Team Leadership

How can team performance in organizations be promoted?

A shared leadership framework mediated by team psychological safety and moderated by team identification.

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Abstract

Shared leadership is a topic that has been growing in importance both for researchers and practitioners over the past few years. In fact, several studies have been conducted on the influence that shared leadership produces on team performance. However, there is still little research about the underlying factors that mediate and moderate the relationship between these two variables. Hence, the purpose of this study is to analyze the relationship between shared leadership and team performance through team psychological safety and for different levels of team identification. The study was conducted through self-reported questionnaires involving 86 people who comprised 27 teams. Data was collected in different countries and from several industries and the questionnaires were developed based on validated scales. The results, conducted in SPSS by using PROCESS macro, provided support for the direct relationship between shared leadership and team performance. Nevertheless, the results did not provide support for the mediating role of team psychological safety between shared leadership and team performance, for the moderation role of team identification and neither for the moderated mediation hypothesis. In future studies, researchers should not only consider other impactful factors that may affect the relationship between shared leadership and team performance, but also collect data from multiple moments in time. This paper sheds light on the importance that is for organizations nowadays to promote shared leadership environments where people are encouraged to see both themselves and their colleagues as potential leaders in order to succeed.

Keywords: shared leadership, team performance, team psychological safety, team identification, moderated mediation

Introduction

Over the past years, organizations have been relying heavily on teamwork for their effectiveness (Welson, Goodman, & Cronin, 2007). This remarkable transformation from work organized around the individual to team-based structures was and continues to be due to several reasons. Some of the most important ones are the increasing levels of competition at a global level and the constant pressure for creativity, invention and innovation that requires the need for more quick and flexible moves (Kozlowski & Bell, 2013). As so, it becomes crucial for employees to learn how to work efficiently within teams (Han, Lee, Beyerlein, & Kolb, 2017), as teams allow and facilitate the complexity and performance of tasks due to the diversity of skills, expertise and experience inherent to each team member (Kozlowski & Bell, 2013). Indeed, one way to promote effectiveness is to distribute the power and task throughout everyone from the team. As a result, the traditional models of leadership have been challenged (Pearce, 2004), and in the last few years, leadership scholars have been changing their focus from a top-down vertical influence process to a horizontal and shared leading process among team members (Zhu, Liao, Yam, & Johnson, 2018).

Subsequently, shared leadership, defined as a dynamic, interactive mutual influence process among individuals in groups with the objective to achieve the organizational goals, has gained considerable importance (Carson, Tesluk, & Marrone, 2007). Unlike the traditional theories that place the emphasis on a single individual, which is assigned to lead the team, and on the relationships between that individual leader with his/her followers, shared leadership theory involves both upward and downward hierarchical influence, highlighting the role of team members in team leading processes (Nicolaides et al., 2014). In fact, there is evidence that shared leadership plays an important role in order to achieve high team performance, as an informal leadership environment helps teams to exchange and absorb information easily, making team's productivity to increase overall (e.g. Wang, Waldman, & Zhang, 2013; Zhu et al., 2018). As so, shared

leadership has seen a recent explosion in theoretical development and research bringing new challenges to organizations, especially the ones that used to follow traditionally rewarded vertical leadership (Zhu et al., 2018).

Even though empirical studies concerning the influence of shared leadership on team performance have reported mostly positive results (e.g. D'Innocenzo, Mathieu, & Kukenberger, 2016; Hoch, 2014; Nicolaides et al., 2014; Pearce & Sims, 2002), some of them revealed negative results in regarding to this relationship. This is mainly to the fact that many times shared leadership is conceptualized and evaluated by the researchers in different ways (D'Innocenzo et al., 2016). Therefore, this study plays an important role to clarify why and when the display of shared leadership is beneficial for team performance. Furthermore, in order to provide a clear and detailed representation of the relationship between those two constructs, this study will explore the role of team psychological safety, which refers to "a shared belief held by members of a team that the team is safe for interpersonal risk taking" (Edmondson, 1999, p. 350) as a possible mediator. Moreover, team identification, which can be seen as a process by which individual team members perceive themselves in terms of the values, goals, attitudes and behaviors they share with other team members (Janssen & Huang, 2008), will be analyzed as a potential moderator.

Team psychological safety is a crucial factor to understand teamwork, team functioning and team performance (Edmondson & Lei, 2014). In a psychological safety climate, team members feel respected and trusted to share their suggestions and ideas without the risk of punishment or embarrassment (Johnson & Avolio, 2018). Some empirical studies have shown that team psychological safety promotes team effectiveness, as teams that enforce a safe climate can learn more with each other and avoid unwise mistakes (e.g. Bradley, Postlethwaite, Klotz, Hamdani, & Brown, 2012; Edmondson, 1999). Additionally, according to Liu, Hu, Li, Wang and Lin (2014), shared leadership is expected to promote team psychological safety in three different ways: first,

as shared leadership is a collective process, all team members have the opportunity to express themselves; second, with leadership responsibilities shared, individual members are able to support each other's work closely; and third, shared leadership makes team members feel more authentic when communicating with their peers. Actually, Liu et al. (2014) showed that team psychological safety might also act as a bridge that links shared leadership with possible outcome variables like team learning or team performance. However, there are not a lot of studies about this topic of team psychological safety as a mediation mechanism between shared leadership and certain outcome variables, like team performance (Liu et al, 2014). In this way, this research works as a confirmatory analysis to investigate the mediating role of team psychological safety between shared leadership and team performance.

Finally, as team psychological safety is a crucial team factor that represents collective perceptions about how comfortable team members feel when interacting and sharing their opinions with other team members (Edmondson, 1999), it becomes crucial to understand to which degree individuals identify themselves with their team. This is because the higher the level of team identification, the higher will be the relationship between shared leadership and team psychological safety. In fact, even though there are previous studies that found support for a positive relationship between team identification and team psychological safety (Johnson & Avolio, 2018), it still remains unexplored whether team identification strengthen the relationship between shared leadership and team psychological safety. This way, throughout this study it will be analyzed the potential effect of team identification in the overall conceptual model.

All in all, in line with what was said above, this study proposes that shared leadership influences team performance through two different, yet related, pathways: a direct pathway, and an indirect pathway through team psychological safety. I further propose that team identification will strengthen the relationship between shared leadership and team psychological safety (Figure

1). Thus, this study advances earlier literature on shared leadership by proposing mediated and conditional indirect effects to explain how it translates into better team performance.

