

Erasmus Mundus Joint Master's Degree in Work, Organizational and Personnel Psychology

*Trust, psychological safety and viability in work groups: team
psychological safety as a mediator between team trust and team viability*

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Abstract

The literature shows the relevance of trust in the achievement of group results (e.g., Costa, Roe & Taillieu, 2001; Kramer, 1999). This study aims to provide empirical evidence that helps in understanding the relationship between trust and viability, at the group level of analysis. Building on previous research showing positive relationships among these variables, the mediating role of team psychological safety in the relationship between team trust and team viability was analyzed.

The present study was conducted with a sample composed of 82 Portuguese work teams, and as data gathering method the questionnaire survey was used. A simple mediation model for each dimension of trust was tested. The results revealed that team psychological safety does mediate the relationship between team trust and team viability. Psychological safety fully mediates the relationship between team affective trust and team viability and partially mediates the relationship between team cognitive trust and team viability. Therefore, on one hand, the results suggest that affective team trust is related with team viability through a team psychologically safe climate and, on other hand, that cognitive trust influences team viability directly, but also indirectly, via team psychological safety.

Overall, the present study contributes in expanding the knowledge about why team trust is related to team viability. At an intervention level, our results suggest that team managers and leaders should adopt strategies to develop team psychological safety, in order to increase the team viability.

Keywords: team trust, psychological safety, group viability

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In the twenty-first century, most organizations seek to achieve their goals by having people work together in teams¹ (Edmondson, 2004; Porter & Beyerlein, 2000; Rousseau & Aubé, 2010). This way of organizing and managing work has drawn managers and the scientific community to deepen their understanding of the relationship between team functioning and team results.

Recent research (Baker, 2016; Cogswell, 2018, Markon, Chiochio & Fleury, 2017) that attempts to analyze the complex relationships between group processes (interactions among team members), emergent states (cognitive, affective and motivational states which are product of those interactions) and team outcomes has framed their work within explanatory models, such as the IMOI model (Input, Mediator, Output, Input) proposed by Ilgen, Hollenbeck, Johnson and Jundt (2005). This model recognizes the complexity of group functioning and “reflects the broader range of variables that are important mediational influences with explanatory power for explaining variability in team performance and viability” (Ilgen et al., 2005, p. 520).

Within that framework, we want to analyze the relationships between team trust, team psychological safety, and team viability. The first refers to “the aggregate perception of trustworthiness that team members have about one another” (Langfred, 2004). Secondly, psychological safety is the shared belief that the team represents a safe environment for interpersonal risk-taking (Edmondson, 1999). Lastly, team viability, which can be conceived as the capacity/ability of a team to adjust to changes and its probability to continue to function as a team in the future (Aubé & Rousseau, 2005; Hackman, 1987).

Once considered the different frameworks that could be used to approach this research topic, we concluded that the IMOI model is the most adequate. Developed by Ilgen et al. (2005) and Kozlowski and Ilgen (2006)², the IMOI model distinguishes between group processes and group emergent states. Marks, Mathieu and Zaccaro (2001) describe the first as “members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward organizing taskwork to achieve collective goals” (p. 357). On the other hand, group emergent states are “cognitive, motivational, and affective states of teams”

¹ Following other authors, (e.g., Mathieu, Hollenbeck, van Knippenberg & Ilgen, 2017), the terms group and team will be used interchangeably.

² The research team is aware that McGrath's (1964) proposed I-P-O model (*input, processes, outputs*) could also have been a good framework for this study. However, the fact that we consider team trust and team psychological safety as group emergent states justifies our decision to utilize the IMOI model. Nonetheless, we acknowledge the limitations of our study in exploring the full cyclical potential of this approach (namely, the *cross-sectional* nature of the study).

(p. 357). According to them, emergent states have a dynamic nature, can influence each other, and interact with group processes and team outcomes (e.g. team viability). Additionally, Ilgen et al. (2005) and Kozlowski and Ilgen (2006) underscore that emergent states can be mediators, which are a set of psychosocial mechanisms that enable team members to successfully use resources to achieve the team's objectives. Thus, our research analyzes the relationships among two different emergent states (team trust and team psychological safety) and a team result, namely team viability (which is considered as a team effectiveness criterion). Considering the relationships found in the literature regarding the referred constructs, this research aims to test a mediation model that includes team trust as the input variable, team psychological safety as a mediator, and team viability as the output.

To achieve the referred objective, i.e., analyzing the direct and indirect relationships between team trust (affective and cognitive components) and team viability, considering psychological safety as a mediating variable, in the first section of this work we present a literature review to conceptualize the variables and acknowledge the relationships among them.

After this, the Objectives and Research Hypotheses will be introduced, followed by the Method, a characterization of the sample, the procedures used to collect the data, the instruments and the chosen Statistical Data Treatment. In the following stages of this thesis, we will present the Results and Discussion.

Finally, we will summarize the main findings and its implication in terms of research and intervention, pointing also the main limitations and suggestions to further research.

State of Art

Team Trust

Authors recognize that an organization's survival depends largely on its ability to instill and maintain perceptions of mutual trustworthiness between its members. Otherwise, if the distrust becomes too significant, some of the workers will take their trust with them and leave the organization to perish (Kramer, 1999).

Work teams are at the core of many organizations nowadays (Rousseau & Aubé, 2010). Costa (2003) considers them performing organizational units, which means they are groups within a determined organization and who have a goal in common, hence they collaborate to achieve it and individuals in a team are partially responsible for it. Additionally, "there is

sufficient task interdependence such that individuals need to develop shared understandings and expected patterns of behavior” (p. 606).

Cohen and Bailey (1997) define a team as: “A collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems (for example, business unit or corporation), and who manage their relationships across organizational boundaries” (p. 241). By interacting with each other, team members share interpersonal information which contributes to form team trust (Peñarroja, Orengo, Zornoza, Sánchez & Ripoll, 2015).

Many definitions of trust have been proposed over the course of history. In this section we will go over the definition of trust, first revising it on the individual level, followed by the group-level of analysis.

In broad terms, one of the most common definitions for trust is that of Mayer, Davis and Schoorman (1995) who consider it the “willingness to be vulnerable”. McAllister (1995), for his part, considers it to be the “extent to which a person is confident in, and willing to act based on, the words, actions, and decisions of another” (p. 25). In the same line, after a thorough revision of diverse conceptualizations, on an individual level, Costa et al. (2001) propose the following:

“Trust is a psychological state that manifests itself in the behaviours towards others, is based on the expectations made upon behaviours of these others, and on the perceived motives and intentions in situations entailing risk for the relationship with those others.” (p. 228).

