

Impact of elite soccer coaching change on team performance according to coach- and club-related variables

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ABSTRACT: A coaching change is an extreme, but frequently occurring phenomenon in elite soccer with its impact on team success debatable. The aim of the current study was twofold: (i) to compare team's performance when coached by new and old coaches; and (ii) to investigate the impact of a coaching change on team's performance according to coach- and club-related factors. All in-season coaching changes from the 2010–11 to 2017–18 seasons within the Spanish, French, English, German and Italian professional leagues were examined. Team performance was assessed as points awarded from match outcome over 1–20 matches prior to and following the coaching change. Four independent variables (coach's *experience*, team's *budget*, whether the coach had been an elite *former player* or not, and whether the coach was a *novice* or not) were included into linear regression modelling. The main results showed that team's short-term performance was improved significantly with a change to a new coach with this impact declining in the longer term (> 10 matches). Specifically, the number of points (1.15–1.32 vs. 0.37–1.03, $p < 0.05$) and the moving average of points (1.19–1.31 vs. 0.37–1.04, $p < 0.05$) awarded per match were significantly greater after the coaching change. Further, the winning effect due to the new coach was independent of coach-related factors such as coaching experience or the new coach being a former elite player. A critical organisational decision to change coaches may provide an essential stimulus for future team success in elite soccer.

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INTRODUCTION

Professional soccer coaches play a key role in leading and managing teams at the individual and club levels [1]. However, professional coaches are required to deal with several issues that may affect the team's performance over the season such as player injuries, congested match fixtures, player recruitment, daily practice, media or the unpredictability of environmental-related factors during soccer matches [2]. At the elite level, the assessment of a coach's ability in soccer is mainly based on win-loss records within national and international competitions with poor success leading to a coaching change at any stage of the season (e.g. starting, mid-season, or final rounds) [2–3]. Therefore, coaching staff experience significant pressure in their role due to the multifactorial nature of team's performances including match outcomes and competition ranking (via accumulated points) during the season [4]. These factors directly impact the coach and team with those coaches not meeting organisational expectations fired, even during the season [5]. However, such a change in coach may have a negative influence on team's performance [4, 6] that questions its appropriateness during a season.

To date, several theories have been proposed to substantiate the effect of a coaching change [7–8]. Firstly, the common-sense theory proposed that a coaching change would disrupt the current negative trend with improvements in subsequent performances via invigorated players and fan base [8]. Secondly, the vicious-circle theory proposed that a coaching change would affect the internal club/team relationships and improve subsequent declining performance [8]. Next, the ritual scapegoat theory proposed that firing a coach would decrease stakeholders' frustration with the team's poor performance and subsequent performances perceived to be better [8]. In addition, the slump ending effect [7] has been clearly observed for improved team performance using a natural trend (i.e. regression to the mean) after the coach was replaced [9–12].

While these theories have been proposed for the improvement following the replacement of a coach, others have failed to identify better performances after the replacement [13] with some even reporting that teams performed worse [14]. To date, a few studies have specifically examined the impact of a coach replacement on team

performance [5, 15]. Lago-Peñas [5] reported that coach turnover had a short-term effect followed by a continued decreased performance over the subsequent 10, 15 and 20 matches during the 1997–98 to 2006–2007 seasons of the Spanish professional soccer league.

Kattuman *et al.* [15] followed the performance of a single team (European professional soccer) across two coaches (i.e. old and new coach). These authors reported a significant and short-term improvement in goal difference per match, and positive result after the coaching change, but no change thereafter in the trajectory of the team's ranking within the league [15]. Additionally, these authors reported positive changes in management/teams behaviour and team's affective tone following the new coach's start [15]. Interestingly, despite this positive behavioural effect, match tactics (e.g. passing network and accuracy) and players' movement (e.g. distance run and sprinted) during matches were unchanged after the coaching change [15].

Collectively, these recent studies have shown positive and negative effects with a coaching change with relevant variables possibly not considered that may have masked or affected the analyses. In particular, the influence of coach-related (i.e. coach's coaching and former playing experience) [2], and club-related factors (i.e., financial budget) has not been examined in regards to team's performances (points won) during short, mid and long-term periods (e.g. 1 to 20 competition rounds) following a coaching change. Therefore, the aim of the current study was twofold: (i) to compare team's performance when coached by new and old coaches; and (ii) to investigate the impact of a coaching change on team's performance according to coach- and club-related factors over 20 matches. It was hypothesised that a coaching replacement would have a short-term impact on team's performance with this decreasing as the season progressed.