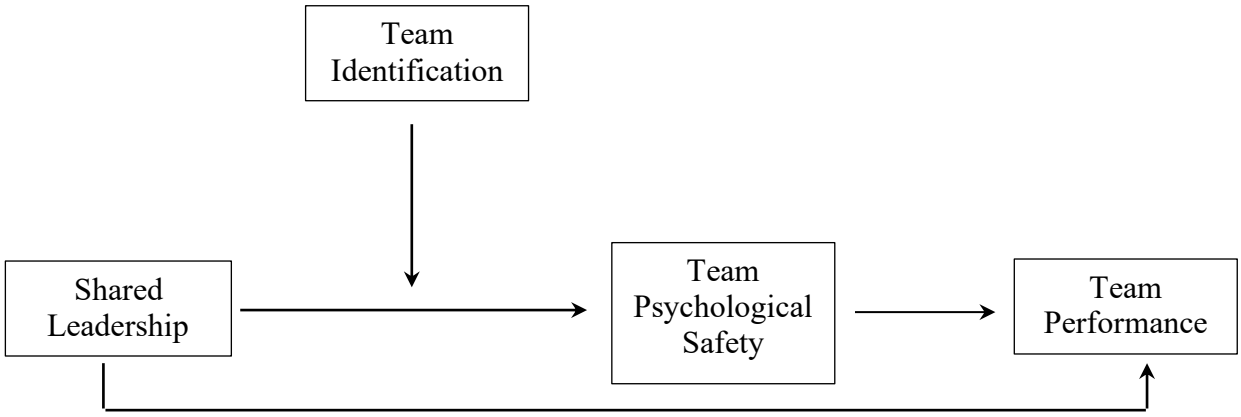

Figure 1. Proposed conceptual model.

Literature Review

Team Performance

Teams. Over the years, teams have been defined by researchers in several different ways, which mostly present the same attributes with slightly differences (Mathieu, Maynard, Rapp, & Gilson, 2008). Although some scholars have distinguished between teams and work groups (Katzenbach & Smith, 1993), throughout this study these two terms will be used interchangeably. According to Kozlowski and Bell (2013, p.5) teams are "(a) composed of two or more individuals, (b) who exist to perform organizationally relevant tasks, (c) share one or more common goals, (d) exhibit task interdependencies, (e) interact socially, (f) maintain and manage boundaries, and (g) are embedded in an organizational context that sets boundaries, constrains the team, and influences exchanges with other units in the broader entity". Indeed, the key elements of this definition encompasses that team members usually have different and unique roles that overall are connected to each other, creating some level of interdependence in order to reach the collective goal (Zaccaro, Rittman, & Marks, 2001). This interdependence requires coordination and synchronization among team members, so that every contribution can be integrated and considered. In this way, as teams come in a variety of types and sizes, cutting across different contexts and functions (Kozlowski & Bell, 2013), members need to constantly exchange information and resources, adjusting both individual and team actions in periods of low coordination (Zaccaro et al, 2001).

Team effectiveness models and performance. From an organizational point of view, team effectiveness is one of the most important factors in order to be successful (Kozlowski & Bell, 2013). It requires "(a) the identification of appropriate individual member contributions and (b) a plan for the best way these contributions can be combined into an integrated team response" (Zaccaro et al, 2001, p. 457). As so, over the years, researchers have been investigating the reasons that lead teams to be more efficient, which resulted in the creation of several conceptual models.

The input-process-outcome (I-P-O), developed by McGrath (1964) more than 40 years ago, was the first model to appear and has served as a valuable guide for researchers throughout the years. However, this framework has suffered some modifications and extensions as it was insufficient to characterize teams, defined as dynamic, complex and adaptive entities (Ilgen, Hollenbeck, Johnson, & Jundt, 2005).

The alternative model named input-mediator-output-input (IMOI) allowed for a wider range of mediating processes and highlighted the ongoing and cyclical nature of team functioning (e.g. Ilgen et al., 2005; Kozlowski & Bell, 2013). Indeed, with this new model team effectiveness not only become wider, but also more complex because it incorporates multiple, nested levels; processes and emergent states; multiple effectiveness criteria; episodic task cycles and developmental progression; and complex, reciprocal feedback linkages (Mathieu et al., 2008). Thus, team performance, which according to Campbell (1990, p.704) "is not the consequence(s) or result(s) of action; it is the action itself", has also become more complex as more and more, members have to adapt their work and way of interaction through team-task episodes (Santos & Passos, 2013).

Shared leadership

For many years, researchers have conceptualized leadership as top-down hierarchical influence process, where a single individual, the formal leader, detained all the power (Pearce & Conger, 2003). Indeed, this conventional leadership research, considered the leader as the only one with the capacity to influence teams within organizations (Pearce & Conger, 2003). However, in the last two decades, this traditional conceptualization of leadership has been challenged, as new concepts, such as shared leadership are appearing. In fact, the main key distinction between the traditional conceptualization and shared leadership is the influence process involved, which in shared leadership entails and underlines peer or lateral influence together with upward and

downward hierarchical influence (Barnett & Weidenfeller, 2016). Throughout the years, shared leadership has been defined in many different ways. Nevertheless, across all these different conceptualizations, there are three key common points: "(a) shared leadership is about lateral influence among peers, (b) shared leadership is an emergent team phenomenon, and (c) leadership roles and influence are dispersed across team members" (Zhu et al., 2018, p.4). In this way, team members skilled in a specific area might engage in leadership positions in that domain, while assuming followership roles in other domains (Manz, Skaggs, Pearce, & Wassenaar, 2015).

It is believed that shared leadership is an essential intangible resource that is available to each team, and as so, it should boost team performance on complex tasks (Carson et al., 2007). In fact, when individuals within teams are open to be influenced by other members of the team then, not only the team can work under a more trustful environment, but also it promotes greater efforts, coordination and efficiency overall (Carson et al., 2007). Indeed, in an environment where shared leadership is pursued, members experience empowerment and self-control, which increases the motivation to take responsibilities and promotes knowledge exchange among members (Wang et al., 2013). In return, if members are open to influence and be influenced by others, team coordination and trust will increase and can lead to higher levels of team performance (D'Innocenzo et al., 2016). There are a handful of empirical studies that have shown that shared leadership is positively related to team performance and a better predictor of team performance rather than vertical leadership (e.g. D'Innocenzo et al., 2016; Hoch, 2014; Nicolaides et al., 2014; Pearce & Sims, 2002). For example, Pearce and Sims (2002) developed a study about the relationship between shared leadership and change management team effectiveness and found out that shared leadership is a more useful predictor to effectiveness than vertical leadership. Indeed, the authors argued that if every team member is actively involved to design a vision for the team, then having a strong visionary leader is not really necessary for the team to focus better on

achieving their goals. Besides this, Ensley, Hmieleski and Pearce (2006), found shared leadership to be a stronger predictor than vertical leadership of new venture performance in a sample of top management teams. As a matter fact, researchers have suggested that in many team contexts vertical leaders do not have the necessary skills or resources to help their teams reach their goals, which would not happen if shared leadership was put into practice (Nicolaides et al., 2014).

Nevertheless, shared leadership does not always produce positive team results. For example, Bowers and Seashore (1966) found out that peer leadership, a vital dimension of shared leadership as it describes the condition in which teams collectively exert influence (Pearce & Conger, 2003), exhibited negative effects on team performance in dimensions regarding the form of support, goal emphasis, work facilitation and interaction facilitation. In addition to this, and more recently, Boies et al. (2010) reached the conclusion that shared leadership has negative effects on team performance. These inconsistent results of the effect that shared leadership has on team performance might be due to the way shared leadership has been conceptualized and evaluated by researchers within the organization (Wang, Waldman, & Zhang, 2013).