For these authors (Costa et al., 2001), trust is conceived as an attitude held by someone, regarding another individual or group. Consistent with such conceptualization, Kramer (1999) argues that trust is indeed essentially a psychological state. Differently to the previously mentioned authors, Lewis and Weigert (1985) emphasize that trust is, fundamentally, a process of discriminating between trustworthy, distrusted or unknown. Therefore, it constitutes a choice.

Whereas some definitions of trust focus on the trusting person’s expectations for positive behavior on the trustee (e.g., Lewis & Weigert, 1985), some definitions rely on an individual’s willingness to be vulnerable with regard to others (e.g., Mayer et al., 1995). Grichanik (2014) explains that the multiplicity of conceptualizations is due to trust being a

topic of interest for sociology, economy, psychology and most importantly for this regard, organizational psychology.

Despite the diversity of trust conceptualizations, the approach proposed by McAllister (1995) and Lewis and Weigert (1985) is one of the most referred in the literature (e.g., Costa, 2003; Costa & Anderson, 2011; Mayer et al., 1995). According to those authors, trust encompasses two components: affection and cognition. Cognition-based trust is conceived as a fact-based decision, grounded in knowledge of reasons for the other to be trusted. So, McAllister (1995) explains that for a decision to be considered trusting, the amount of knowledge that carries such decision lies somewhere between total knowledge and total ignorance: given total knowledge, there is no need to trust, and given total ignorance, there is no basis upon which to rationally trust.

Complementarily, the authors explain that affective trust, which “creates a social situation in which intense emotional investments may be made” (Lewis & Weigert, 1985, p. 970), is determined by the existing emotional link between the individuals. According to McAllister (1995), the emotional ties that link individuals provide enough basis for trust.

At a group level (the level of analysis of the present paper) team trust can be defined as proposed by Langfred (2004) as “the aggregate perception of trustworthiness that members have about one another”. According to Grichanik (2014), who adapted to a team level the unidimensional model proposed by McAllister (1995), team trust involves affective and cognitive bases (i.e., is a two-component construct). The referred author considers that this construct refers to the perception by team members of openness to share ideas, feelings, and concerns, of the expectation to receive support and understanding, as well as the recognition of the professional competence of team members (Dimas, Alves, Lourenço, & Rebelo, 2016). Still, according to Grichanik (2014), when trusting relationships are absent within a group, one can observe a tendency towards ineffective employment of their resources. The former premise suggests that both components of team trust are relevant to the functioning and effectiveness of teams.

Finally, it should be noted that the literature emphasizes that the generalized perceptions of trust that members of a given team have regarding their colleagues clearly reflect the fact that trust, at the group level, can be conceived as an emergent state of the team characterized by the acceptance of vulnerability, which is, in turn, based on positive expectations regarding

the behaviors, conduct and intentions of the others (Costa, 2003; Mayer et al., 1995; Peñarroja et al., 2015)

Effects of team trust on psychological safety and team outcomes.

In the present section, we will explore empirical evidences that suggest that trust is related to group processes and other group emergent states and is relevant in obtaining certain team and organizational outcomes.

Trust is considered a crucial aspect of the functioning of teams in organizations (Costa et al., 2001). For instance, Breuer, Hertel and Hüffmeier (2016) identified a positive relationship between team trust and practices of cooperation and coordination within teams, which simultaneously showed a positive relationship to team effectiveness. In the same way, Swift and Hwang (2013) found a positive relationship between affective trust and team member's willingness to share their knowledge with coworkers, and Casimir, Lee and Loon (2012) pointed to the moderator role of affective trust in the relationship between affective commitment and knowledge sharing.

Finally, and namely regarding team psychological safety, Kahn (1990) showed that interpersonal relationships characterized by support and trusting behavior promote a climate of psychological safety. Similarly, Edmondson (2004) mentions that leader behavior such as accessibility, and some group emergent states, including team trust, are precursors of psychological safety (May et al., 2004).

As Costa and collaborators (2001) explain, positive outcomes can also arise when trust is present in work teams. Indeed, research (e.g., Aubé & Rousseau, 2005; Costa et al., 2001; Kramer, 1999; Langfred, 2000, 2004; Schaubroeck, Lam & Peng, 2011) has shown that trust in work teams has a significant impact on the team outcomes, i.e., in team effectiveness in its several components. In this context, McAllister (1995) found a positive relationship between the behavioral consequences of trust and the supervisor's assessment of performance. Furthermore, both dimensions of trust have shown to have a strong positive relationship with team planning, solving problems and continuous improvement in quality, as criteria of performance (Erdem & Ozen, 2003).

In the same way, Costa (2003), for example, found a positive correlation between team trust and team performance and team satisfaction and emphasizes that these relationships

support the notion that trust is highly relevant for the proper functioning of teams in organizations.

Similarly, Schaubroeck et al. (2011) identified that both affect-based and cognition-based trust in team leader's may contribute to engage teams and "unlock their potential" to use their capacity to perform more effectively, and Morgan and Hunt (1994) showed that the presence of trust in teams diminishes people's intentions to leave the teams/organization, pointing to the positive relationship between team trust and team viability which is one of the relationships under study in the present research.

In this regard, it should be noted that DeOrtentiis, Summers, Ammeter, Douglas and Ferris (2013) explain that there exists "extant research on the team trust-team effectiveness relationship indicating that greater specificity was needed in developing a more informed understanding of this relationship and how it operates" (p. 533). They add that this relationship seems to be "more complicated than previously conceived and might suggest the presence of mediators or intermediate linkages in this relationship, yet little work has been done in this area to date" (p. 526). We draw on the empirical evidence and the conclusions of DeOrtentiis et al (2013) to fundament our interest in exploring the mediating role of team psychological safety in the relationship between team trust and team viability.

Team Psychological Safety

Psychological safety is described as the feeling of freedom "to show and employ one's self without fear of negative consequences to self-image, status or career" (Kahn, 1990, p. 708). In the words of Edmondson (2004) it describes an intrapsychic state "related to interpersonal experience" (p. 3) that implies that a given individual feels safe to put themselves on the line in a set context. In the workplace, examples of this would be asking questions, proposing new ideas, requesting feedback or reporting a mistake (Edmondson, 2004).

