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PSYCHOLOGICAL SAFETY, AUTHENTIC LEADERSHIP AND SOCIAL NETWORKS: A PSYCHO-STRUCTURAL APPROACH TO THE STUDY OF GROUPS

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RESUMO

A investigação recente acerca de grupos e equipas tem-se desenvolvido fundamentalmente em torno de duas tradições: a dos constructos psicológicos partilhados, primordialmente ligada à psicologia e a da perspetiva estrutural, mais ligada à sociologia, aos estudos organizacionais e à teoria acerca da análise de redes sociais. Esta tese pretende integrar estas duas perspetivas numa lógica mais holística, aqui apelidada de perspetiva psico-estrutural no estudo de grupos e equipas.

Assim, esta tese tem como objetivo explorar a relação entre a relação entre a segurança psicológica, a liderança autêntica e a análise de redes sociais. A relação entre estas três componentes permitiu o desenvolvimento de três artigos baseados numa visão psico-estrutural das dinâmicas dos grupos. Por fim, esta tese teve como objetivo estender o estudo da segurança psicológica, liderança autêntica e redes sociais ao contexto do ensino superior. Esta opção parte duma perspetiva que realça a importância do desenvolvimento de conhecimento dentro da psicologia numa lógica multi-contextual.

Com vista ao alcance destes objetivos foram submetidos três artigos para três revistas científicas de cariz internacional. O primeiro artigo, já publicado, diz respeito ao desenvolvimento de um modelo conceptual de influência das redes sociais no desenvolvimento da segurança psicológica do grupo. Neste sentido, apresenta proposições relacionadas com a influência dos membros centrais das redes na segurança psicológica dos grupos e equipas, através de um processo de contágio social.

O segundo artigo é de natureza empírica e tem como principal objetivo estudar a relação entre a liderança autêntica, a segurança psicológica e a performance académica de alunos do ensino superior. Os resultados deste artigo permitem concluir que tanto a segurança psicológica como a liderança autêntica têm um impacto positivo na performance académica.

Testou-se ainda o papel da segurança psicológica enquanto mediadora da relação entre a liderança autêntica e a performance académica, sendo que, no entanto, os resultados não suportam a existência deste efeito de mediação.

Por fim, o terceiro artigo desta tese tem um formato empírico e teve como objetivo dar seguimento aos estudos sugeridos no segundo artigo ao avançar com a densidade enquanto medida de rede social como uma variável importante na relação entre segurança psicológica, ensino autêntico e performance académica. Uma das contribuições deste artigo prende-se com o desenvolvimento do conceito de ensino autêntico (*authentic teachership*) a partir da teoria acerca de liderança autêntica. Os resultados deste estudo permitem concluir que existe uma relação positiva entre a densidade e o ensino autêntico, a segurança psicológica e a performance académica.

No global, os resultados dos estudos incluídos nesta tese ilustram as oportunidades que se podem abrir na compreensão das dinâmicas dos grupos e equipas, através da utilização de uma abordagem psico-estrutural. Mais concretamente, os resultados dos estudos incluídos nesta tese permitem concluir que a liderança autêntica e a segurança psicológica estão positivamente relacionadas com as redes sociais, e mais explicitamente com a densidade, e que exercem um impacto positivo na performance académica de estudantes do ensino superior. Desta forma, a presente tese contribui para o desenvolvimento de uma nova abordagem não só no estudo da performance académica de estudantes do ensino superior mas também na compreensão na importância das dinâmicas de grupos e equipas em geral.

ABSTRACT

Recent research about groups and teams have been developed mainly around two traditions: psychological shared constructs, fundamentally from psychology and the structural perspective, more related with sociology, organisational studies and social network analysis. This thesis aims to integrate these two perspectives in a single and holistic one, here named by psycho-structural perspective on the study of groups and teams.

On the other hand, this thesis has the objective of exploring the relationship between psychological safety, authentic leadership and social network analysis. The relationship between these three components allowed the development of three articles based on a psycho-structural view of group dynamics. Finally, this thesis has the objective of extend the study of psychological safety, authentic leadership and social networks to the higher education context. This choice is based on a perspective that highlights the importance of the development of psychological knowledge taking into account a multi-contextual perspective.

Three articles have been submitted to international journals to achieve these objectives. The first article presents a conceptual model about the influence of social network on the development of psychological safety. Thus it presents several propositions related with the influence of central members of social networks on the psychological safety of groups and teams through a process social contagion.

The second article is an empirical article and has as the main objective study the relationship between authentic leadership, psychological safety and academic performance of students from higher education. Based on the results of this article we may conclude that both psychological safety and authentic leadership have a positive impact on the academic performance. It was also teste the role of psychological as a mediator of the relationship

between authentic leadership and academic performance. However the results don't support the existence of this mediation effect.

Finally, the third article of this thesis is an empirical article and has the objective of complete the third article by advancing with network density as an important variable on the relationship between psychological safety, authentic teachership and academic performance. One of the contributions of this article is the development of the concept of authentic teachership based on the theory about authentic leadership. The results of this study support the existence of a positive relationship between

Globally the results of the studies included in this thesis illustrate the opportunities that may emerge for the development of the understanding of group and team dynamics through the use of a psycho-structural approach. More concretely, the results included in this thesis conclude that authentic leadership and psychological safety are positively related with social networks, more precisely with network density, and have a positive impact on the academic performance of students from higher education. Therefore, this thesis contributes for the development of a new approach, not only on the study of academic performance of students from higher education, but also on the understanding of group and team dynamics in general.

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CHAPTER 1 – GENERAL INTRODUCTION

Shared Constructs: A Psychological Approach To The Study Of Groups And Teams

The concept of shared constructs

Constructs are conceptual notions about the reality that are not directly observable and because of that need to be inferred from some kind of observable actions or features of an entity (Morgeson and Hofman, 1999). For example, an individual's mathematical ability is a conceptual notion (i.e. construct) not directly observable but that can be inferred from several observable behaviours (e.g. correctly solving a mathematical problem). These authors mention that it is possible to consider constructs at the collective level, calling them collective constructs. In this case, collective "is used to describe any interdependent and goal directed combination of individuals, groups, departments, organizations, or institutions. In other words, the model to be outlined is applicable to any set (or grouping) of entities and, thus, represents a general model for developing multilevel theories" (Morgeson and Hofman, 1999, pp. 251).