On balance, assuming what was said above, it is likely that environments who follow a shared leadership approach will have better results on the overall performance, as members experience higher levels of empowerment and knowledge exchange, which indeed result in a higher coordination and team effort. Therefore, the following is hypothesized:

Hypothesis 1: Shared leadership behaviors have a positive influence on team performance.

Team psychological safety

Team psychological safety is defined as a shared belief that the team is safe for interpersonal risk taking and that oneself is able to show and employ his or her ideas without fearing the negative consequences (Edmondson, 1999). Indeed, psychological safety is a team-

level concept that, besides describing what was said above, according to Edmondson (2004) is a concept that is intrinsically related to trust, as both of them describe psychological states that, not only involve perceptions of risk, but also have the potential to create positive outcomes for work groups and organizations. Within organizations, psychological safety comes from members feeling trust in and respect for each other, encouraging, in this way, individual voice through sharing different perspectives, seeking feedback and discussing mistakes without the risk of punishment or embarrassment (Johnson & Avolio, 2018). Consequently, environments where people trust in each other and feel trusted, will foster a sense of psychological safety, which in return will allow for positive team performance outcomes (Roussin, 2008).

As it was mentioned before, shared leadership is all about being open to be influenced by others and actively contribute to one another's development, creating an atmosphere where team members feel safe to share their insights out loud. In this way, in environments where the leadership power is shared, people need to feel psychological safe, in order for the team to engage more easily in behaviors such as asking for feedback, speaking up about concerns and mistakes, coming up with groundbreaking ideas without concerning about other's reactions (Cauwelier, Ribière, & Bennet, 2016). Besides this, being psychological safe within a team diminishes the concern about being judged as incompetent when seeking for help from people in superior positions at the hierarchy and promotes high quality relationships, as each individual, not only have a greater capacity of communicating, but also have an unusual capacity to withstand challenging events and episodes (Carmeli, Brueller, & Dutton, 2009). Thus, it is expected that shared leadership will be positively associated to team psychological safety.

Team psychological safety, as it was described before, encompasses intrapersonal trust and mutual respect in which people are comfortable being themselves (Edmondson, 1999). Indeed, it is "developed through relationship quality and serves as a key social-psychological mechanism

through which people are able to engage in learning behaviors, raise concerns and talk about things openly" (Carmeli et al., 2009, p.86). In this way, team members may be willing to detect and speak up errors, helping the team to not only make the necessary changes to perform better, but also to prevent the same error to occur in the future (Edmondson, 1999). Therefore, in this study I expect that team psychological safety, as a mediator through shared leadership, will increase team performance (Faraj & Yan, 2009).

So, based on the above arguments, I argue for team psychological safety to mediate the relationship between shared leadership and team performance. Hence, the following hypothesis is proposed:

Hypothesis 2: Shared leadership is positively related with team performance through team psychological safety.

Team identification

Identification with a specific team can be understood both by examining why individuals identify with a certain team and how this identification progresses with the time (Johnson & Avolio, 2018). According to Janssen and Huang (2008), team identification is a process by which individual team members perceive themselves in terms of the values, goals, attitudes and behaviors they share with other team members. In fact, as the social identity theory says, some of the core reasons why individuals decide to identify with certain groups are mainly to avoid and reduce the uncertainty, and to enhance the individual self-esteem (Hogg & Terry, 2000). In another words, social identity theory states that social identification is the perception of oneness with or belongingness to some human aggregate (Ashforth & Mael, 1989). In this way team identification, not only encourages people to act in a team-typical way, but also motivates individual team members to believe in each other's capabilities to perform well (Lee, Farh, & Chen, 2011). In this

way, “individuals are said to identify with a social entity when they (1) label or categorize themselves as members of it, (2) define themselves with the same characteristics used to define the social entity and, (3) feel a psychological attachment and a sense of belonging to it” (Huettermann, Doering, & Boerner, 2014, p.414).

In addition, according to Ashforth and Mael (1989) there are some relevant principles regarding group identification that should be highlighted. To begin with, oneself to identify with a group do not need to make any effort to follow the group’s goals; instead he or she needs to perceive him- or herself as psychologically intertwined with the fate of the group in order to personally experience both the successes and failures of the team. Besides this, the researchers also pointed out to the fact that identification with a group is similar to identification with a person or a reciprocal role relationship (Ashforth & Mael, 1989). Putting it in another words, with higher levels of team identification, members are more likely to behave in ways that are aligned with team efforts, such as being more cooperative in support of the team’s values, norms and interests (Johnson & Avolio, 2018).

In environments where shared leadership is promoted, and individuals identify themselves with the team, it becomes easier for the team to share their common interests, visions, goals, as employees feel free to speak up their ideas and opinions without fearing the consequences. As a result, this will not only strengthen the team power and the way leadership is shared among the team, but it will also make the team members feel safer and willing to take more risks for the team. Besides this, employees will also tend to cooperate with each other better, developing, in this way, higher quality relationships (Lee et al., 2011). Consequently, as individuals are usually members of various social groups (Huettermann et al., 2014), if they identify themselves with the team, then it is more likely that they will feel psychological safe and trust other’s ideas and decisions. As a matter fact, results from past research have shown that sometimes demographic diversity

complicates team identification, yet the studies also showed that the relationship between the two variables can change accordingly to each team (Vegt & Bunderson, 2005). This is, demographically diverse teams can be high on team identification, while demographic homogeneous teams can be low on team identification. And if this is the case, then it is expected that diverse teams will be better able to exchange ideas and learn across boundaries when there is a shared sense of team identification than when there is not (Vegt & Bunderson, 2005). This perception of belonging to a team is then an indirect prerequisite for people to feel psychological safe in their teams, which in turn, if positive, will increase the team performance overall. Following this lead, the following hypotheses are proposed:

Hypothesis 3: The positive relationship between shared leadership and team psychological safety is stronger for high levels of team identification, than for low levels of team identification.

Hypothesis 4: The indirect effect of shared leadership to team performance through team psychological safety will be stronger when team identification is high, than when team identification is low.

Method

Context, Sample and Procedure

In order to test the hypotheses proposed above and as the present study is a quantitative research method, the primary data was collected through an online self-report questionnaire. The questionnaire was created using the online tool Qualtrics provided by Maastricht University and the link to complete it was available from 18th of September until the 31st of October. To reach an acceptable number of participants in a quick and inexpensive way the non-probability method was

used, mainly the opportunity and snowball sampling, where most respondents were chosen based on personal contacts and networking (Burns & Burns, 2008).

In total, I contacted 42 people from several countries working at different industries, either by email, phone call or text messages to participate in this study. Due to the fact that most of my personal contacts were Portuguese people, to increase the participation rate, the questionnaire was translated into Portuguese. To ensure that the translated version was comparable with the original English version, two other people that are fluent in both languages were asked to analyze whether the questions kept the same meaning. Since I wanted to collect data from teams, the survey was only sent to individuals who met the requirement of working in a team composed by more than two people. For those who were contacted, I kindly asked each one of them to inquire two or more people from the same team to fill in the questionnaire. Together with the invitation email, I sent the anonymous survey link, as well as a specific code for the team, in order to aggregate the team members together in a later stage. The first and second reminders to complete the questionnaire were sent out after two and three weeks to increase the answering rate.

