mourinho	Chelsea	1.97	2.16
1	Manuel Pellegrini	Manchester City	2.05	2.26
1	Mark Hughes	Stoke City	1.11	1.32
1	Andre Villas-Boas	Tottenham	1.82	1.89
1	Brendan Rodgers	Liverpool	1.37	1.61
1	Steve Clarke	West Brom	1.24	1.29
1	Chris Hughton	Norwhich	1.24	1.16
1	Paul Lambert	Aston Villa	1.00	1.08
1	Alex McLeish	Aston Villa	1.26	1.00
1	Martin Jol	Fullham	1.29	1.37
1	Mark Hughes	Fullham	1.21	1.29
1	Steve Bruce	Sunderland	0.95	1.16
1	Carlo Ancelotti	Chelsea	2.18	2.26

1	Mark Hughes	Manchester City	1.45	1.32
1	Sven-Goran Eriksson	Manchester City	1.11	1.45
1	Martion Oneill	Aston Villa	1.11	1.32
1	Jose Mourinho	Chelsea	2.08	2.50
1	Rafael Benitez	Liverpool	1.58	1.53
1	David O'Leary	Aston Villa	1.18	1.47
1	Glenn Roeder	West Ham	1.11	1.39
1	Steve McClaren	Middlesborough	1.11	1.18
1	Peter Taylor	Leicester City	1.45	1.26
2	Javi Gracia	Watford	1.08	1.32
2	Alan Pardew	Crystal Palace	0.85	1.11
2	Tony Pulis	West Brom	0.90	1.13
2	Garry Monk	Swansea City	1.00	1.47
2	Mauricio Pochettino	Southampton	1.00	1.47
2	Roy Hodgson	West Brom	1.04	1.24
2	Kenny Dalglish	Liverpool	1.25	1.37
2	Steve Kean	Blackburn	1.24	0.82
2	Alan Pardew	Newcastle	1.19	1.71
2	Owen Coyle	Bolton	1.00	1.21
2	Roberto Mancini	Manchester City	1.71	1.87
2	Sam Allardyce	Blackburn	0.76	1.32
2	Roy Hodgson	Fullham	0.74	1.39
2	Steve Bruce	Wigan	0.62	1.18
2	Gary Megson	Bolton	0.50	1.08
2	Alan Curbishley	West Ham	0.82	1.29
2	Harry Redknapp	Portsmouth	0.67	1.42
2	Bryan Robson	West Brom	0.75	0.79
2	Martin Jol	Tottenham	1.08	1.71
2	Graham Taylor	Aston Villa	1.48	1.18

APPENDIX F: DATA FOR ANALYSIS 5

Change Type	Coach Name	Club Coached	PPG 1st 19	PPG 2nd 19	PPG 3rd 19
1	Manuel Pellegrini	West Ham	1.42	1.32	1.00
1	Jose Mourinho	Manchester United	1.89	1.74	2.21
1	Pep Guardiola	Manchester City	2.05	2.05	2.89
1	Antonio Conte	Chelsea	2.58	2.32	2.05
1	Claudio Ranieri	Leicester City	2.05	2.21	0.95
1	Ronald Koeman	Southampton	1.74	1.42	1.26
1	Mauricio Pochettino	Tottenham	1.63	1.74	2.32
1	Jose Mourinho	Chelsea	2.11	2.21	2.47
1	Louis van Gaal	Manchester United	1.89	1.79	1.58
1	Manuel Pellegrini	Manchester City	2.16	2.37	2.26
1	Roberto Martinez	Everton	1.95	1.84	1.11
1	Mark Hughes	Stoke City	1.11	1.53	1.32
1	Brendan Rodgers	Liverpool	1.32	1.89	1.89
1	Chris Hughton	Norwhich	1.32	1.00	1.00
1	Paul Lambert	Aston Villa	0.95	1.21	1.05
1	Martin Jol	Fullham	1.05	1.68	1.11
1	Carlo Ancelotti	Chelsea	2.21	2.32	1.79
1	Steve Bruce	Sunderland	1.16	1.16	1.42
1	Roberto Martinez	Wigan Athletic	1.00	0.89	1.05
1	Martion Oneill	Aston Villa	1.32	1.32	1.58
1	Garreth Southgate	Middlesbrough	1.05	1.37	0.89
1	Jose Mourinho	Chelsea	2.42	2.58	2.74
1	Rafael Benitez	Liverpool	1.63	1.42	2.16
1	David O'Leary	Aston Villa	1.26	1.68	1.32
1	Glenn Roeder	West Ham	1.26	1.53	0.74
1	Steve McClaren	Middlesborough	1.00	1.37	1.37
2	Steve Kean	Blackburn	0.95	0.74	1.11
2	Alan Pardew	Newcastle	1.16	1.68	1.84
2	Owen Coyle	Bolton	0.95	1.53	1.05
2	Roberto Mancini	Manchester City	1.95	1.74	1.74
2	Sam Allardyce	Blackburn	1.42	1.05	1.32
2	Roy Hodgson	Fullham	1.16	1.37	1.42
2	Steve Bruce	Wigan	1.21	1.16	1.47
2	Gary Megson	Bolton	0.95	1.16	1.32
2	Alan Curbishley	West Ham	1.11	1.63	1.21
2	Harry Redknapp	Portsmouth	1.16	1.58	1.32
2	Bryan Robson	West Brom	0.95	0.79	1.00
2	Martin Jol	Tottenham	1.58	1.53	1.84