Other authors used different concepts when referring the constructs at the group or team level. Turner, Chen and Danks (2014), use the terminology team shared cognitive constructs when mentioning this kind of group level constructs. This terminology has been drawn from the idea that groups have shared cognitions. Other terminology used to mention constructs at a group level is shared constructs. Shared constructs have been defined as group "attributes that stem from the perceptions of individual members, but it is supposed that team members share these perceptions" (Molleman, 2005). The concept of shared constructs is broader than the concept of share cognitions and include not only this ones but also experiences, values, norms, emotions, and all other features that can be held in common by the group members.

Many other forms of team/groups cognition can be identified in the literature from different fields such as: team mental models, primarily studied by industrial and organisational psychologists; information sharing has been studied in social psychology; transactive memory systems have been studied by cognitive psychologists; group learning, mainly studied in decision making; and cognitive consensus has been studied by organisational behaviourists (Mohammed and Duville, 2001).

However, there are three aspects in common in all these concepts: 1) they mention processes that occur at the group level; 2) assume that shared knowledge, beliefs and understandings about the reality influence individual and/or group behaviour; and 3) the shared cognitions emerge from the interaction between the group members. According to Mohammed and Dumville (2001), the team mental models concept includes four different sub-domains: information sharing, transactive memory, group learning and cognitive consensus. As we can see in Table 1 the differences between these subdomains are related with the degree sharing emphasis, the general content domain and the specific content domain (Mohammed and Dumville, 2001).

Table 1 - Sub-domains of team mental models (In Mohammed and Dumville, 2001)

Sub-domains of team mental models	Degree of sharing emphasis	General content domain	Specific content domain
Information sharing Transactive memory	Sharing as distributed	Knowledge structure	Task work
Group Learning	Sharing as overlapping	Knowledge structure	Teamwork
Cognitive Consensus	Sharing as both distributed and overlapping	Belief structure	Representations of key issues

Three main reasons why shared cognitions are important have been appointed (Cannon-Bower and Salas, 2001). First shared cognition has potential value as an explanatory mechanism. This means that shared cognition provides explanations on what defines an effective team. Secondly, by providing such explanations, shared cognition contribute to predict other variables in a team such as team effectiveness. For example, taking into account the construct trust, if the members of a group share the idea that the group is trustful it is expected that they show more cooperative behaviours. Finally, if we assume that there are some shared cognitions that will positively influence the team outcomes (e.g. team effectiveness) then practitioners can assess this constructs in order to identify problems in the team and to get an insight into how to solve it. For example, if when assessing the levels of shared trust in a team the practitioner identifies a lack of trust, then he can develop an intervention to foster the shared cognition of trust and consequently improve the team effectiveness.

Taking into account all the concepts presented above about constructs at group or level this study assumes in this thesis the concept of shared group constructs as shared cognition, emotion, knowledge and/or perceptions in general, that emerge from the interaction between group/team members and will influence both individuals and groups behaviour.

The measurement of shared group constructs

One of the challenges when studying constructs at the group level is how to assess it, i.e. how to pass from the individual to the group level. Chan (1998) advanced with some ideas about it by presenting five composition function models according with the functional

relationship: 1) additive model, 2) direct consensus model, 3) referent shift consensus model 4) dispersion model, and 5) process composition model.

On the additive model the construct at the group level results from the summation of the individuals, regardless of the variance among these units. If we think, for example, about the cohesion of a team this would be the result of the sum of the perceptions of cohesion of its members. This is the most common measure when measuring group level constructs. For instance, most of the studies about the construct psychological safety used the average of individuals' psychological safety to get a measure of team psychological safety (e.g. Edmondson, 1999, 2003; Tucker, Nembhard and Edmondson, 2007; Nembhard and Edmondson, 2006).

On the direct consensus model, the construct at the group level results from the consensus among individuals from that group. There are two main indices that usually are used to measure direct consensus: interrater agreement (IRA) and interrater reliability (IRR) (LeBreton and Senter, 2008). Interrater reliability is the "relative consistency in ratings provided by multiple judges of multiple targets" and interrater agreement is the "absolute consensus in scores furnished by multiple judges for one or more targets" (LeBreton and Senter, 2008 pp. 816). Direct consensus models typically use means individual scores to approximate a group's standing on a higher level construct (Cole, Bedeian, Hirschfeld, and Vogel, 2011). Using the example of self-efficacy, the group (self) efficacy would be a result of the consensus of group members about their individual self-efficacy (example of an item: "Failure just makes me try harder").

In turn, referent-shift consensus models mirror their direct consensus counterparts. This means that they also use IRA and IRR indices across group members. The main difference between direct shift consensus and referent-shift consensus is that the group

member are required to respond to survey items in reference to the group (Chan, 1998). For example, using the same example about team self-efficacy, in this case, the item "Failures makes me try harder" should be modified to "Failure makes my team try harder".

On the dispersion model, the meaning of group level constructs is in the dispersion or variance among individuals. One example is when we infer the climate strength bases on the validity of the dispersion index of psychological climate. Finally, the process models focus on the similarity of the processes between levels. For example, the process of emergence of group climate as analogue of the process of development of psychological climate at the individual level. DeRue, Hollenbeck, Ilgen and Feltz (2010) identified four different forms of dispersion: shared belief, minority belief, bimodal and fragmented. In a shared belief situation there is a lack of variability in the perceptions between the members of group. This means that that the belief is widely shared and accepted among the group. For instance, all the group members agree that the merit is recognised in the group.

Minority belief form of dispersion gives indication of a situation in which there is a member with a meaningfully different belief relative to the rest of the group. For example, if in general the group agree that the group promotes the merit and there is a member that don't share this vision, this is considered a situation of minority belief. There is also in bimodal dispersion a lack of unanimity, however in this case subgroups with different opinions emerge within the group. Considering the same example, this means that some members agree that the group doesn't promote merit and other subgroup disagree.