The questionnaire itself, generated by Qualtrics allowed the participants to independently complete the survey through different platforms (e.g. Computer, smartphone, tablet) during the defined data gathering period. It started with a small descriptive text explaining the purpose of the survey and assuring the respondents confidentiality and anonymity. Further, each of the team members had to indicate the extent to which they agreed to some statements related to all the team-variables analyzed in the study and answer some demographic questions about themselves. To serve as an incentive, at the end of the survey, a complete report of the study was promised for the people who decided to leave their email. Each questionnaire took around five to ten minutes to be completed.

In total, 110 people answered the questionnaire. However, only the surveys that were successfully completed and had a corresponding code that allow to identify the respective team were considered for the analysis of this study. The sample was then reduced to 101 people, that were nested in 32 teams with a minimum of three people per team, distributed across seven different industries. Regarding the respondents, 26.7% people worked at the Life Sciences & Health industry, 20.8% people in Education, 9.9% in Business Administration, 8.9% in Consultancy, Informatics & Scientific activities and 21.7% in Commerce & Sales, High Tech or any other industry. Moreover, 57% of the people who answered the survey were female and 43% male. The average age of the participants was 38.38 years old ranging from 20 to 64 (SD=12.6), and from these individuals 77.4% were Portuguese, 6.7% Italian and 15.9% from other nationalities. Besides this, the average team size was 11.66 people (SD=11.1) and the average tenure within the team 6.1 years (SD=6.77).

Measures

The measures used in this research paper were adapted from previous studies. All items within the questions were assessed on a 7-point Likert-type scale ranging from 1 "strongly disagree" to 7 "strongly agree". The survey items can be found in Appendix A. Besides this, in order to ensure internal consistency a Cronbach alpha was calculated. Moreover, control variables, more specifically membership tenure and team size, were also considered, as they could influence the end results.

Shared Leadership. To measure shared leadership, it was used a twenty-item questionnaire developed by Grille and Kauffeld (2015) that focus on four different aspects of shared leadership (task-, relation-, change-, and micropolitical-oriented leadership) that together are assumed to represent the overall shared leadership dimension. Some sample items are "As a team we clearly assign tasks", "As a team we take sufficient time to address each other's concerns"

or “As a team we never let down each other”. The Cronbach alpha from the original scale was .86 and from this research was .94, allowing the scale to be considered reliable.

Team Psychological Safety. Team psychological safety in this study was assessed with a seven-item scale frequently used to test this particular variable. It was developed by Edmonson (1999) and some statements found in this particular scale are “If I make a mistake on this team, it is often held against me”, “Members of this team are able to bring up problems and tough issues” or “It is safe to take a risk on this team”. From all the items of this scale, three of them were negatively stated and had to be reversed in the scoring process in order to be able to obtain higher values for this variable. The Cronbach alpha from both the original scale and the present study were considered reliable with a coefficient of .82 and .73 respectively.

Team Identification. To measure team identification the four highest-loading items from Allen and Meyer’s (1990) affective commitment scale were used. This decision to include only these four items was based on the research developed by Vegt and Bunderson (2005), where each person was asked to assess the extent to which they agreed to statements like “I feel emotionally attached to this team”, “I feel a strong sense of belonging to this team” or “I feel as this team’s problems are my own”. The Cronbach alpha for Vegt and Bunderson (2005) study was .92 and for the present research was .91, which shows that both scales had good internal consistency.

Team Performance. Perceived group performance was measured with five items developed by Conger, Kanungo, and Menon (2000). The items measure the current perceptions of the team regarding ongoing performance broadly defined rather than the expectations for future performance regarding specific tasks. Some sample items are as follows: “We have high work performance”, “We always set a high standard of task accomplishment” or “We almost always

beat our targets". Both the original scale and this study showed good internal consistency, with a Cronbach alpha coefficient of .85 and .87 respectively.

Control Variables. Regarding the control variables, I included two demographic variables, namely the membership tenure and the team size. Membership tenure of employee (in years) was controlled as the longer an employee is inserted within a team, the better is their understanding about how the team will act in regard to different situations, increasing the likelihood of achieving a better performance. In this way, as new employees are expose to a whole new team with different rules, cultures and behavioral aspects (Sturman, 2003), it is important to make sure that this variable does not bias the expected results. Moreover, team size, which was measured by the number of members within a team, was also accounted for control, as larger teams may have access to more resources that potentially leads to higher performance (Kozlowski & Bell, 2013).

Analytical Strategy

In order to analyze the answers from the people who participated in this study regarding the conceptual model of this research, the statistical program IBM SPSS version 25 was utilized. As so, when the collection of data in Qualtrics ended, the data was exported to SPSS for further analysis.

The first step made to study all the above theorized hypotheses was a simple mediation model to analyze the direct effect of shared leadership on team performance (Hypothesis 1), as well as the mediating role of team psychological safety on the relationship between shared leadership and team performance (Hypothesis 2). After that, it was analyzed the moderating effect of team identification on the relationship between shared leadership and team psychological safety (Hypothesis 3). Lastly, the overall moderated mediation model was analyzed (Hypothesis 4). In

all the analysis, the control variables membership tenure and team size were considered. For all the previous mentioned analysis, this study made use of PROCESS macro developed by Hayes (2013), more specifically models 1 (moderation), 4 (mediation) and 7 (moderated mediation). Also, it used the bootstrapping technique to create 5,000 bootstrap samples with 95% confidence intervals (Preacher & Hayes, 2008), as this method allows to avoid problems and adjust for non-normal distributions (MacKinnon, Lockwood, & Williams, 2004).

Results

Aggregation

Even though some individuals may contribute more than others to achieve better results (Kozlowsk & Klein, 2000), as this study is at the team-level, all the individual answers were accounted the same and aggregated to the team-level through SPSS. Consequently, I ended up with mean values per team of the four variables mentioned before: shared leadership, team psychological safety, team identification and team performance. To calculate them, and to justify the previous mentioned aggregation, several measures were taken. First, I computed the within group agreement, $R_{wg(j)}$, through the mean R_{wg} of each individual item (James, Demaree, & Wolf, 1993). Then the two intra-class correlation coefficients (ICCs) were computed by using first the One-Way ANOVA test and after the appropriate formulas developed by Bliese (2000) (Appendix B).