Edmondson (2002) clarifies that psychological safety "describes a climate in which the focus can be productive discussion that enables early prevention of problems" whereas cohesiveness has been shown in some cases to "reduce the willingness to disagree and challenge other's views" (p. 7), a phenomenon that was coined "groupthink" by Janis in 1972.

The study of psychological safety at the group level of analysis started with research by Edmondson in which she found significant differences in the climate of psychological safety

between groups within the same organizations (Edmondson & Lei, 2014). Even when these shared a strong organizational culture, the perceptions of psychological safety varied across teams (Edmondson, 2002, 2003). This variance between groups in the same organization can be attributed to the behavior of managers and leadership, which may convey different messages about the consequences that interpersonal risk-taking may have. Hence, the authors argue that this is essentially a group-level phenomenon (Edmondson & Lei, 2014).

Since this research is at the team level of analysis, it's convenient to examine what the literature has to say about psychological safety on this range. For team psychological safety to be a group-level construct, it must characterize the team rather than individual members of the team, and team members must hold similar perceptions of it (Edmondson, 1999). In sum, it is defined as the shared belief that the team is safe for interpersonal risk-taking (Edmondson, 1999).

Edmondson (2004) argues that perception of psychological safety is generally similar among people who work together "such as members of an intact team, both because team members are subject to the same set of contextual influences" (p. 5) and because these perceptions originate from relevant shared experiences.

Psychological safety creates the conditions for team members to feel safe to risk suggesting a new idea, pointing to a mistake that has been made or admitting their own errors without fear of severe repercussions.

It should be noted that, as Edmondson (2004) explains, team trust and team psychological safety cannot be confounded. According the referred author the focus of trust is on the *other*, while psychological safety focuses on the *self*. This way, trust is equated to giving others the benefit of the doubt and psychological safety would equate to feeling that others will give you the benefit of the doubt. Another difference emphasized by Edmondson (2004) is that psychological safety is a construct that is restricted to a narrower and shorter time frame when compared to trust.

Team psychological safety shows relationships with several aspects of group functioning such as team learning (Edmondson, 1999; 2002; 2004; Pisano, Bohmer & Edmondson, 2001) and team work engagement (May, Gilson & Harter, 2004) and also with team results like employee's efforts aimed at quality improvement (Nembhard & Edmondson, 2006). In this regard, Kramer (1999) says that, at the group level, it has been shown that psychological safety affects performance and further team outcomes, suggesting the relevance

of new studies concerning those relationships, which reinforces the importance of the present study in which we consider that team psychological safety directly relates to team viability.

Effects of team psychological safety on team viability.

Team viability is the enhancement of a team's ability to continue to be a team in the future (Aubé & Rousseau, 2005; Hackman, 1987; Rousseau & Aubé, 2010; Sundstrom, De Meuse, & Futrell, 1990). Hackman (1987) argues that "the social processes used in carrying out the work should maintain or enhance the capability of members to work together on subsequent team tasks" (p. 323). This implies that the integrity of the group as a performing organizational unit must be sheltered so the unit can prosper.

On a similar vein, Bell and Marentette (2011) elaborate that viability in a work group constitutes the "capacity for the sustainability and growth required for success in future performance episodes" (p.279) thus suggesting that team viability concerns the tendency and probability of the group for continuity over time. Therefore, regarding the model of the present study, team viability will be conceived as a team outcome that comprehends the capacity of team members to adapt to changes, whether internal or external, and the probability that they will continue to work together in the future (Aubé & Rousseau, 2005; Hackman, 1987; Mathieu, Maynard, Rapp, & Gilson, 2008).

Team viability is just one of several criteria of team effectiveness. The researchers who have been working on team effectiveness domain (e.g., Hackman, 1987; Kozlowski & Ilgen, 2006) have defined the latter with regard to the degrees and level of attainment of the organizational goals previously established.

Hackman (1987) mentions that the traditional way of measuring this was based solely on the productivity (task performance) of a team is unrealistic and that team effectiveness must be considered as a multidimensional construct. The above-mentioned author elaborates that effectiveness cannot be solely based on the completion of tasks. Contrary to participants in experimental research, real team members continue to interact after they complete a task, and that interaction - and emergent states that arise from it - can impact the group's willingness or capacity to work together. Thus, considering also social and personal criteria within the definition of effectiveness renders it much closer to the reality of the functioning of work groups.

Adopting that approach, nowadays researchers tend to define team effectiveness also in terms of team innovation, the quality of the experience from belonging to a team or the maintenance or team viability.

Although Psychological safety has been shown to be a precursor of several team functioning and team outcomes such as team learning or team work engagement, (Edmondson, 1999; 2002; 2004; May et al., 2004; Pisano et al., 2001), team creativity (e.g., Carmeli, Reiter-Palmon, & Ziv, 2010; Kark & Carmeli, 2009) or employee involvement in quality improvement efforts (e.g., Nembhard & Edmondson, 2006), there is a scarcity of empirical evidence linking psychological safety to team viability. However, in the study conducted by Ferreira (2017), which is, to the best of our knowledge, the only one linking directly team psychological safety and team viability, a positive relationship was found.

Other studies, although indirectly, also suggest that psychological safety can be an antecedent of team viability. Indeed, Baik and Zierler (2018), for example, found that psychological safety increases healthcare workers' accounts of job satisfaction which is considered by Grichanik (2014) as a proxy variable for viability. In the same way, Carmeli, Reiter-Palmon, and Ziv (2010) found evidences of team psychological safety being positively related with employee involvement, i.e., with a satisfactory and positive feeling related to work (Bakker & Leiter, 2010; Schaufeli, Salanova, González-Romá, & Bakker, 2002) which can be viewed as an indicator of a sense of belonging as well as of a desire to continue working together. On the same line, Aubé and Rousseau (2005) found a positive relationship between team goal commitment and three criteria for team effectiveness (team viability, quality of group experience and team process improvement) while analyzing supportive behaviors as a mediator. Although the focus of their study isn't that of psychological safety as conceptualized by us, supportive behaviors as conceptualized by the authors does share similarities with psychological safety, namely regarding the climate of cooperation and safety to rely on others and of freedom and confidence in asking for the help of others.

Finally, the study of Kruzich, Mienko and Courtney (2014) using constructs such as human resource primacy and intention to leave (this construct shares commonalities with our notions of what constitutes viability in a work group) showed that psychological safety is negatively related to turnover.