The fragmented form of dispersions gives the indication that all the members of the group have their own perspective about the construct. In this case, the group with a high level of heterogeneity, what means that there is a high variability among group members. For example, each member have their own view about if the group promotes the merit or not.

The process composition "focuses on the mechanisms by which a construct associated with episodes of or changes in behaviours occurring at a lower level of conceptualization emerge at a higher level" (Cole et al., 2011). This model differs from the others by being dynamic, i.e. focused on the changes on the behaviour of individuals or teams. Thus this model is useful when there is interest in the process and not so much in some stable attributes, outcomes, or state of affairs (Chan, 1998). This means that first the researcher develops an understanding of the process at individual level and the by analogy extrapolates it to the group level. For example, if we consider psychological safety, studying psychological safety at the individual level will allow the researcher to identify the main features of the process of an individual become psychologically safe. Then the researcher applies the same principles to the group level psychological safety, i.e. how the group become psychologically safe.

The emergence of shared group constructs

"A phenomenon is emergent when it originates in the cognition, affect, behaviours, or other characteristics of individuals, is amplified by their interactions, and manifests as a higher-level phenomenon" (Koslowski and Klein, 2000 pp. 55). This means that by interacting with each other individuals will contribute for the emergence of shared constructs that result from some kind of aggregation of their individual cognitions, affects, behaviours or other characteristics. For example, if we consider organisational climate, this results from the perceptions of individuals about the climate of the organisation that by interacting with each other will contribute for the emergence of a higher level phenomenon, the organisational climate.

Moreover, according to Morgeson and Hofman (1999) the emergence of collective constructs results from a series of ongoings, events, and event cycles between the component

parts, the individuals in the case of groups. Furthermore they noted that these ongoings, events, and event cycles occurring in a group can serve as the ongoings to other groups (Morgeson and Hofmann, 1999). For example, when two different teams have the opportunity to interact, the ongoings of the two team interact producing and event that might influence the emergence of group level constructs.

On the other hand, drawing on complexity theory Kozlowski, Chao, Grand, Braun and Kuljanin (2013) define emergence as a "dynamic, interactive process and specify three core conceptual foci to capture its essential nature: It is multilevel, process oriented, and temporal". According to these authors emergence is a complex process that includes both dynamic interactions between entities (i.e. process) and over time it manifests as a collective property (i.e. structure) (Kozlowskiet al, 2013).

This means that the research of shared constructs involves the study of the construct as a result of the interaction between individuals but also the individuals as parts of the social system that generates the collective construct. For example, we may study the organisational climate as a construct that influences other variables, such as work satisfaction, performance (i.e. structure) and/or study the how organisational climate emerge from the interaction between individuals (i.e. process).

Psychological safety: a specific group shared construct

Psychological safety concept has been brought for the research agenda related with groups and teams by Edmondson (1999) and refers to the perception individuals that their group/team is safe to take interpersonal risk. Just like many other concepts, sometimes, it is not easy to stablish the first moment that the concept of psychological safety has been presented. However one of the first mentions to the concept of psychological safety has been

made by Kahn (1990, pp.708) which defines psychological safety as “feeling able to show and employ one's self without fear of negative consequences to self-image, status, or career. People felt safe in situations in which they trusted that they would not suffer for their personal engagement”.

Usually the literature about psychological safety mentions four different types of personal risks that individuals face when integrated in teams or groups: a) to be seen as ignorant when making a question; b) to be seen as incompetent in general or in a specific task when admitting the error (or simply call attention to it), asking for help or accepting the probability of failing; c) to be catalogued as negative when criticizing past or present events; and d) to be seen as intrusive when asking for feedback (e.g. Edmondson, 1999).

It is important to distinguish psychological safety from other relational constructs such as trust and perceived organisational support (Carmeli and Gittell, 2009). Psychological safety goes beyond interpersonal trust as it refers to the climate within a team characterized by both interpersonal trust and mutual respect that allows people to be themselves (Edmondson, 1999). However trust may be an important feature for the development of a psychologically safe environment (Edmondson, 1999).

In turn, perceived organisational support is a related concept but not necessarily the same thing (Carmeli and Gittell, 2009). Perceived organizational support emphasises the general beliefs about the appreciation of the organization for the work of their employees and the concern with their well-being (organization focused), while psychological safety is about feeling comfortable to take interpersonal risks (personal relations focused).

Initially psychological safety has been studied as a group variable. Edmondson (1999) argues that by being a belief, psychological safety should converge in a team once the team

members are subject to the same set of structural influences and these perceptions develop out of salient experiences. However the literature about psychological safety has been treated this concept as variable at both individual, group/team and organisational level and also as antecedent, outcome, moderator and mediator.

The research at the individual level established relation between individual perceptions of psychological safety and several outcomes such as job engagement, organisational commitment, quality internal auditing, learning from failure and creative work involvement (Edmondson and Lei, 2014). For example a study developed by Kark and Carmeli (2008) found a positive relation between individual perceptions of psychological safety and feelings of vitality, which, in turn, result in involvement in creative work.

At the group level psychological safety has been studied as antecedent of performance and team learning behaviours and as outcome of antecedents at three level of analysis: organisational resources, team member and leader interactions; team goal clarity and personality differences (Edmondson & Mogelof, 2005). It has also been studied as mediator of several relationships between antecedent such as organizational context, team characteristics, and team leadership, and outcomes of innovation, performance, learning, and improvement in or by a team (Edmondson and Lei, 2014). As a moderator has been studied mainly as moderating the relationship between variables such as goal clarity or need for learning, and learning or performance outcomes.

Finally research at the organisational level studied the relationship between psychological safety, commitment-based human resources practices, social capital, high quality relationships, climate for initiative and firm performance (Edmondson and Lei, 2014). In these studies psychological safety emerges both as mediator and moderator, usually between organisational antecedents and outcomes.