In this study, in order for $R_{wg(j)}$ to be considered a good estimate, the cut-off criterion was a mean value equal or above .70 (James, Demaree, & Wolf, 1993). Besides this, the ICC(1) was justified only if the *F*-statistic was statistically significant, as this indicates that the between-group variance is significantly greater than the within group variance of a given measure (Bliese, 2000). Regarding the ICC(2), to be accepted it needed to be a higher value than the ICC(1). However, at

first, both team psychological safety and team identification presented $R_{wg(j)}$ values below .70, which suggested a bimodal response distribution and that the different teams comprised subgroups (O'Neill, 2017). In order to solve it, I decided to take off the teams which presented at least four R_{wg} values below zero and ended up eliminating five teams. After removing these teams, I calculated the $R_{wg(j)}$ again and, this time, all the variables met the necessary conditions (see Table 1). Thus, individual answers qualified to be aggregated and these aggregated mean values were used in the further analysis.

Table 1. Aggregation indices.

Variables	**$R_{wg(j)}$**	**ICC(1)**	**ICC(2)**	***F***	***p***
Shared Leadership	.94	.14	.70	3.323	.000
Team Psychological Safety	.72	.15	.71	3.460	.000
Team Identification	.78	.12	.64	2.811	.000
Team Performance	.84	.06	.45	1.833	.019

Note. n=27 teams.

Descriptive Statistics

Table 2 presents an overview of the descriptive statistics and correlations for all the team-level variables of the study, as well as the two control variables mentioned above (membership tenure and team size). It is possible to observe that the four team variables of the model (team performance, shared leadership, team psychological safety and team identification) have a mean higher than the center of the 7-point Likert scale that was used in the survey. Indeed, the values range from 5.50 to 5.55, which points towards a non-normal distribution, skewed to the right. Nevertheless, this is minimized by using the bootstrapping method as it was mentioned before. Moreover, regarding the standard deviations all variables present relatively low values, between .59 and .86, meaning that all the answers tend to be close to the mean. When it comes to the control

variables, membership tenure (in years) presents a mean of 6.39 and a standard deviation of 5.15, which can tell us that most people have been working with the same teams around 6 years. Team size presents a mean of 11.59 and a standard deviation of 11.70, meaning that the team size varies substantially, but in average teams are composed by eleven people.

Furthermore, Table 2 also illustrates the correlations of the four variables of the model plus the two control variables mentioned above. In fact, it can be observed that team performance is positively related with shared leadership ($r = .64$ $p < .01$) and not statistically significant with team psychological safety ($r = .17$, $p = .387$). Moreover, team identification shows a positive high correlation with both shared leadership and team psychological safety as $r = .58$, $p < .01$ and $r = .65$, $p < .01$, respectively. Lastly, it is possible to see that none of the control variables, membership tenure and team size, show significant correlations between them and with any of the four main variables in the current conceptual model.

Table 2. Descriptive Statistics and Intercorrelations

	Mean	***SD***	**1**	**2**	**3**	**4**	**5**	**6**
Control Variables								
1. Membership Tenure	6.39	5.15	-					
2. Team Size	11.59	11.70	.11	-				
Model Variables								
3. Shared Leadership	5.55	.70	-.09	.12	(.94)			
4. Team Psychological Safety	5.50	.59	.14	-.01	.59*	(.73)		
5. Team Identification	5.52	.86	.22	.17	.58*	.65*	(.91)	
6. Team Performance	5.61	.65	-.21	-.13	.64*	.17	.10	(.87)

Note. n=27 teams. *$p < .01$
Internal consistency coefficient statistics (Cronbach's alpha) are on the diagonal in parenthesis.
SD = Standard Deviation

Simple Mediation Analysis

A simple mediation analysis for this study was conducted by using the PROCESS macro model 4 developed by Hayes (2013). Indeed, this allowed to deconstruct the model into the conceptual diagram represented in Figure 2, where the direct, indirect and total effect were analyzed, representing Hypothesis 1 (direct effect) and Hypothesis 2 (total effect).

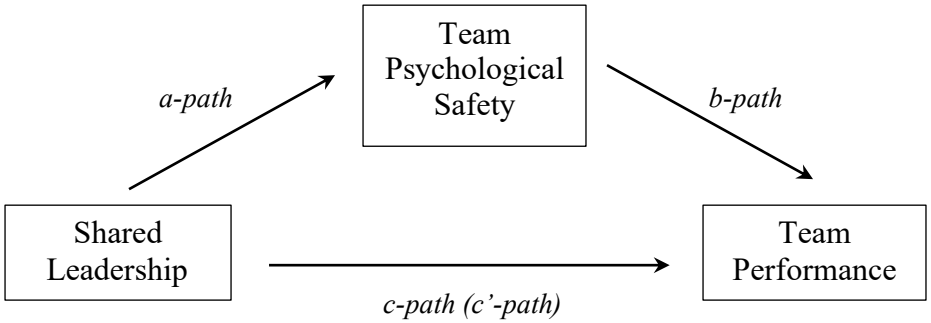

Figure 2. Statistical diagram of the simple mediation model (Hayes, 2013).

Table 3 below presents the results of these three different paths. The association of shared leadership and team performance is analyzed by the c-path and corresponds to the first Hypothesis of this study. Then the association between shared leadership with team psychological safety and team psychological safety with team performance is represented by a-path and b-path respectively. Even though these two paths do not correspond to any of the hypothesis of this research is important to observe them in order to understand the overall mediation result that corresponds to the second Hypothesis of this study.

To begin with, the total effect of shared leadership on team performance (*c-path*) is significantly positive, as the linear regression model shows a good fit (adjusted $R^2 = .48$). Hence, this means that the model explains roughly 48% of the observed variance of team performance (p

< .01). Indeed, shared leadership has a positive significant impact on team performance (β = .61, $t(23) = 4.29$, $p < .001$). Thus, Hypothesis 1 is supported.

In second place, by observing the results in table 3 for the *a-path*, the findings show that there is a significant relationship between shared leadership and team psychological safety. Once again, the linear regression model shows a good fit with an adjusted $R^2 = .35$ ($p < .05$), meaning that the model explains about 35% of the observed variance of team psychological safety. In fact, shared leadership has a significant positive impact on team psychological safety (β = .49, $t(23) = 3.42$, $p < .01$). Regarding the last model where both the *c'-path* and the *b-path* are analyzed, it also shows a good fit with an adjusted $R^2 = .53$ ($p < .01$). However, even though *c'-path* presents a positive relationship between shared leadership and team performance (β = .77, $t(22) = 4.54$, $p < .001$), *b-path* displays a relationship between team psychological safety and team performance that is not statistically significant (β = -.32, $t(22) = -1.60$, $p = .1245$). Consequently, the indirect effect of shared leadership on team performance through team psychological safety is not statistically significant. Indeed, this conclusion is also illustrated as the bootstrap values between the upper and lower limits of the study do include zero (β = -.16 and [95% CI = -.35, .26]). Hence, as the mediation is not significant Hypothesis 2 is not supported.

Table 3. Regression Results for Simple Mediation.