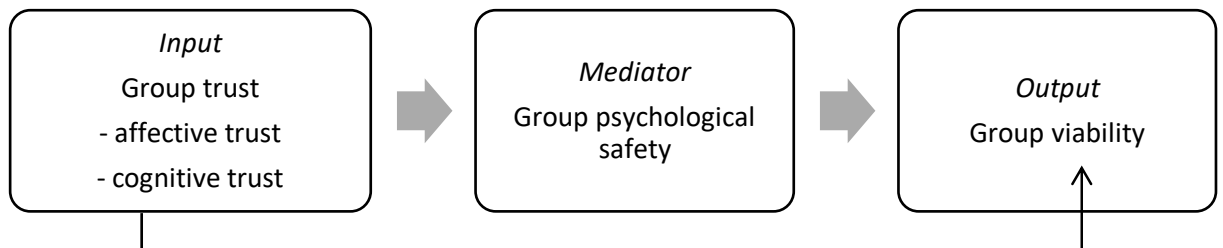
Objectives and Research Hypotheses

As we have shown, although the literature suggests that team psychological safety is a powerful precursor of team outcomes (e.g., Carmeli et al., 2010) and a consequent of team trust, at the same time, we identified a knowledge vacuum with regard to the mediating role of team psychological safety in the relationship between team trust and team viability. In fact, there are no studies analyzing the relationships among the three referred constructs in the same model. Therefore, we are interested in exploring the mediating role of psychological safety in the relationship between team trust and team viability.

Accordingly, the present research aims to analyze the direct and indirect relationships between group trust (its affective and cognitive components) and the group's viability while considering group psychological safety as a mediating variable. Thus, a model in which group trust will be the input variable, group viability the output variable, and the group psychological safety the mediating variable, will be tested (Fig. 1).

Figure 1.

Model under study



Accordingly, the following hypotheses will be tested:

- H_{1A}: Cognitive trust will be positively related to team psychological safety
- H_{1B}: Affective trust will be positively related to team psychological safety
- H₂: Psychological safety will be positively related to team viability
- H_{3A}: Psychological safety mediates the relationship between team cognitive trust and team viability
- H_{3B}: Psychological safety mediates the relationship between team affective trust and group viability

Method

This research is cross-sectional, non-experimental and the analysis is at a group level.

Sample

The sample is constituted by 82 work teams (including team leaders and team members) that belong to 57 different organizations, with an average of 6 members ($M = 6.41$), a standard deviation of 3.56, and a minimum and maximum of 3 and 18 members, respectively. The most represented organizations are small companies (42%). Most of these organizations belong to the service sector (72.5%), the rest are from agriculture (3.8%), industry (15.0%) and non-profit organizations (8.8%).

The criteria used for selecting the teams were: 1) teams must be constituted at least by 3 members; 2) the members perceive themselves and are perceived by others, as a team, and 3) the members interact regularly, in an interdependent way, to accomplish a common goal (Cohen & Bailey, 1997).

Regarding the team leaders, the sample is comprised of 82 individuals of which 57% are male 43% are female. The mean age and standard deviation of age are 42.16 and 10.86 years, respectively. The minimum and maximum ages are 20 and 66 years, correspondingly. Regarding their academic level, more than 50% of the leaders has a bachelor's degree or above (55.7%). All leaders were direct supervisors of the teams being responsible for team management and not performing the team daily tasks.

When it comes down to team members, 353 individuals comprise the sample. Of them, 67% identified as female and 33% as male. Their age ranges from 18 to 70 years, with an average of 38 years ($M = 38.10$) and a standard deviation of 12 years ($SD=12.33$). The academic level of 63.3% of the team members is at the high school graduate level or below, while 36.7% has a higher education level. On average, the members had been in their work teams for 5 years ($M= 5.52$, $SD= 7.25$) ranging from 0.3 and 46 years.

Data Collection Procedures

The sample was collected by convenience sampling method through in-person and electronic questionnaires between November and December of 2016 by members of the Successful Team Effectus Project (STEP), of the Faculty of Psychology and Educational Sciences of the University of Coimbra.

All participants provided their informed consent and the confidentiality and anonymity were guaranteed by the researchers. The research team also ensured not to make use of any individual results but exclusively at a group level. Where the questionnaires had to be applied online, e-mail addresses of participants were safeguarded.

Two instruments were used: one that was utilized to evaluate team effectiveness, namely team viability, which was responded by team leaders. The questionnaire facilitated to team leaders evaluated viability since it's considered that the leaders have a better sense of the changes that happen within their work teams, such as their ability to solve problems, to integrate new members and to continue to further work as a group (Ferreira, 2017).

The levels of trust and psychological safety were obtained from the questionnaire that was administered to the team members, given that these constructs are states (emergent states) shared by team members. Consequently, for that same reason, the aggregation of data was conducted to ensure that it represents the team level situation rather than individual-level impressions.

Measures

The questionnaires used are the adapted Portuguese versions of Trust in Teams Scale, originally developed by McAllister (1995) and subsequently adapted to the group-level by Grichanik (2014); the Team Psychological Safety scale, developed by Edmondson (1999); and the Team Viability scale by Aubé and Rousseau (2005).

Trust in Teams Scale

As we already referred, we used the Portuguese adapted version of the Trust scale (McAllister, 1995) which was later adapted by Grichanik (2014) for the group-level. The scale was translated and adapted to Portuguese language by I. Nascimento (2015) with a sample of college students. Later, R. Nascimento (2017) also analyzed the psychometric qualities of the scale with a sample of real work teams, which we are also using for this project (See Annex 1). In this research the version of R. Nascimento (2017) was used.

The original scale has ten items: the first five evaluate the cognitive dimension of trust and the following evaluate its affective dimension. The items are responded through a Likert-type scale (i.e. "My colleagues respond to the team's objectives in a professional manner..." for the cognitive dimension, and "In my team we can share our ideas, worries and strategies freely" for the affective dimension) ranging from (1) which corresponds to "Completely

Disagree” to (6), that corresponds to “Completely Agree”. In this scale higher values suggest that the team members trust each other. The study of R. Nascimento (2017), through Principal Component Analysis (PCA), led to the elimination of two items (one for each dimension) from the original scale, leaving the instrument with four items in each dimension: items 1 through 4, for the cognitive dimension, and 7 through 10, for the affective dimension. The solution obtained by R. Nascimento (2017) with the same sample that we use for this study explained a 73.41% of the variance in the sample and showed good internal consistency of the instrument in both components³: ($\alpha = .88$ for the cognitive dimension, and $\alpha = .87$ for the affective dimension of team trust). Also relevant is a posterior study by Bastos (2018), that reinforced the previous recommendations about the psychometric characteristics of the scale that we used. In that study, that worked with a sample of work teams with some degree of virtuality, the Cronbach Alpha for the cognitive and affective dimensions were .89 and .85, accordingly.