In terms of literature about shared constructs (i.e. collective constructs, team mental models, shared cognition, etc.), psychological safety received little attention. This may be due to the fact that most of the studies developed about psychological safety used an additive model to move from individual level to group level perceptions (e.g. Edmondson, 1999; Nembhard and Edmondson, 2006; Gong, Cheung, Wang and Huang, 2012) what may be depreciative to authors from the shared constructs tradition. The exception is an analysis of the last 20 years of research about groups/teams presented by Allen and O'Neil (2015). These authors considered psychological safety as shared construct by presenting it with other shared constructs studied in the last 20 years.

Taking this into account, this study considers psychological safety as an emergent state that, just like other group constructs, emerge from the interaction between group members. On the other hand, based on the literature published on psychological safety up to now, this thesis assumes psychological safety simply as the result of the average of individual psychological safety of group members. This will allow more easily to move from a more individual perspective to a group level analysis along the different papers of this thesis.

Social information processing: how the shared constructs are formed

One of the mechanisms by which individuals and groups develop individual and shared constructs is through social information processing. This concept is based on the idea that individuals, as adaptive organisms, develop attitudes, behaviour and beliefs according with their social context and the reality of their own past and present behaviour and situation (Salancik and Pfeffer, 1978). This means that individuals develop personal constructs based on their experience in a specific group and situation.

According to De Dreu & Beersma (2010, pp.1111) information-processing at the individual level "refers to the individual group member's tendencies to search for, attend to, select, encode, and retrieve information from outside the group boundary, from other group members, and from memory". Therefore the interaction between group members will be fundamental not only to develop group level constructs but also for individuals to make sense about the reality and develop their own personal constructs.

On the other hand individuals don't exist only as team members, so the knowledge, attitudes and beliefs developed through experiences that happen outside the group will also have an influence on the development of individual constructs. For example, considering the psychological safety, if when in different teams in the past an individual has been punished every time he asked for feedback he may be reluctant in asking feedback in a new team, showing a low psychological safety.

The person's immediate social environment is an important source of information, establishing the difference between social information processing and simply information processing. This means that the social environment provides cues for individuals construct and interpret events and at the same time give them information about what their attitudes and opinions should be (Salancik and Pfeffer, 1978). For example, if the members of a team receive a reward every time they present a successful idea, the members may use this cue to develop a perception that the team rewards the good ideas. At the same time, this situation may contribute for the development of a belief that they should have a positive attitude towards the generation of new ideas within the team.

Hinsz, Tindale and Vollrath (1997) presented the information-processing model as made by four main components: the processing objective, information (encoding, storage and retrieval), response and feedback. First it is important highlight that by interacting with the

world an individual acquires information that is embedded within a specific context. This context provides a processing objective for the information.

The process itself starts when an individual first perceives the information. This information will be encoded through a process that involves the structure, evaluation, interpretation, and transformation of the information in a representation (Hinsz et al, 1997). After encoding, the information is stored in the memory and can be assessed and brought out of storage through a process of retrieval. Then individual makes a response that can be a choice (decision making), conclusion base on premises (inferences), evaluative judgment (opinion) or solution (problem solving), followed by a feedback about changes in the situation (Hinsz et al, 1997).

This model doesn't distinguish social information-processing from information-processing in general. However taking into account the information-processing theory of Salancik and Pfeffer (1978) we may say that what characterizes social information-processing from other types of information-processing is the content. Therefore, the content from social information-processing is related with the social context (e.g. the communication between the members of a group) and the content of general information-processing maybe originated by any source of information on the environment (e.g. the weather forecast).

At the group level "information processing involves the degree to which information, ideas, or cognitive processes are shared, and are being shared, among the group members and how this sharing of information affects both individual- and group-level outcomes" (Hinsz et al, 1997).

Group information processing can be considered as a second-order factor with two components: information exchange and information utilisation (Deeter-Schmelz and Ramsey, 2003). The information exchange is related to the sharing, discussing and evaluation of

information between the members of the group. Thus, just like presented previously in this work the interaction between groups members assume a key role in the information processing and for the emergence of shared constructs. In turn, information utilisation regards the use of the team processed information by group members.

Social network analysis: a structural approach to the study of groups and teams

Introduction to social networks.

Since the second half of the 20th century the volume of research about social networks as increased exponentially. This fact results from a shift away from an individualist, essentialist and atomistic explanations toward more relational, contextual and systemic understandings (Borgatti and Foster, 2003). This growth spans all of the social sciences but is even more evident in physics, epidemiology and biology (Borgatti and Halgin, 2011). Accompanying the increase of interest on social networks, the developments in the overlap of different fields, such as sociology, economics, anthropology, mathematics, political science, history, and social psychology, contributed for the emergence of a new approach to analysis of complex intra-group relations (Lusher, Robins and Kremer, 2010). Contrarily to the psychological view presented in the previous section of this work, this systemic and structural approach, focuses in the interactions and relationships between group members. Hence, social network analysis is based on the view that groups are micro-social systems and focuses upon the relationships between individuals in a given context, rather than in the view that individuals are independent and autonomous units (Lusher et al., 2010).

One of the advantages of social network analysis is that it allows the study both of social structures and individual attributes at the same time. Therefore, it can be a powerful tool to examine the complex dynamics within groups and teams. Moreover, using social

network analysis allows the study of the interactions between individual attributes and social networks at three levels: 1) influence of individual attributes on the network; 2) influence of the network on individual attributes; or 3) co-evolution between personal attributes and social networks (Tasselli, Kilduff and Menges, 2015).

Main social network analysis concepts.

Network graphs and types of ties.

According to Borgatti and Halgin (2011) "network consists of a set of actors or nodes along with a set of ties of a specified type (such as friendship) that link them". These actors can be many different things such as individuals, groups or organisations. Also the ties may have different meanings, such as friendship, who speaks to whom, who likes whom, etc. Borgatti, Everett and Johnson (2013) present a taxonomy of types of relations that can be studied using social network analysis (See Table 2).