Model Summary	R^2	$F_{(3,23)}$	p		
Outcome: Team Psychological Safety	.35	4.07	.019		
Predictors	β	*SE*	*t*	**LLCI**	**ULCI**
Constant	2.71**	.82	3.30	1.01	4.40
Shared Leadership (*a-path*)	.49**	.14	3.42	.20	.79
Membership Tenure	.00	.02	.22	-.04	.04
Team Size	.00	.01	.25	-.02	.02

Model Summary	R^2	$F_{(4,22)}$	*p*		
Outcome: Team Performance	.53	6.20	.002		

Predictors	*β*	***SE***	***t***	**LLCI**	**ULCI**
Constant	3.31**	.95	3.47	1.33	5.29
Shared Leadership (*c'-path*)	.77***	.17	4.54	.42	1.12
Team Psychological Safety (*b-path*)	-.32	.20	-1.60	-.73	.10
Membership Tenure	-.02	.02	-.82	-.05	.02
Team Size	-.01	.01	-1.23	-.03	.01

Model Summary	R^2	$F_{(3,23)}$	*p*		
Outcome: Team Performance	.48	6.95	.002		

Predictors	*β*	***SE***	***t***	**LLCI**	**ULCI**
Constant	2.45**	.81	3.02	.77	4.12
Shared Leadership (*c-path*)	.61***	.14	4.29	.32	.91
Membership Tenure	-.02	.02	-.87	-.06	.02
Team Size	-.01	.01	-1.28	-.03	.01

Indirect Effects of SL in TP	*β*	***BootSE***	**BootLLCI**	**BootULCI**
Team Psychological Safety	-.16	.15	-.35	.26

Note. n = 27 teams. *$p < .05$ **$p < .01$ ***$p < .001$
SL = Shared Leadership
TP = Team Performance

Simple Moderation Analysis

Figure 3 shows the moderation path in this specific research. Table 4 shows the results for the moderation hypothesis. The results show that team identification has a main effect on team psychological safety ($\beta = .42$, $t(21) = 2.10$, $p < .05$) but shared leadership has not ($\beta = .22$, $t(21) = 1.29$, $p = .2120$). The interaction effect of shared leadership and team identification on team psychological safety is insignificant as $\beta = .09$, $t(21) = .51$, $p = .6162$. Indeed, the bootstrapped

confidence intervals in this interaction include zero, meaning that the moderation in this conceptual model, Hypothesis 3, is not supported.

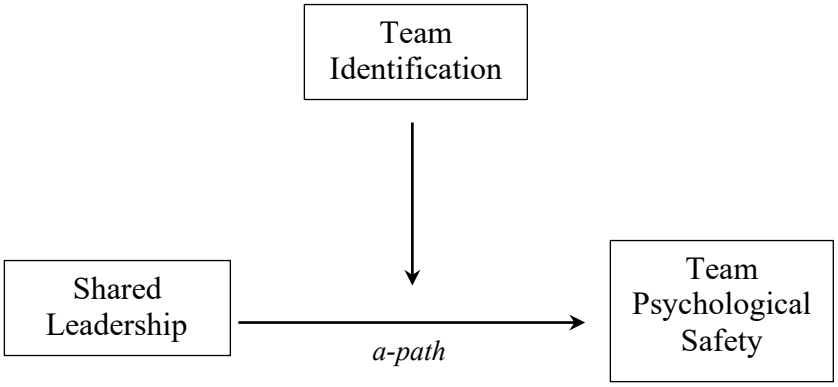

Figure 3. Moderation test paths (Hayes, 2013).

Table 4. Regression Results for Simple Moderation.

Model Summary	R^2	$F_{(5,21)}$	p		
Outcome: Team Psychological Safety	.50	4.20	.0084		
Predictors	β	***SE***	***t***	**LLCI**	**ULCI**
Constant	5.54***	.17	31.95	5.18	5.91
Shared Leadership	.22	.17	1.29	-.14	.58
Team Identification	.42*	.20	2.10	.00	.83
SL x TI	.09	.17	.51	-.26	.43
Membership Tenure	-.01	.02	-.66	-.05	.03
Team Size	.00	.01	.07	-.02	.02

Note. n = 27 teams. *$p < .05$ **$p < .01$ ***$p < .001$
SL = Shared Leadership
TI = Team Identification

Moderated Mediation Analysis

After analyzing both the mediation and moderation variables of the model, which showed us insignificant results, the last hypothesis of the conceptual model predicts a moderated mediation depicted in figure 4. Indeed, it is hypothesized that team psychological safety moderated by team identification mediates the association between shared leadership and team performance. In this way, table 5 presents the results, from which we can observe that both the confidence intervals of the conditional indirect effects of team identification for low [95% CI = -.35, .19], medium [95% CI = -.27, .22] and high [95% CI = -.28, .26] as well as the conditional interval of the index of the moderated mediation [95% CI = -.12, .23], do include zero. In this this way, it is possible to say that the statistical results are insignificant and do not show support for the previous mentioned moderated mediation and, hence, Hypothesis 4 is not supported.

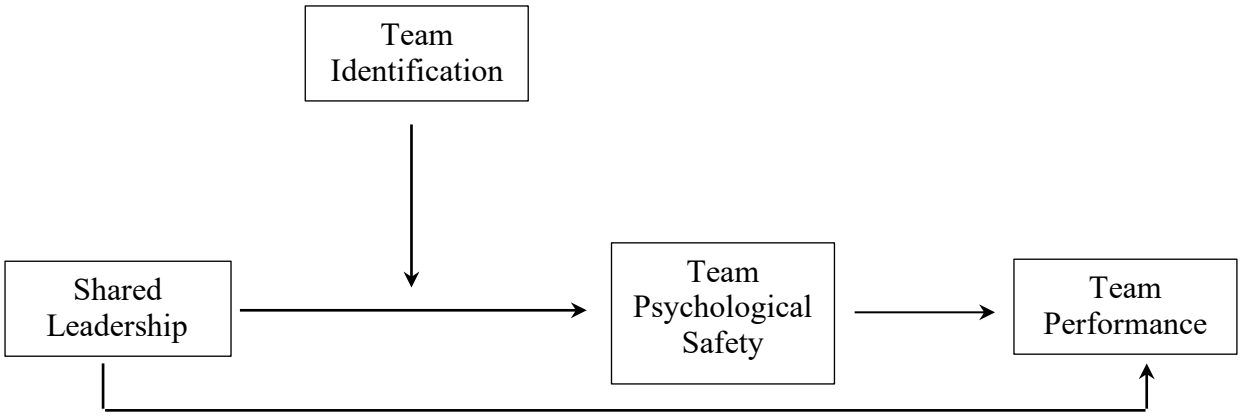

Figure 4. Moderated mediation model.

Table 5. Confidence Intervals of Indirect Effects and Index of Moderated Mediation.