Team Psychological Safety

To measure this construct, we used the Portuguese version of the *Team Psychological Safety scale* developed by Edmondson (1999) and subsequently adapted to the Portuguese language by Ferreira (2017) for the same sample that we work with, in this study. The original scale is unidimensional and is comprised of seven items of which three are reverse (1, 3, and 5), and the participants responded to them in a Likert type response scale from (1) Very Inaccurate to (7) Very Accurate (See Annex 2). Some example items are “It is safe to take a risk in this team” and “Sometimes, members of this team will reject others because they are different”. The studies conducted by Ferreira (2017) regarding the adaptation to the Portuguese language lead to a change in the labels of the scale which were modified to range from (1) Does not apply to (7) Applies completely. Following this, the analysis of the structure of the scale, ran through a Principal Components Analysis lead to the exclusion of four items: the three reversed items because they loaded in a spurious factor, and item 6 because it showed commonalities below 0.40⁴. Hence, the final version of the scale is unidimensional, comprised of three items which explain 62.62% of the total variance, all with commonalities above .40 and factor loadings above 0.50. The obtained Cronbach α by Ferreira (2017) was of .70.

³ The reference for the values for the internal consistency of the scales is that these should be above .70 (Nunnally, 1978).

⁴The cut-off point of .40 is that proposed by Stevens (2009).

Team Viability

The *Team Viability Scale* (answered by the team leaders) was developed by Aubé and Rousseau (2005). The original scale is comprised of four items (e.g. “team members adapt themselves to changes in the workplace...” and “The members of this team could work together for a long period of time”). The items are responded through a Likert-type scale in which the lowest value (1) corresponds to “almost not applicable” and the highest level (5) corresponds to “applies almost completely”.

The scale was adapted to the Portuguese by Albuquerque (2016) (see Annex 3) who conducted a study of the structure of this scale through Principal Component Analysis (PCA). The results lead to the retention of one factor which explained 56.72% of the total variance, with all items loading above 0.68 and with commonalities above 0.47. The reliability analysis had a score of Cronbach’s α of .74, which according to Nunnally (1978) can be considered acceptable.

Confirmatory factor analysis (CFA) conducted by Martins (2016), Pessoa (2016) and Aniceto (2016) revealed a good adjustment of the data to a single-dimensional model ($\chi^2(2)=1.88$, $p=.392$, CFI =1.00, RMSEA = .000). In those studies, the internal consistency of the scale was .72. A similar score (.75) was obtained by Bader (2017), and Maia (2017). R. Nascimento (2017), who used the same sample as the one in the present study, obtained a Cronbach α (.68). Although this is a value close to that considered acceptable (.70), according to Nunnally and Bernstein (1994), it is low. Once the content of the items was analyzed, it was concluded that the third item (“The new members are easily integrated into this team”) was the least related to the underlying construct of the scale. This item had a low correlation (.33) and it was seen that its exclusion from the scale would increase the Cronbach’s alpha. Hence, we opted to eliminate it. Finally, the scale that we used is comprised of three items (1, 2 and 4 of the original version), with a Cronbach α of .73 and with correlations above .53.

Control Variable

Team size was included as a control variable since several studies show that team size affects group emergent processes/states and team outcomes (e.g., Hülsheger, Anderson & Salgado, 2009). The teams’ size was obtained from the team’s leaders.

Statistical Procedures

Although the data was collected at the individual level, the instructions for the participants specified that their answers were supposed to reflect the situation of their work team because the analysis is focused at the team-level. The data (for the Trust in Teams Scale and Psychological Safety Scale) was aggregated to the teams by means of computing the average scores obtained in each scale or dimension.

The research team used the Average Deviation Index developed by Burke, Finkelstein and Dusig (1999) to justify the aggregation of data and to ensure that the averages could be safely used. In this case, R. Nascimento (2017) calculated the AD_M for the *Trust in Teams Scale* and obtained a mean value of 0.49 for the affective component and 0.41 for the cognitive component, with a cut-off point of 1. On the other hand, Ferreira (2017) obtained an AD_M score of 0.80 (cut-off point of 1.17) for the *Team Psychological Safety Scale*. Considering that all the mean values obtained for the analyzed scales are below their respective cut-off points, and following the procedure proposed by Gamero, Gonzalez-Romá, and Peiró (2008), no teams were excluded, and it was regarded as safe to aggregate the data at the group level.

Additionally, to justify data aggregation, the intraclass correlation coefficients ICC (1) and ICC (2) (Bliese, 2000) were calculated. The ICC (1) values for Cognitive Trust, Affective Trust, and Psychological Safety were .20, .22 and .32, respectively. For ICC (2) the values were .53, .55 and .67, respectively. All the values are near the values considered acceptable (Bliese, 2000; LeBreton, & Senter, 2008), which supports the data aggregation to the team level.

Psychological Safety and Team Trust measures should also vary significantly between groups. Using one-way ANOVA (F), we found enough variance between the groups in the sample, for the latent variables that were aggregated at the group-level. The observed F value to Cognitive Team Trust was as follows: $F(81, 271) = 2.11, p < .001$. The observed F value to Affective Team Trust was as follows: $F(81, 271) = 2.22, p < .001$. Finally, the observed F value to Team Psychological Safety was: $F(81, 271) = 3.05, p < .001$. These results showed an adequate between-team discrimination of the three scales, and they supported the validity of the aggregated measure.⁵

⁵ In some teams, violations of the ANOVA assumptions were identified, namely regarding the normality of their distribution. To ensure that the ANOVA results were reliable, we also ran a non-parametric test (Kruskal-Wallis). The results were satisfactory and confirmed the inter-group variability.

The hypotheses were tested by means of simple mediation analysis. We used PROCESS, a macro for SPSS developed by Hayes (2013) to test the model of simple mediation. One simple mediation was executed for each of the dimensions of team trust. PROCESS allows using 5000 bootstrap estimates for the construction of 95% bias-corrected confidence interval for the indirect effects in simple mediation.