Table 2 - Taxonomy of types of relations (Borgatti, Everett and Johnson, 2013 p.4)

Relational states							Relational events	
Similarities			Relational roles		Relational cognition			
Location	Participation	Attribute	Kinship	Other role	Affective	Perceptual	Interactions	Flows
Same spatial and temporal space	Same clubs, same events	Same gender, attitude	Mother of, sibling of	Friend of, boss of, competitor of	Likes, hates	Knows, knows of, sees as happy	Sold to, talked to, helped, fought with	Information, beliefs, money

Borgatti and Li (2009) present a different typology, which starts with the distinction between continuous and discrete ties. Continuous ties are the ones that are constant in time. In turn, discrete ties are discrete events which occurrences' can be counted. There are two different types of continuous ties: similarities and social relations. In the similarities class the

ties give indication of "pre-social" conditions such as co-membership in groups or co-location in space (Borgatti and Li, 2009). For example, one research question that we can answer by using this approach is "are employees whose offices are near each other more likely to develop friendship than employees whose offices are further apart?" (Borgatti et al., 2013). Social relations class is related to both continuously existing ties and other role-based ties (e.g. kinship ties, is friend of, etc.) and cognitive-affective relations (e.g. knows, trusts, etc.) (Borgatti and Li, 2009). For example, this approach could be useful to study if the members of a team trust more in other members from their team or in members from other teams.

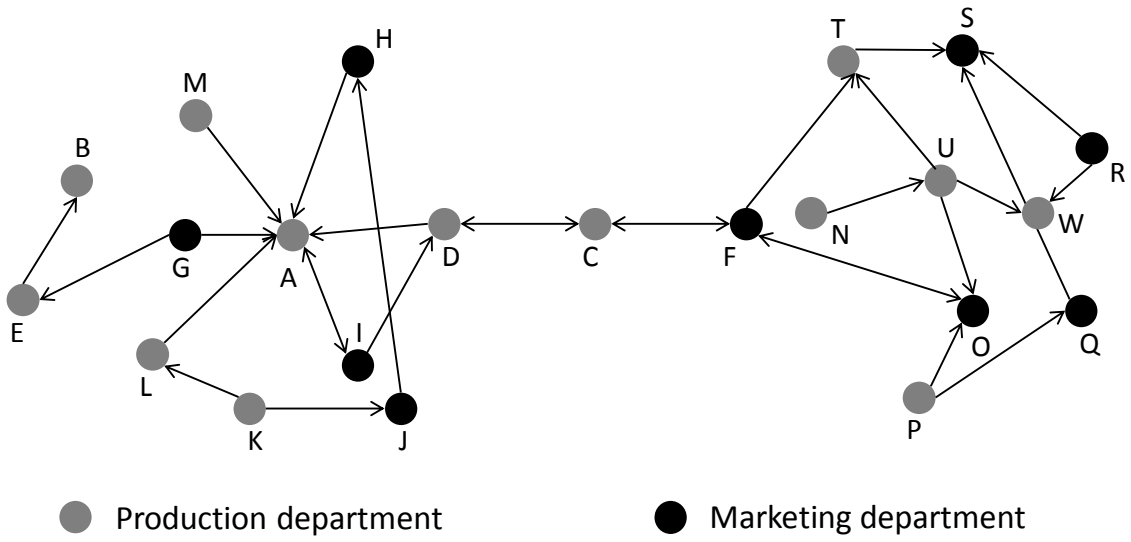
In turn, there are two types of discrete ties: interactions and flows. Interaction are events in which actors interact with each other, such as email to, lunch with. Interactions are different from social relations, but can be influenced by them. For example, if two actors see each other as being friend they will be more willing to lunch with each other.

Flows consist of the content that moves between actors of a network, such as knowledge, ideas, etc. In practice, flows are assumed from interactions or social relations instead from a direct measure of it (Borgatti and Li, 2009). For example in a study by Borgatti and Cross (2003) about learning in social networks used measures about knowing (i.e. understanding of other actor knowledge and skills), value (i.e. other actor as valuable source of information), access (i.e. access to other actor knowledge) and information (i.e. how often turned to other actor for information or knowledge seeking) to understand the knowledge flow within different groups.

It is common, in social network analysis, the use of network graphs to present a visual representation of the networks that are being studied. In this graphs the vertices represent the actors (i.e. the social entities) and the edges the relations between the actors. For example, Figure 1 represents an advice seeking network of two departments of the same organization.

In this case we are considering bi directional network, once the connections between actors are represented by arrows. For instance, we may say that individual T turns to S to ask for advice, but S doesn't turn to B. We may use also shapes or colours to represent individual attributes of the actors. In this example, the grey nodes are from the production department and black nodes are from the marketing department.

Figure 1 – Example of a network of advice seeking of two departments from the sae organisation.



Main social networks measures

Levels of analysis. Research using social network analysis focus on three different levels of analysis: node, dyad and network. At the node level the individual is the unit of analysis, so research at this level tries to understand the impact of the network on the actor or the individual impact of the actor on the network. At this level we ask questions such as "do actors with more friendship ties have higher psychological safety)". For example, a study developed by Liu and Ipe (2010) studied the relationship between team members personality and their position in the network, more precisely how some personality traits can influence the centrality of the actors.

At the dyad level, the focus is the pairwise relation between actors, and is related with research questions such as "do pairs of actors with professional ties tend to develop friendship ties?" (Borgatti et al., 2013). In other words to study dyads means to study the relations that all the pairs stablish in a network. An example of study focused on dyads is the one developed by Krackhardt and Kilduff (2002). According to these authors dyads embedded in triads are likely to have higher agreement concerning who is tied to whom in the organisation and are likely to have higher agreement concerning who are embedded in triad in the organization (Krackhardt and Kilduff, 2002).

Finally, at the network level, researchers try to understand the features that characterize the network as a whole. At this level emerge research questions such as "do denser networks tend to have a positive impact on knowledge sharing?" For example, members of networks in which members are highly connected tend to share tastes, outlooks and other features that can be transmitted through the network, since the members which whom they contact also interact with each other (McPherson, Popielarz and Drobnic, 1992). Each of these levels incorporate different measures, thus we present next the measures at each level of analysis.

Measures at the node level. In the literature about social network analysis three main concepts emerge related with the analysis of networks at the node or actor level: 1) centrality; 2) network constraint and, 3) structural equivalence (Carpenter, Li and Jiang, 2012). Centrality is a property of a node's position in a network that illustrates the structural importance of a node according to its structural position in the network (Borgatti et al., 2013). Usually the literature about social network analysis mention four different types of centrality: degree centrality, eigenvector centrality, betweenness centrality and closeness centrality (see for example Carpenter et al., 2012; Borgatti et al., 2013).