MATERIALS AND METHODS

Sample

All mid-season coaching changes ($n = 411$) from the 2010–11 season to the 2017–18 season in the Spanish La Liga ($n = 85$), French Ligue 1 ($n = 51$), English Premier League ($n = 79$), German Bundesliga ($n = 82$) and Italian Serie A ($n = 109$) were collected. These leagues represented the five major European Championships and consisted of 18 (Bundesliga) or 20 teams (English FA Premier League, Ligue 1, La Liga and Serie A) that played 34 or 38 matches, respectively, each season. All teams played a balanced home and away schedule. Each coaching change was considered as a single case with at least one match with each coach (i.e. old and new coach). The coaching changes that involved less than 20 matches were less than 5% of total cases ($n = 17$) (i.e. Spanish La Liga $n = 7$, French Ligue 1 $n = 0$, English Premier League $n = 3$, German Bundesliga $n = 4$, and Italian Serie A $n = 3$) and were analysed accordingly (see below) without biasing the model. In addition, only $n = 8$ cases involved the same club during the same season (i.e. Spanish La Liga $n = 1$, French Ligue 1 $n = 1$, English Premier League $n = 1$, German Bundesliga $n = 2$, and Italian Serie A $n = 3$). The number of points awarded to teams in matches prior to and following

a coaching change were obtained from different public, open access databases. The annual budget of the clubs was collected by consulting the Deloitte and Touche Annual Reports (<http://www.deloitte.com>). Finally, other measures such as the experience and expertise of coaches were retrieved from the open access web domain <https://www.transfermarkt.co.uk>.

Procedure

The performance measure was the number of points awarded to teams in the 1, 2, 3, 4, 5, 10, 15 or 20 matches prior to and following the coaching change. For each match, teams were awarded 3 points for a win, 1 point for a draw and 0 points for a loss. The advantages of these measures were twofold. Firstly, a performance measure that declined when performance stagnated was obtained. Second, abrupt performance declines or increases were smoothed out. Further, several moments across the season were selected to examine how team performance changed.

Statistical Analysis

First, data normality assumptions were tested using the Kolmogorov-Smirnov test while descriptive results were presented using mean and standard deviation. Secondly, the autocorrelation function (ACF) was used with a lag of 7 (7 match intervals: 1, 2, 3, 4, 5, 10, 15 and 20) to test the persistency of points awarded per match for each coach. Thirdly, comparisons among repeated measures for each coach (old and new) were analysed via paired t-tests with the level of significance set at $p < 0.05$.

Linear regression analyses were estimated to determine the winning profile of a new coach. As indicated previously, the dependent variable was the points awarded over 1, 2, 3, 4, 5, 10, 15 or 20 matches following the coaching change (*performance*). When interpreting the statistical results, positive or negative coefficients indicated a greater or lower propensity to improve team's performance, respectively. Four independent variables were included in the models. The first variable was the number of months as a head coach within the first division of any league (*experience*). The second variable was the ranking of each team in accordance with the annual budget with 1 being the highest annual budget and 18 or 20 being the lowest, pending number of teams in competition (*budget*). The third variable analysed was whether the coach had been a former elite player or not and was coded as a dichotomous variable: 1 = former player; 0 = not former player (*former player*). Finally, the fourth variable identified whether the observed coach was a novice coach or not within the league competition and was coded as a dichotomous variable: 1 = the observed coach had experience in the league competition; 0 = the observed coach was a novice in the league competition (*novice*).

The developed models were as follows where β_1 was the intercept and ε_1 was the disturbance term:

$$\text{PERFORMANCE} = \beta_1 + \beta_2 \text{ EXPERIENCE} + \beta_3 \text{ BUDGET} \\ + \beta_4 \text{ FORMER PLAYER} + \beta_5 \text{ NOVICE} + \varepsilon_1$$

RESULTS

Descriptive results for points awarded to teams with each coach (i.e. points per match and moving average of points per match) are presented in Table 1. The moving average of points awarded per match was significantly greater for the new compared to the old coach for all matches studied (Table 1). In addition, the points awarded per match were significantly greater for the new compared to the old coach for all matches studied except during 15 (old = new) and 20 (old > new) matches (Table 1). No significant autocorrelations ($p > 0.05$) for old and new coaches were identified for points awarded or the moving average of points awarded per match (Table 2).

Table 2 shows the influence of the independent variables on the number of points awarded to teams during 1, 2, 3, 4, 5, 10, 15 or 20 matches following the coaching change. The variable *budget* had a significant effect on points awarded with teams possessing a lower annual budget awarded less points (Table 2). The variables *experience*, *former player* and *novice* did not have any influence on the number of points awarded to teams (Table 2).