The indirect effect in simple mediation is calculated as the product of coefficients from the independent variable to the mediator and from the mediator to the dependent variable. Bootstrapping allows us to infer that the indirect effect is statistically significant when zero is not included between the lower and upper bound of the 95% bias-corrected bootstrap confidence interval generated by PROCESS.

Results

After analyzing the descriptive statistics, we went onto analyzing the correlations between our variables: Team Trust (in both its components), Psychological Safety and Viability, as well as our single control variable, team size, with the objective to understand the intensity and direction of the relationships between the variables.

The bivariate correlation analysis between our studied variables (Table 1) allows us to identify that the team size is not correlated to the variables under study.

Table 1.

Means, Standard Deviations and Correlations of the variables under study

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5
1. Team size	6.42	3.55	-				
2. Viability	4.12	0.67	-.21	-			
3. Cognitive trust	5.17	0.54	-.08	.40***	-		
4. Affective trust	5.06	0.61	-.10	.36***	.82***	-	
5. Psychological Safety	4.86	1.00	-.05	.42***	.49***	.60***	-

Note. *N*=82

*** $p < .001$.

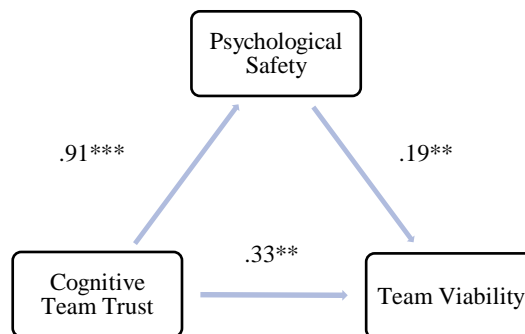
In contrast, we identified that viability is positively correlated to Cognitive Trust ($r=.40$, $p<.001$), as well as to Affective Trust ($r=.36$, $p<.001$) and Psychological Safety ($r=.42$, $p<.001$). According to Cohen (1988) its relation to both components of Team Trust and to Psychological Safety is of moderate effect size.

Affective trust was shown to be positively correlated with Psychological Safety ($r=.60$, $p<.001$). Likewise, cognitive trust was positively correlated with Psychological Safety ($r=.49$, $p<.001$).

To test the mediating effect, we followed the rationale of MacKinnon (2008). He argues that for a mediation to happen there must be a significant relationship between the independent variable and the mediating variable (path α). Second, the relation between the mediating variable and the dependent variable when controlling for the independent variable must be significant (path β). Finally, the product of those coefficients, the mediating effect ($\alpha*\beta$), must also be statistically significant. We verify this last requirement by checking the bootstrap confidence interval generated by PROCESS. When zero is not included between the lower and upper bound of the 95% bias-corrected bootstrap confidence interval we infer that the indirect effect is statistically significant.

Figure 2.

Mediation of Psychological Safety between Cognitive Team Trust and Team Viability



To test for our hypotheses, we conducted two simple mediations, as explained, one for each of the dimensions of Team Trust. Results for the mediation of Cognitive Team Trust can be seen in Table 2.

Table 2.

Mediation analysis for Cognitive Team Trust (PROCESS model 4)

DV / Predictor	b	SE	95% CI		R ²
			LL	UL	
Team psychological safety					.24***
<i>Cognitive team trust</i>	.91***	.18	0.55	1.28	
Team viability					.23***
<i>Team psychological safety</i>	.19*	.08	0.04	0.34	
<i>Cognitive team trust</i>	.33*	.14	0.05	0.62	
Indirect Effect	.17	.08	0.04	0.33	

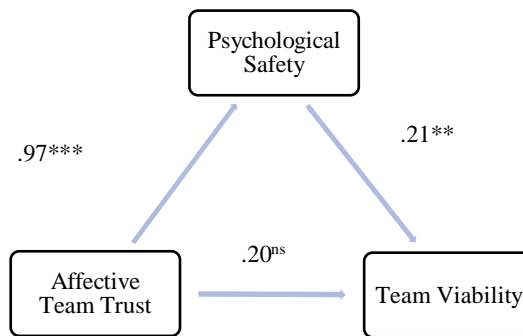
Note. $N = 82$. DV = dependent variable. b = non-standardized regression coefficient. SE = standard error. CI = confidence intervals. LL = lower limit. UL = upper limit. Interaction = mediated regression effect.

* $p < .05$, ** $p < .01$; *** $p < .001$, two-tailed.

The regression coefficient between Cognitive Team Trust (X) and Team Psychological Safety (M) was statistically significant ($a = .91, p < .001$), as was the regression coefficient between Psychological Safety and Team Viability (Y) when controlling for X ($b = .19, p = .014$), fulfilling the two first requirements according to MacKinnon (2008). We calculated the product of coefficients for paths α and β , which is also statistically significant ($\alpha * \beta = .17$; boot $SE = .08$, IC 95% = [.0387, .3341]), hence the mediated effect is statistically significant (MacKinnon, 2008). Finally, considering that the direct effect of X on Y is statistically significant ($c' = .33, p = .022$) we conclude that Psychological Safety partially mediates the relationship between Cognitive Team Trust and Team Viability. Considering these results, the hypotheses H_{1A} , H_2 and H_{3A} were supported.

Figure 3.

Mediation of Psychological Safety between Affective Team Trust and Team Viability



On the other hand, as one can observe in Table 3, the relationship between Affective Team Trust (X) and Team Viability (Y) was totally mediated by Team Psychological Safety (M).

Table 3.

Mediation analysis for Affective Team Trust (PROCESS model 4)

DV / Predictor	b	SE	95% CI		R ²
			LL	UL	
Team psychological safety					.36***
<i>Affective team trust</i>	.97***	.15	0.68	1.26	
Team viability					.19*
<i>Team psychological safety</i>	.21**	.08	.04	.38	
<i>Affective team trust</i>	.20	.14	-.08	.47	
Indirect Effect	.20	.09	.05	.40	

Note. $N = 82$. DV = dependent variable. b = non-standardized regression coefficient. SE = standard error. CI = confidence intervals. LL = lower limit. UL = upper limit. Interaction = mediated regression effect.

* $p < .05$; ** $p < .01$; *** $p < .001$, two-tailed.