Degree centrality is the simplest measure of centrality and measures the level of activity of an actor based on the number of direct ties with other actors (Freeman, 1979). We may argue that this is not a real centrality measure because it doesn't give an accurate indication of the position of the actor on the network. Degree centrality may be interpreted in many ways depending on the nature of our study. For example, degree centrality may be important to determine the exposition of individual to information that flows in the network since an actor with many connections will be more exposed to the information than an actor with few ties.

Eigenvector centrality expands the notion of degree centrality by accounting not only the direct connections but also the connections of the actors immediately adjacent to the focal actor (Bonachi and Loyd, 2001). In other words this measure takes into consideration not only the degree centrality of an actor but also the centrality of the actors with whom the focal actor contacts. For example, the best way for a new employee to know new people is to stablish a relation with someone that also knows a lot of people on the organisation. This is a more accurate measure when comparing with degree centrality if the researcher aims to identify the position of the actor on the whole network.

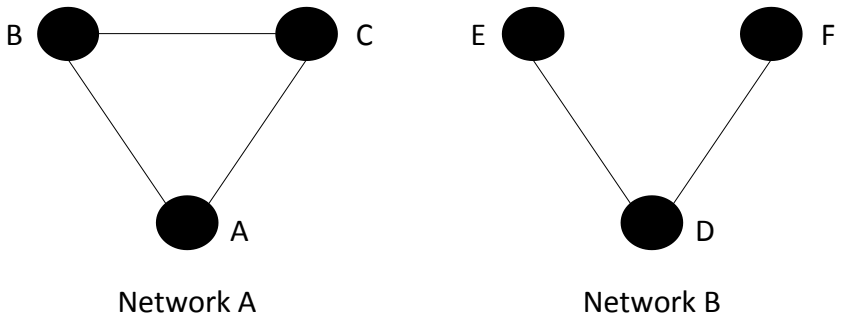
Betweenness is "based upon the frequency with which a point falls between pairs of other points on the shortest or geodesic paths connecting them" (Freeman, 1978 pp. 221). This can be viewed as the potential power that an actor may wield due to the ability to slow down flows or to distort what is passed along in order to serve the actor's interests (Borgatti, Mehra, Brass and Labianca, 2009). For example, a study by Tsai and Ghoshal (1998) found a positive relations between the centrality of a business unit in interunit social interaction and the level of its perceived trustworthiness.

Finally, closeness centrality "depicts the ease of connection between the focal node and all other nodes, and is measured by the mean length of shortest paths between a node and all its reachable alters" (Carpenter et al., 2012 pp.1337). In other words, closeness gives the indication of the extent to which an actor can reach all other actors in the network. This measure can be important, for example, when studying the flow in communication networks. For instance if a manager wants to share an information needs to choose the mean that allows him/her to achieve all the communication targets in a shortest path.

Most of the literature about centrality assumes that it is advantageous for an actor to be central in their network. For example, leader's centrality in both internal and external friendship networks showed to be related with group performance and with their reputation for leadership among subordinates, peers and supervisors (Mehra, Dixon, Brass and Robertson, 2006). Based on this, other studies try to identify what makes an actor become central. For instance, a study developed by Lopes (2012) concluded that actors with high level of optimism tend to occupy more central positions in the network.

Network constraint is an index that measures the extent to which a person's contacts are redundant, depicting whether it lacks structural holes (gaps between network nodes) (Burt, 1992). This means that the higher score on network constraint, more redundant contacts the actor have. A structural hole is present when the focal actor is connected with two different actors and they are not connected between them. For example, in Figure 2, on the network B the actor D is connected with E and F but E and F are not connected to each other, in this case we may say that there is a structural hole. In constraint network there are few structural holes, for example, on the network A of Figure 2, actor A is connected with B and C and B and C are connected to each other. In this example, the value of constraint index is maximum.

Figure 2 – Example of two networks with and without a structural hole.



In the literature, structural holes and network constraint have been studied both as positive and negative impacts according to the context. For example, Susskind, Odom-Reed and Viccar (2010) found a positive relationship between the presence of structural holes and team performance. On the other hand, Xiao and Tsui (2007) found that structural holes are negatively related to the employee's career performance, more specifically in collectivist national cultures such as in China.

Finally, we consider two actors as being structurally equivalent if they share all the same identical ties from and to the same set of nodes (Carpenter et al., 2012). However, in practice researchers use a measure of structural equivalence as the degree of similarity between the social ties possessed by a pair of nodes. One of the streams in the study of structural equivalence argues that people are influenced by others occupying the same position in their network that themselves, i.e. they are structural equivalents (Shah, 1998). At the organisational level Palloti and Lomi (2011) found that organisations that occupy the same position in the network tend to have similar performance. This illustrates the idea that actors that have the same position in a network may get the same advantages.

Measures at the dyad level. At the dyadic level we may consider three main constructs: strength of ties, simmelian ties (Carpenter et al., 2012) and dyadic cohesion

(Borgatti et al, 2009). There are no consensus on the literature about the concept of strength of ties or ties strength, thus I present here the most influential conceptualisations of this construct. We may consider the strength of ties as the combination of the frequency of interaction, the duration of the ties and the emotional closeness between actors (Carpenter et al., 2012). On the other hand, Granovetter (1973) considers that "the strength of a tie is a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie". In turn, Monge and Contractor (2001) refer to strength of tie as composed by different measures, such as amount of time, emotional intensity, intimacy and frequency, among others.

The main difference between the perspective of Monge and Contractor (2002) and the perspectives of Carpenter et al. (2012) and Granovetter (1973) is that in the first case tie strength results from the combination of dependent measures and in the second ones tie strength may be measured using different and independent measures. However, and despite the differences between the authors, there is a tendency in the literature to consider strength of ties made up by three main components: frequency of interaction, duration of the connections and the intensity of the psycho-affective connection (i.e. emotional intensity, intimacy, emotional closeness).