DISCUSSION

In this study the effects of a coaching change or leadership succession on team performance was examined. The current study demonstrated that: (i) team's short-term performance was improved significantly with a change to a new coach with this impact declining in the longer term (> 10 matches); and (ii) the winning effect due to the new coach was not dependent upon coach-related factors such as coaching experience or the new coach being a former elite player. A critical organisational decision to change coaches may provide the essential stimulus for future team success in elite soccer.

A coaching change is an extreme, but frequently occurring phenomenon in elite soccer. For example, there were 55 coaching changes within the `Big Five` European Soccer Leagues during the 2017/18 season. Despite this potential large number of annual coaching changes, studies to date have provided inconclusive results about the relationship between in-season coaching changes and team's performance. For example, teams tended to experience positive results in their first matches with a new coach in the top three divisions of

TABLE 1. Descriptive results for points awarded per match and the moving average of points awarded per match for the old and new coach (ACF: autocorrelation function and standard error).

	Old coach		New coach		t-test	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Points awarded per match						
1 match	0.37	0.85	1.27	1.27	-12.13	.001**
2 matches	0.64	1.02	1.32	1.38	7.80	.001**
3 matches	0.92	1.19	1.23	1.27	3.83	.001**
4 matches	0.86	1.15	1.42	1.31	6.46	.001**
5 matches	0.90	1.15	1.31	2.02	-3.46	.001**
10 matches	1.03	0.60	1.15	0.76	-2.54	.012*
15 matches	1.13	0.60	1.15	0.72	-0.37	.710
20 matches	1.24	0.66	1.14	0.71	2.26	.024*
ACF	0.38 (0.29)		0.29 (0.30)			0.20/0.33
Moving average of points awarded						
1 match	0.37	0.85	1.27	1.27	-12.13	.001**
2 matches	0.51	0.69	1.30	0.91	-15.01	.001**
3 matches	0.64	0.65	1.27	0.78	-14.30	.001**
4 matches	0.70	0.57	1.31	0.74	-14.77	.001**
5 matches	0.74	0.53	1.31	0.75	-13.92	.001**
10 matches	0.89	0.45	1.23	0.59	-11.19	.001**
15 matches	0.97	0.41	1.20	0.57	-8.48	.001**
20 matches	1.04	0.39	1.19	0.56	-5.93	.001**
ACF	0.54 (0.29)		0.53 (0.29)			0.06/0.07

* $p < 0.05$; ** $p < 0.01$

TABLE 2. The impact of coaching change on team performance.

Dependent variable: Points per match awarded to teams (0–3 points per match)								
	Independent Variables							
	Match 1	Match 2	Match 3	Match 4	Match 5	Match 10	Match 15	Match 20
<i>experience</i> ^a	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
<i>budget</i> ^a	-0.07* (0.01)	-0.06* (0.01)	-0.06* (0.01)	-0.06* (0.01)	-0.05* (0.01)	-0.05* (0.01)	-0.05* (0.01)	-0.06* (0.01)
<i>former Player</i> ^a	0.05 (0.13)	0.01 (0.09)	-0.04 (0.08)	-0.07 (0.08)	-0.08 (0.07)	-0.07 (0.06)	-0.03 (0.06)	-0.06 (0.06)
<i>novice</i> ^a	0.06 (0.14)	-0.01 (0.11)	0.01 (0.08)	-0.03 (0.08)	-0.11 (0.10)	-0.03 (0.06)	-0.01 (0.06)	-0.02 (0.05)
Constant	1.99 (0.19)*	1.99 (0.14)*	2.04 (0.11)*	2.05 (0.10)*	2.01 (0.11)*	1.87 (0.09)*	1.79 (0.09)*	1.84 (0.09)*
R ²	0.08	0.11	0.17	0.16	0.14	0.24	0.24	0.17
Observations	409	386	386	386	386	386	386	386

^aValues are Beta coefficients (standard error) from the linear regression analyses.

the Belgium league [16] and the Spanish La Liga [5]. In contrast, coaching changes have either had no, or a slightly negative effect on team's performance in the Italian Serie A [17] and the Dutch Premier League [18]. Within English professional soccer, coaching changes resulted in poorer team performance [16]. Therefore, a clearer understanding of the benefits and/or disadvantages of in-season coaching changes is needed to support elite soccer organisations. The current study has extended our knowledge and confirmed that an in-season coaching change can be beneficial to team success. This outcome was a result of several strengths of the current study compared with previous studies including that: (i) the sample size was very large and included > 400 coaching changes from five different competitions; (ii) the statistical analyses included temporal analyses of ACF and the moving average of points awarded per match, improving the power of the current findings; and (iii) how club- (i.e. budget) and coach-related (i.e. past and present coaching experience, whether a coach was a former elite player or not) factors affected team's performance. The current findings provide a methodical and meaningful effect of coaching changes on elite soccer team's performance.