The regression coefficient between Affective Team Trust and Team Psychological Safety was statistically significant ($a = .97, p < .001$). Likewise, the regression coefficient between Psychological Safety and Team Viability, when controlling for X was statistically

significant ($b = .21, p = .016$). The product of the two coefficients was statistically significant and, therefore, the mediated effect is statistically significant ($\alpha * \beta = .20$; boot $SE = .09$, IC 95% = [.0513, .3958]). Finally, the direct effect of X on Y (path τ) was not statistically significant ($c' = .20, p = .160$) which indicates there is a full mediation of psychological safety in the relation between affective team trust and team viability. Therefore, the hypotheses H_{1B} and H_{3B} were supported.

Discussion

The objective of the study was to analyze the relationship between team trust (in both of its components) and team viability while considering psychological safety as a mediating variable. We obtained results that are congruent with the reviewed literature and that support our hypotheses.

For H_{1A} and H_{1B} we found that Cognitive Team Trust and Affective Team Trust are both positively related to Psychological Safety. Research has shown trust to be a precursor to psychological safety (Edmondson, 1999, 2002). The rationale that the relationship of these two variables exists and is positive brings us back to the fundamental literature on the topic. For once Edmondson (2002) argues that they are distinct constructs. Trust refers to a more stable belief over time that other's actions will be beneficial to us and psychological safety mainly refers to the belief that the team is safe for risk-taking in crucial decision-points. In spite of the fact that the two variables can influence each other over the life cycle of a work team, the literature supports conceiving a model in which team trust is a predictor of psychological safety (May et al., 2014) given that trust pertains to the anticipation of consequences in a much wider temporal range, whereas psychological safety refers to the assessment of risk in "micro behavioral decision-points" (Edmondson, 2004, p. 4). Therefore, considering the literature in which we based the rationale of the model we studied, and the relationship hypothesized, although with caution, due the cross-sectional nature of our study, our results suggest that psychological safety can be a consequent of team trust.

Regarding H_2 , one of the epistemic gaps that we had identified was the exploration of the relationship between psychological safety and team viability. Nevertheless, the literature suggests a positive relationship between team psychological safety and team viability (e.g., Ferreira, 2017) and also tells us that psychological safety is positively related to other team outcomes which indirectly pointing to viability such as work engagement (May et al., 2004) or team satisfaction (Edmondson, 2003; McAllister, 1995). In our research, we observed that

psychological safety is related to team viability for both studied models (for Affective trust and for cognitive trust). Despite the scarce empirical knowledge that explores this relationship, it seems only predictable that an environment in which people feel it is safe to take risks and that enhances its capacity to have healthy dissensus and dialogue is a team with higher chances of further working.

When it comes to H_{3A} the results showed that regarding cognitive team trust, psychological safety partially mediates its relationship with team viability, which means that by itself cognitive trust has an impact on team viability. Therefore, our results suggest that team members' trust in one another's cognitive abilities (e.g., their level of professional competence) may be sufficiently determinant for one to continue to be part of that group. Maybe this result could be explained considering the nature of teams analyzed – work teams.

In fact, cognitive trust is based on the knowledge about task competences of the other members of the team and thus is more focused on task-related abilities which are required for the team goals. In work teams, when team members trust in the competences of each other, they tend to feel more comfortable regarding the achievement of the group goals increasing the desire to keep functioning as a group (Barczak, Lask & Mulki, 2010; Grossman & Feitosa, 2018; Wicks, Berman & Jones, 1999).

In contrast, we encountered a total mediating role of psychological safety regarding the affective component of team trust (H_{3B}). In this case, psychological safety totally conveys the influence of affective team trust on team viability. Therefore, affective team trust only has an indirect effect on team viability, through the mediating variable. Thus, we can say that a work group characterized by interpersonal care, concern for the well-being of the other, sharing of ideas and feelings of identification, is a work group where a social climate based on psychological safety is promoted. The psychological safety, in turn, increases the desire of team members to continue work as a group, in the future. In other words, we can say that a climate people consider to be safe when they ask questions or suggest new ideas, will foster the group's capacity to continue being a unit and work together in the future. Thus, our results suggest that affective trust is important to team viability as it influences the development of psychological safety, and not because it directly influences team viability.

Synthesizing: our results regarding H3 reinforce the importance of discriminating between cognitive and affective team trust since the mechanism in which they function within teams and the needs they respond to, are different. Affective trust has a stronger relationship

with psychological safety than cognitive trust and influences team viability through its effect in psychological safety (indirect effect); while cognitive trust has both, direct and indirect effects on team viability.

Our results are divergent of those found by Peñarroja (2011) who elaborated that cognitive trust may be easier to achieve and is important for the consecution of team tasks, but it won't necessarily augment the probability of a team to continue working together in the future.

Conclusions

Summarizing, our results show that team cognitive trust has a direct effect on team viability, while affective trust needs psychological safety for its effect to propagate through. This implies that trust in the knowledge of one's coworker's competence may suffice to maintain that group's unity. In contrast, the affect-based trust in one's coworkers is not enough to guarantee that. In that case, affective trust is relevant because it stimulates a climate that feels safe for interpersonal risk-taking which, in turn, positively influences the team's viability.

We identify some practical implications of our study that could be useful for managers and HR teams to help improve their team's development and effectiveness. We believe that managers should pay close attention to strategies able to induce trust among team members (i.e., team trust), especially trust based on rational beliefs about the competence of all coworkers, since our results pointed to that cognitive team trust has a direct effect on viability. It should be noted that the development of affective trust, although not directly, is also relevant for team viability. Therefore, practices of socialization in the teams are important, since it promotes a psychological safety climate that influences team viability, thus enabling affective trust to propagate through. Edmondson (2004) noted that leader behaviors such as openness and availability can facilitate the development of psychological safety. Congruently with what is stated in Kruzich et al. (2014) worker's perception of support from their supervisors and their company's attention to human resources increase the level of psychological safety. This also had the effect of decreasing the member's intention to leave the organization which can be considered an indicator of viability. These empirical findings added to ours, constitute a topic to be considered by managers of teams.

A climate where psychological safety is present does not only impact the team's viability but it's rather important to nurture team learning, according to the findings of Edmondson (2002, 2003) and Schaubroek et al. (2011). Thus, our results support the notion

that regardless of the type of work done or the criteria of effectiveness, psychological safety should be at the forefront of HR practices.