We are in a presence of a simmelian tie when two actors (A and B) are reciprocally connected to one another and both of them are also connected to a third one (C) (Carpenter et al., 2012). In other words we have a simmelian tie when a dyadic is embedded within a triad. We can then conclude that, when, and only when considering three actors, a simmelian tie is the opposite of a structural hole. For example, Goh, Krackhardt, Weingart and Koh (2014) have studied the impact of a third element in a dyad friendship relation in terms of response to

unfair outcomes from one member to another. These authors found that the retaliation is stronger following an unfair deal when third party is mutual friend, rather than strange.

Dyadic cohesion refers to "a set of concepts relating to the social closeness of a pair of nodes, such as geodesic distance (the length of the shortest path from one to the other), or multiplexity (the number of different kinds of relations that bind a pair of nodes)" (Borgatti et al, 2009). Geodesic distance allows us to understand how reachable an actor in relation to other is. For example, one possible research question that we can answer using this measure is how the distance between an actor and the central actor can impact their influence on the decision of the group. Multiplexity is related with the degree in which two actors share more than one tie (Monge and Contractor, 2001). For example, two actors may be friends and at the same time seek each other for advice related with work matters. For example, Lee and Lee (2015) developed a study in which found a positive relationship between the similarities between actors in terms of gender, professional rank and functional unit and multiplexity between creative interaction ties and advice relations.

Measures at the network level. At the network level we may consider four main concepts: network density, network cohesion, network size and small worlds (Carpenter et al., 2012). Network density measures "the number of ties (connections) that exist by the total number of ties possible if everyone on the group were connected to everyone else" (Cross, Ehrlich, Dawson and Helferich, 2008 pp. 94). One of the aspects that we must take into account when studying network density is the importance that time have on explaining the network. For instance, Borgatti and Halgin (2011) state that studying network density at a single point in time is simplistic since it doesn't capture whether the density is waxing or waning. Moreover, the time a team or group spend together will have an impact on network density (Schulte, Cohen and Klein, 2010). When the members come together in a recently

new team they have less friendship ties with other members than after some weeks. Thus, the friendship network density increases over time (Schulte et al., 2010).

Cohesion is related with the average number of ties from any person in the group to any other person (Cross at al. 2008). Network cohesion can be an important feature, for example, for managers to get a picture on how information flows in a team or organisation. For example, a low density in a communication network may give an indication of a lack of communication in the group making more difficult to spread a message among team members. On the other hand, cohesion constitutes an important feature four group processes such as social contagion. According to Monge and Contractor (2001) one of the mechanism of contagion is the contagion by cohesion, which implies that attitudes and behaviours of the actors will influence other with whom they contact.

Network size is simply the total number of actors in a network. Just like team and groups size also network size is an important variable when studying groups and teams. For example, Morrison (2002) found that the newcomers with larger information networks have greater organisational knowledge. On another example is a research that studied the impact of network activation of individuals when confronted with job less threat, according to their status (Smith, Menon and Thompson, 2012).The results shown that high status actors activate larger networks than lower status actors.

The concept of small-world network has its roots in the work of Stanley Milgram in 1967. Based on a series of experiments this author developed the idea that even a very large small world actors are separated by only six degrees of separation or six intermediaries. Two network measures can be used to quantify small world: average path length L (p) and the cluster coefficient C (p) (Watts and Strogatz, 1998). L (p) measures the average number of intermediaries between two actors in the network along their shortest path and C (p) measures

how many actor's contacts are connected to each other (Uzzi, Amaral and Tsochas, 2007). An example of an application of this concept can be found in a study developed by Davis, Yoo and Baker (2003), which shows that firms from USA tend to share members of their boards, giving the indication that starting in a member of one of the boards will allow us to achieve all other members from other boards in a short path, i.e. with a few intermediaries.

Social contagion: social networks contributing to explain group level variables

Just like social processing theory, already mentioned in this work, also social contagion can explain how individuals make sense about their social context. The main difference between these two processes is that the first focus on the cognitive processes and the second in the interaction between elements of a group. Social contagion can be viewed as the adoption of attitudes and/or behaviours of others with whom individuals contact in the social network (Scherer and Ho, 2003). This influence may be conscious or unconscious and does not require that there is any intention to influence. Social contagion has been viewed traditionally in individual terms, however some author advance that this construct can be analysed both at individual and group level (Bovasso, 1996). This is consistent with the idea that actors are mutually influencing and informing each other contributing for the homogeneity within structural groups or subgroups (Borgatti and Foster, 2003). In other words, the social contagion within a network will contribute for the emergence of shared beliefs and perceptions in the group.

Based on this we may assume that the network ties are the vehicle through which social contagion occur, especially considering the ties as communication or affiliation (e.g. friendship). In other words the interaction between group members expose them to the behaviours and attitudes of each other what contributes to the social contagion occur.

According to (Burt 1987) there are two distinct form of social interaction which are central to social contagion process: cohesion and structural equivalence. In the social contagion by contagion actors are influenced by the others with whom they contact directly. In this case social contagion is direct and proportionated by the mere exposition to others behaviours and attitudes. On the other hand, the contagion by structural equivalence occurs when actors share similar positions in the network having a similar pattern of relations. In other words, in the contagion by structural equivalence the contagion is indirect and results from the shared connections between the actor that influences and the one that is influenced.

We can distinguish in the literature two different types of social contagion according to the content: cognitive contagion and emotional contagion. Cognitive contagion occurs when an actor transfers ideas and cognitive biases altering alter one's perceptions of reality (Roberson, 2006). On the other hand emotional contagion is "a process in which a person or group influences the emotions or behaviour of another person or group through the conscious or unconscious induction of emotion states and behavioural attitudes" (Schoenewolf, 1990 pp. 50). Therefore both processes are, conscious or unconscious, social influence processes differing in terms of the content of the contagion. However Barsade (2002) states that there are some important differences in these two processes due the qualitative differences between the transfer of ideas and feelings. The main difference is related with the fact that words are more important when sharing ideas but to understand emotion the non-verbal cues are central. Because of this cognitive contagion doesn't need face to face contact contrarily to emotional contagion in which is important the actors to be face to face in order to read non-verbal language such as facial expressions and body language (Barsade, 2002).