Indirect Effects (SL -> TPS -> TP)		***β***	***BootSE***	**BootLLCI**	**BootULCI**
Team Identification					
(Low)	-.6058	-.05	.13	-.35	.19
(Medium)	.0608	-.07	.11	-.27	.22
(High)	.8108	-.09	.13	-.28	.26

Index of Moderated Mediation	***Index***	***BootSE***	**BootLLCI**	**BootULCI**
Team Identification	-.03	.08	-.12	.23

Note. n = 27 teams.
SL = Shared Leadership
TPS = Team Psychological Safety
TP = Team Performance

Discussion

General Discussion and Theoretical Implications

As a result of today's unpredictable and competitive business environment, organizations in order to succeed and achieve higher team performance need to adopt and implement internal team leadership (Carson et al., 2007). Indeed, the growing complexity of tasks and the increasing need to innovate and create new things, makes it really difficult for one single leader to be in charge and solve all the problems (Day, Gronn, & Salas, 2004). In this way, the primary objective of this study was to extend our knowledge on the relationship between shared leadership and team performance. Therefore, a conceptual model was developed and this relationship was analyzed indirectly through team psychological safety as a possible mediator. In addition, as the goal was to understand under which conditions that relationship would be stronger or weaker, team identification was analyzed as a potential moderator for the overall model. In sum, the main intent of this research was to improve and develop depeer prior findings by investigating why and when

shared leadership would lead to positive or negative team performance by considering specific and relevant contigencies and contextual factors.

As expected, the research results presented above showed us that shared leadership is indeed positively related to team performance. This goes in line with most of the previous empirical studies (e.g. D'Innocenzo et al., 2016; Hoch, 2014; Nicolaides et al., 2014; Pearce & Sims, 2002) and adds important insights to the shared leadership construct. In fact, as shared leadership is a recent phenomenon that has only been tested recently (Zhu et al., 2018), the results of this study allow to extend the existent literature in the way that no matter the type of industry or nationality, the relationship between these two variables seems to be always positive.

Moreover, in response to previous scholars' calls to explore the influence of shared leadership on team emergent states, which increase team performance (e.g. Carson et al., 2007; Han et al., 2017), the relationship between shared leadership and team performance through team psychological safety was tested. Nevertheless, even though the relationship between shared leadership and team psychological safety was found to be significant, the results indicated that team psychological safety does not mediate the relationship between shared leadership and team performance. This finding contradicts the assumption made by Liu et al. (2014) in which team psychological safety may act as a bridge that links shared leadership with possible outcome variables like team performance. In fact, even though psychological safety as an emergent state may play an important role in team performance, its effect may be indirect and possibly expressed through other variables like innovation or team learning (Faraj & Yan, 2009). Also, as shared leadership environments imply already some levels of trust, coordination and knowledge exchange amoung members, it may happen that in this model shared leadership and team psychological safety are evaluating similar dimensions and, as a result, the overall effect is insignificant. Another plausible explanation for the lack of support of team psychological safety as a mediator variable

is the presence of endogeneity bias, as this can misguide accurate inferences of the real impact of mediation on outcome variables (Beardsley, 2011). In fact, although multiple regression analysis assumes that the mediator is not caused by the dependent variable (Baron & Kenny, 1986), it is possible that in the current model team psychological safety and team performance are influencing each other simultaneously. This means that past performance can influence the way individuals respect each other and feel comfortable being themselves. For example, people who failed to perform well in the past may no longer be seen with equal respect when compared to other people who perform good, generating an environment with lower levels of trust. Thus, past performance has an impact on the current team psychological safety and can create the risk of reaching the wrong conclusions if not considered in the analysis (Zaefarian, Kadile, Henneberg, & Leischnig, 2017).

Lastly, the findings of the current study also showed that team identification does not moderate the relationship between shared leadership and team psychological safety neither the indirect relationship between shared leadership and team performance through team psychological safety. Despite the fact that previous findings indicate that team identification has an important influence in affective intragroup processes (Tanghe, Wisse, & Flier, 2010), defined as a shared pattern of affective states and possibly considered as an antecedent condition for people to feel phycological safe within their teams, the results of this research contradict these findings. One possible explanation for this may be that there are other conditions that together with team identification enhance or weaken the effect of shared leadership on team psychological safety such as task complexity or job variety. For example, when an employee is working within a team where shared leadership is promoted and he/she identifies with the team, it is possible that he/she may still not feel psychological safe to share his/her perspective if the task complexity goes behind their knowledge. Other explanation for the lack of support of team identification as a moderator is that

almost 50% of the respondents work in the Life Sciences & Health and Education industries, which are industries that struggle to implement and develop a shared leadership environment (Lindahl, 2008; McAlearney, 2005). Consequently, this makes it more difficult for individuals to take responsibilities and exchange knowledge (Wang et al., 2013), which in the end will lead members to have lower levels of both team psychological safety and team identification. Besides all these previous explanations, these findings may also be explained due to some of the limitations present in this study, which will be explained better in a further section.

Practical Implications

This research suggests several implications for management that can help companies to improve their internal processes and become more successful. To begin with, as the findings of this study showed, shared leadership proved to be an important predictor of team performance in every industry sector analyzed. As so, organizations should strongly support the emergence of shared leadership, by, for example, organizing team building exercises to give the opportunity for people to get to know each other and increase the levels of trust, or setting expectations and encourage team members to see both themselves and their colleagues as potential leaders. Besides this, organizations could also provide trainings that fosters this perspective of shared leadership in order for their employees interiorize them as "best practices" (Carson et al., 2007).

Furthermore, nowadays, one of the biggest challenges that organizations are facing is how to manage the interpersonal threats inherent in employees that constrain organizational learning and performance (Edmondson & Lei, 2014). Consequently, despite the lack of support of team psychological safety as a mediator and team identification as a moderator, their direct relationship with shared leadership was found to be positive. This indeed can bring some useful implications for companies like the importance of creating environments where people do not feel threaten or ignored and feel safe to speak up, ask for help and give feedback. For example, instead of

individually fixing problems and finding solutions for challenges that come up at work, employees should speak up and question how and why the problem occurred in the first place, in order to avoid other members of the team to face similar situations. Indeed, because these behaviors encompass interpersonal risk, team psychological safety is crucial to enable them (Edmondson & Lei, 2014) and, thus, should be highly promoted by organizations. Besides this, companies should be encouraged to organize events that promote positive team emotional experiences, as in today's businesses most of the communication within teams is made through nonpersonal media. In this way, not only the team identification levels would increase, but also the number of misunderstands, stress and conflict would decrease.

Limitations and Future Research

Like every research, this study presents several limitations that need to be acknowledged in order to help future researchers. In first place, due to time constraints and in order to achieve a reasonable response rate, the sample used was gather through personal contacts and networking connections. Consequently, and even though it considered several industries and nationalities the sample is not representative of whole population. In this way, future research could reproduce this study gathering a random, bigger and more diverse sample to guarantee more reliability within the results.

In second place, another issue had to do with the cross-sectional design of the study that only allowed to analyze the data at a specific point in time (Burns & Burns, 2008). Indeed, this brought two main limitations. On the one hand, it did not take into account that time factors might have influenced the results of the conceptual model. For example, the levels of team identification and team psychological safety within teams might vary depending on the assigned task or at different levels of stress and workload. Therefore, it would be interesting for future researchers to collect data from the same teams at multiple moments in order to evaluate the potential differences

in the above-mentioned variables. On the other hand, the cross-sectional design did not allow for casual inferences, meaning that changes in the dependent variable, team performance, might stem from other impactful variables. Thus, future research should implement longitudinal studies in order to understand better the causal relationships between the investigated concepts.