Taking into consideration the growing relevance of teams within organizations and the importance of their capability to achieve their expected goals, this study contributes to the understanding of the work group's functioning. It provides information that supports the notion that the cognitive aspect of trust is relevant in itself to produce viability. It also sheds a light on the need for psychological safety for affective trust to propagate through. At the same time, our study reinforces the central role of psychological safety to maintain a climate where people are stimulated to stay in the team in the future. The perception of feeling confidence to ask questions, propose ideas, challenge each other while feeling safe and finding growth in these practices (i.e., a team psychological safety climate) is relevant in order to increase team viability. Managers, HR teams and supervisors should consider the relevance of these variables to implement formative plans, training sessions and team development strategies. These should not only focus on the task-related aspects of the team but on the relational ties and nurturing sentiments of reciprocation, care and concern over one another. Having honor codes for communication among team members, creating a culture of healthy discussion within the teams, encouraging understanding, and directly confronting detrimental behaviors, are some ideas that could help managers in the process of developing healthy teams.

Limitations and further research

First and foremost, although this study responds to a literature gap on the relationship between our variables, it constitutes a rather simple model. The cross-sectional nature of the study renders some inherent limitations because empirical relationships of causality can't be inferred and the full potential of the IMOI model wasn't fully explored. To overcome this limitation, it would make sense to do longitudinal research and explore the full potentialities of the model.

The fact that the information used derives from the perception of individuals regarding their teams, could lead to social desirability bias since individuals may distort their answers to fabricate a more favorable image of the group they belong to (Fowler, 1995).

Additionally, we understand that multiple-choice questions limit the potential of collecting a richer and broader range of information about the teams. The use of other methods of data gathering such as interviews, logs for team members to register their experiences, as well as open-ended questions, could be adopted in further research, to respond to this limitation.

As we shown in the literature review sections, there are other variables that could have been studied as mediators of the studied relationship (e.g., affective team commitment, team motivation). Thus, further research can explore models including such variables. In the same ways other control variables such as the activity sector or the team's tenure can be included in the future. Likewise, since trust and psychological safety have been shown to exert influence over other criteria of effectiveness, future studies could include several team outcomes in more complex models.

The fact that the sample was comprised solely by Portuguese teams, should be considered. The results might differ from other cultures. Hence, further research should expand our knowledge of cultural differences regarding group emergent states.

Furthermore, it would be interesting to study this same relationship in virtual teams, which would add up to the findings of other authors who researched trust and psychological safety and the effect of virtuality level (e.g., Peñarroja et al., 2013).

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Annexes

Instruments

Annex 1. Team Trust Scale

(Confiança grupal)

São apresentadas em seguida algumas afirmações acerca da sua equipa de trabalho. Pedimos-lhe que, **considerando a equipa como um todo**, nos indique em que medida concorda ou discorda com cada uma das afirmações referidas. Para isso, assinale com um X, à frente de cada afirmação, o valor que melhor corresponde ao que, em sua opinião, acontece na sua equipa de trabalho. Utilize, por favor, a seguinte escala:

1	2	3	4	5	6
Discordo muito	Discordo moderadamente	Discordo ligeiramente	Concordo ligeiramente	Concordo moderadamente	Concordo muito

	1	2	3	4	5	6
1. Os meus colegas encaram os objetivos do grupo com profissionalismo e dedicação.						
2. Tendo em conta os antecedentes dos meus colegas, não tenho razões para duvidar da sua competência e preparação para levar a cabo o nosso trabalho.						
3. Posso confiar que os meus colegas não me dificultarão o trabalho com as suas ações.						
4. Os meus colegas confiam neste grupo.						
5. Se o líder conhecesse melhor os meus colegas e os seus antecedentes, estaria mais preocupado e iria monitorizar o seu desempenho com maior rigor						
6. O meu grupo tem uma relação de partilha. Podemos partilhar livremente as nossas ideias, preocupações e estratégias.						
7. Posso falar livremente com os meus colegas sobre as dificuldades que estou a ter com o trabalho sabendo que eles estão dispostos a ouvir.						
8. Todos sentiríamos uma sensação de perda se alguém saísse do grupo e já não pudéssemos trabalhar juntos.						
9. Se eu partilhar os meus problemas com os meus colegas, sei que eles irão responder com preocupação e de forma construtiva.						
10. Considero que todos fizemos um investimento emocional considerável na nossa relação de trabalho.						

Annex 2. Team Psychological Safety Scale

(Segurança psicológica)

De seguida apresentamos algumas afirmações **acerca da sua equipa de trabalho**. Pedimos-lhe que nos indique em que medida as afirmações se aplicam ou não se aplicam à realidade da sua equipa. Para isso, assinale com um X, à frente de cada afirmação, o valor que melhor corresponde ao que, em sua opinião, acontece na sua equipa de trabalho. Utilize, por favor, a seguinte escala:

1	2	3	4	5	6	7
Não se aplica	Quase não se aplica	Aplica-se pouco	Aplica-se moderadamente	Aplica-se muito	Aplica-se quase totalmente	Aplica-se totalmente

	1	2	3	4	5	6	7
1. Se nesta equipa cometemos um erro, este é frequentemente usado contra nós.							
2. Os membros desta equipa são capazes de abordar problemas e assuntos difíceis.							
3. Por vezes, as pessoas desta equipa rejeitam outros por serem diferentes.							
4. Nesta equipa é seguro arriscar.							
5. É difícil pedir ajuda a outros membros da minha equipa.							
6. Ninguém desta equipa tentaria, deliberadamente, prejudicar os meus esforços.							
7. Quando trabalho com os outros membros da equipa, as minhas competências e talentos únicos são valorizados e utilizados.							

Annex 3. Team Viability Scale

O conjunto das seguintes afirmações tem como objetivo **caracterizar a sua equipa de trabalho**. Neste sentido, diga, por favor, em que medida cada uma delas se aplica à equipa onde trabalha. Assinale com uma cruz (x) o valor que melhor se adequa ao que lhe é apresentado em cada afirmação, utilizando a seguinte escala:

1	2	3	4	5
Quase não se aplica	Aplica-se pouco	Aplica-se moderadamente	Aplica-se muito	Aplica-se quase totalmente

	1	2	3	4	5
1. Os membros da equipa adaptam-se às mudanças que ocorrem no seu ambiente de trabalho.					
2. Quando surge um problema, os membros desta equipa conseguem resolvê-lo.					
3. Os novos membros são facilmente integrados nesta equipa.					
4. Os membros desta equipa poderiam trabalhar juntos por um longo período de tempo.					