High performance soccer coaches play a crucial role in the coach-athlete performance relationship [1]. Coaches often face challenges and constraints that influence their daily practice and the competitive outcome [2]. Nevertheless, high performance soccer coach's ability and reputation are based upon match wins and losses, with poor win-loss ratios potentially leading to coaching changes by organisations or clubs [3]. A club's decision to change coaches can be driven by many factors however, the most common reason reported has been to induce a shock-effect where a new coach motivates players better for improved results [15]. Potentially, the employment of a new coach produces novel and positive relationships, and less negative emotions and stress, during trainings and matches that motivate players and staff for success [15]. Therefore, changes in player's

psychological and motivational behaviours may be a favourable short-term result after a coaching change [19–22].

Conventional wisdom suggests that it takes time for new coaches to accumulate organization-specific knowledge for success [9–10]. Baldock and Buelens [23] argued that a period of approximately one month (i.e. 4–5 matches) might be too short for new coaches to renovate the team for success. Further, they suggested that evaluations of coaching ability and team performance beyond 6–7 matches after a coaching change were more worthwhile [23]. Our results demonstrated that the beneficial effects of a coaching change in elite soccer lasted at least 10 matches but was absent at 15–20 matches. In fact, team performance, via the number of points awarded, during the old coach's tenure was higher than that for the new coach at 20 matches after the coaching change. This lack of long-term effect may be related to other factors such as changes in the number of muscular injuries experienced by the team [24]. The frequency of muscle injuries was reported to be 2.3 times higher in the two weeks, and 1.9 times higher at one month, after the arrival of a new coach [24]. Therefore, the innate ability of the coach to lead the team for the long-term appears to be vital once the initial psychological effects of a coaching change disappears.

The employment of coaches in professional sports is complex and dynamic with several factors, other than winning, potentially contributing to maintaining or dismissing a coach [2]. Often, the opinions of club management and owners, as well as corporate sponsor expectations, contribute to coaching employment decisions [25]. In the current study, annual budget was the only club- or team-related variable associated with team performance. This result supported prior work which showed that resources were a key contributor to team success [24] [25], and possibly greater than that of a coach's playing and/or coaching experience [2]. In the current study, team success was not affected by prior coaching experience, including

being a novice coach, or whether the new coach was a former elite player. Consequently, it seemed that the impact of the new coach was dependent more on the change itself rather than on the characteristics of the new coach.

The current study has important practical applications for coaches, players and club management. For a team experiencing a run of poor results, changing the coach may provide a crucial stimulus to break the sequence and improve team success, particularly in the short-term (~10 matches). This organisational option may be advantageous towards the end of the competitive season where success could lead to winning a league championship. In fact, many teams may be inadvertently supporting this advice with coach turnover higher at the end of the seasons in multiple European professional football soccer leagues such as the Belgium Jupiler League [25], English Premier League [26], German Bundesliga [27], Italian Serie A [17], Dutch Eredivisie [28], and Spanish La Liga [5]. However, clubs should take into account that the coach's prior coaching and/or playing experience may be of little relevance to near-term success.

To our knowledge, this study has been the first to examine the effects of a coaching change on team performance accounting for coach- and club-related factors. While novel, some limitations of this study should be acknowledged. Firstly, this study did not consider match-statistics as a measure of team performance or player motivation to perform prior to and after the coaching change. Secondly, the study did not examine or account for when the coaching change occurred (i.e. stage of season). Thirdly, the exact driver/s for a coaching change were not determined including possible revolutionary organisational changes at the executive and/or team roster levels. Fourthly, the current study examined coaching changes over one season with future research encouraged to consider the temporal impact (i.e. previous two or more seasons of the dismissed coach)

in order to compare the long-term, team performance evolution. Lastly, the margin of victory (i.e. goal difference) was not considered in the analyses, which may have an effect on team's performances during the season [29], regardless of a coaching change. Thus, future research should consider goal-difference as a covariate to assess the impact of a coaching change on team performance such as points won [29]. The above factors may have an important influence on the relationship between coaching changes and team performance with future research encouraged to incorporate these aspects.

In conclusion, the current study demonstrated that the significant organisational decision for a coaching change had a positive impact on team's performance over time. Specifically, the number of points and the moving average of points awarded per match in the short term (< 11 matches) were significantly greater after the coaching change. Previous competition or league experience as a head coach, the number of years as head coach, or to have been a former player did not improve team success following employment of a new coach. Organisational decisions to change coaches may ultimately lead to short-term success in elite soccer.

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Conflict of interest declaration

No conflict of interest were reported by the authors.

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