Moreover, the variables within the conceptual model were all aggregated to a team level construct, by averaging of the subjective scores of each member individually. In this way, it could be argued that the measure of shared leadership, for example, did not allow to understand precisely whether the leadership style came equally from the team as a whole, or if it was driven by some individuals more than others. Future research could find a way to complement the individual perceptions by also measuring the variables in an objective manner (e.g. through external observers).

Lastly, the fact that all the answers were self-reported and that every participant fulfilled the same questionnaire may have created problems of common method variance, evidenced by fake internal consistency values. In order to avoid this type of bias, future research could develop a more complex model and design the questionnaire mixing the order of the questions and using different scales types (Chang, Witteloostuijn, & Eden, 2010). For example, in teams where the formal leader is involved, he/she could answer questions only about team performance, while the rest of the team members could respond to questions regarding their empowerment levels and how encouraged they are to take on leadership responsibilities.

Apart from the above discussed limitations, this study provides several other opportunities for future research. First of all, it could be interesting for future researchers to focus more deeply on the nature of shared leadership, its development and boundary conditions. Nowadays it is clear that relying on more than one leader can be effective on the overall performance (Carson et al.,

2007). However, there are many different leadership styles that the formal leader can adopt while still pursuing a shared leadership approach, such as directive, transactional, transformational and empowering. In this way, it could be interesting to observe one specific style as a boundary condition and analyze how it could influence the relationship between shared leadership and team performance. In addition to this, the boundary conditions such as task competence, task interdependence, task complexity and cultural values should also be examined as they allow shared leadership to be effective (Pearce & Conger, 2003).

Furthermore, it could be interesting to include in the model some predictors of shared leadership, such as team environment, team personality, team integrity (Zhu et al., 2018). In fact, teams that have strong collective beliefs and in which individuals are empowered and have more autonomy are more likely to develop and implement shared leadership (Carson et al., 2007). Besides this, teams with higher levels of extraversion, agreeableness, openess to experience and emotional stability are also more likely to promote environments where shared leadership can succeed (Zhu et al., 2018).

In last place, other potential mediating mechanisms that link shared leadership to team performance should be explored as well. For instance, Nicolaides et al. (2014) found that team confidence mediated the relationship between shared leadership and team performance, as the levels of trust within the team are higher and, as so, it facilitates knowledge sharing resulting in higher performance. Moreover, Hiller et al. (2006) findings suggest that when team members engage in leadership roles, then the levels of collectivism are higher, which in turn enhanced team performance.

Conclusion

"Individually, we are a drop. Together, we are an ocean." (Ryonosuke Satoro)

Times are changing and so is the perception of leadership. As we saw throughout this paper and as Satoro mentioned in the quote cited above, organizations are focusing more and more in teamwork to succeed. In reality, over the last few years, shared leadership has called the attention for both researchers and companies due to its positive results and organizational impacts. As so, this research focused on studying closer the direct effect that shared leadership produced on team performance, as well as, the indirect effect between these two variables through team psychological safety for different levels of team identification. As expected, results indicated that shared leadership is positively related to team performance. However, and even though the relationship of both team psychological safety and team identification with shared leadership showed significant results, the mediation effect of former and the moderation effect of latter variable were considered insignificant. This gives scholars an opportunity to revise this study's assumptions and explore other contextual factors that may affect the initial relationship between shared leadership and team performance. To sum up, I hope this study was insightful not only for organizations, but also for researchers to further analyze and explore this recent topic of shared leadership.

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Appendices

Appendix A: Survey Items of Model's Variables

Team Performance

(1) We have high work performance.

(2) Most of our tasks are accomplished quickly and efficiently.

(3) We always set a high standard of task accomplishment.

(4) We always achieve a high standard of task accomplishment.

(5) We almost always beat our targets.

Shared Leadership

(1) As a team we clearly assign tasks.

(2) As a team we clearly communicate our expectations.

(3) As a team we provide each other with work relevant information.

(4) As a team we ensure that everyone knows their tasks.

(5) As a team we monitor goal achievement.

(6) As a team we take sufficient time to address each other's concerns.

(7) As a team we recognize good performance.

(8) We promote team cohesion.

(9) We support each other in handling conflicts within the team.

(10) As a team we never let each other down.

(11) We help each other to correctly understand ongoing processes in our team.

(12) As a team we help each other to learn from past events.

(13) As a team we help each other to correctly understand current company events.

(14) As a team we can inspire each other for ideas.

(15) As a team we support each other with the implementation of ideas.

(16) We use networks in order to support our team's work.

(17) We ensure that our team is supported with necessary resources to fulfill the task.

(18) As a team we assist each other to network.

(19) We establish contact with important experts valuable for our team.

(20) As a team we are open to external assistance in the case of internal team problems.

Team Psychological Safety

(1) If you make a mistake on this team, it is often held against you. (Reversely coded)

(2) Members of this team are able to bring up problems and tough issues.

(3) People on this team sometimes reject others for being different. (Reversely coded)

(4) It is safe to take a risk on this team.

(5) It is difficult to ask other members of this team for help. (Reversely coded)

(6) No one on this team would deliberately act in a way that undermines my efforts.

(7) Working with members of this team, my unique skills and talents are valued and utilized.

Team Identification

(1) Feel emotionally attached to their team.

(2) Feel a strong sense of belonging to their team.

(3) Feel as if the team's problems are their own.

(4) Feel like part of the family in their team.

Demographic Questions

(1) Gender

(2) Age

(3) Industry Sector

(4) What is your nationality?

(5) How long have you been a member of this team? (Membership Tenure)

(6) How many members does your team consist of? (Team Size)

Appendix B: ICC calculation through the conducted One-way ANOVA

Team Performance

ICC(1) = 1.185 – 0.646/1.185+((12.840-1)*0.646) = 0.057

ICC(2) = 1.185 – 0.646/1.185 = 0.455

Shared Leadership

ICC(1) = 1.738 – 0.523/1.738+((12.840-1)*0.523) = 0.144

ICC(2) = 1.738 – 0.523/1.738 = 0.699

Team Psychological Safety

ICC(1) = 1.539 – 0.445/1.539+((12.840-1)*0.445) = 0.151

ICC(2) = 1.539 – 0.445/1.539 = 0.711

Team Identification

ICC(1) = 3.029 – 1.078/3.029+((12.840-1)*1.078) = 0.116

ICC(2) = 3.029 – 1.078/3.029 = 0.644

Appendix C: Official Statement of Original Thesis

By signing this statement, I hereby acknowledge the submitted master thesis titled "How can team performance in organizations be promoted? A shared leadership framework mediated by team psychological safety and moderated by team identification." to be produced independently by me, without external help.

Wherever I paraphrase or cite literally, a reference to the original source (journal, book, report, internet, etc.) is given.

By signing this statement, I explicitly declare that I am aware of the fraud sanctions as stated in the Education and Examination Regulations (EER) of the SBE.

Place: Lisbon

Date: 3rd of January, 2019

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Course/Skill: Master Thesis

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