Current Thesis

The first objective of the current thesis is to expand the study of groups and teams through the development of a psycho-structural approach. In other words, I intend with this study to integrate the psychological approach, mainly composed by studies about shared constructs, and the structural approach, based on social network analysis, in a new psycho-structural approach. By doing this, the present thesis will focus both on the shared constructs and on the contribution of social networks on the development of such group level variables. Table 1 presents the main characteristics of a psycho-structural approach comparing it with the psychological and the structural approach. The first aspect to take into account is the focus of the research. In the psychological approach the focus is the shared cognitions and constructs and in the structural approach the focus is the interactions between group members. Therefore, the psycho-structural approach will focus on the contribution of interactions (social networks) on shared cognitions. An example of a research question using this approach may be "what is the impact of the central actor (social network concept) on the psychological safety of a group (shared construct)".

The second aspect that distinguishes the different approaches is the group boundaries. In the psychological approach the group is formally and externally defined. For example, considering an organisation the psychological approach will study the teams or groups that are defined in the structure of the organisation. On the other hand, in the structural approach the groups are defined by the pattern of relations stablished by its members. Finally, in the psycho-structural approach the group is both defined externally and through social network analysis, what makes possible to study both formal and informal groups simultaneously. Using the same example, one may decide to study a specific department of an organisation

and at the same time study informal sub-groups within the department originated by a social network analysis.

We may also distinguish the three approaches in terms of level of analysis. The psychological approach gives more attention to the group level constructs. In turn the structural approach focuses more on the interpersonal aspect, more specifically at three levels: node, dyads and whole network. Therefore, the psycho-structural approach put emphasis on the study of interpersonal relations at node, dyad and whole network levels and the development of group level variables. For example, one may study importance of the central node (node level) and network density (whole network) on the development of group trust (group level), assuming a multi-level and psycho-structural approach.

Finally we may distinguish the three approaches in terms of how groups develop a shared perceptions. The psychological approach assumes that individuals process information given by the context and develop their perceptions through the cues given by the environment in an idiosyncratic manner (information processing). In this case the shared perceptions are originated because individuals within a team tend to be exposed to same environment and then develop common understandings about it. On the other hand, structural approach assumes that by being exposed to each other, group members will be influenced by the attitudes and behaviours of whom they interact (social contagion). Thus structural approach focus on the importance of members interactions for the development of shared perceptions. The psycho-structural approach takes into account both perspectives, stating that both information processing and social contagion are important for the emergence of shared meanings. For example, if a team member is punished by the team leader in a meeting for being late, that might influence not only the members that were present in the meeting

(information processing) but also the ones that didn't attend but heard about what happened (social contagion).

Table 3 - Differences between the psychological, structural and psycho-structural approaches to the study of groups and teams.

	Psychological Approach	Structural Approach	Psycho-structural approach
Focus	On the shared cognitions and constructs	On the interactions between group members	On the contribution of interactions for the emergence of shared cognitions and constructs
Group boundaries	Closed (formal group)	Open (Informal group)	Formally and informally defined
Levels of analysis	Group level	Interpersonal level (Node, dyads and whole network)	Multi-level: individual, dyads, subgroups and group.
Process of emergence of shared perceptions	Information processing (idiosyncratic)	Social contagion (relational)	Both by information processing and social contagion

Another objective of this thesis is to understand the development of psychological safety using a psycho-structural approach. In other words, the present study aims to understand the impact of social network features, such as network density, on the psychological safety. On the other hand, it tries to understand the relationship of psychological safety with other important variables (e.g. authentic leadership) for the function of groups.

Finally, this work assumes that this psycho-structural approach it is valid not only to study groups and team at the organisational level but also in other contexts. Therefore it focus on the study of psychological safety, social networks and authentic leadership at the educational level to understand the impact of this variables on academic performance. The objective of doing it is to contribute for the trans-disciplinary study of groups and teams and to test the application of the psycho-structural approach in other context than the organisational.

This work is composed by three articles submitted to international journals. The first article has been published in the Journal of Industrial and Engineering Management as a conceptual paper. This first paper presents a theoretical model of how the interactions between team members influence the psychological safety of the entire team. It focus on the role played by the central member and ties characteristics such as strength of ties and friendship level, in terms of social contagion. Since this was the first article of this thesis, it develops a conceptual model assuming a psycho-structural approach to the study of groups and teams.

The second paper is an empirical paper, submitted to the Academy of Management Learning and Education Journal. The goal of this paper is to explain how authentic leadership of teachers and psychological safety relate with each other and how it influences the academic performance of higher education students. This article assumes a psychological approach and explored not only the impact of psychological safety and authentic leadership on academic performance but also the role of psychological safety as a mediator of the relationship between authentic leadership and academic performance.

Finally, the third paper has been developed as continuity of the first one and is an empirical paper submitted to the journal Studies in Higher Education. Firstly it presents the

concept of authentic teachership as an application of authentic leadership behaviours to the educational setting. Secondly it makes a transition from a psychological to a psycho-structural approach by taking into account the variable network density in the relationship between authentic teachership, psychological safety and academic performance. Thus the purpose of this paper is to explore the impact of authentic teachership, psychological safety and network density on academic performance, and also explore the relationship between network density, psychological safety and authentic teachership.

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CHAPTER 2 –SCIENTIFIC PAPERS

Social Networks And Psychological Safety: A Model Of Contagion

Abstract

Purpose: We attempted to explain how the interactions between members influence the psychological safety of a team using social network analysis by proposing a model based on social contagion in which the psychological safety of the central member has a key role in the psychological safety of the whole team.

Design/methodology/approach: We present a theoretical paper which crosses theory about social network analysis, psychological safety and social contagion.

Findings and Originality/value: We suggest that there are two groups of variables that mediate this relationship. The first group concerns the characteristics of the node and is composed by the proximity to the node's personal characteristics and the value of the central member as a source of information. Second, we advance that there are two dimensions at the level of tie properties that mediate the influence of a central member on team psychological safety – tie strength and friendship level. Finally, the interacting opportunities- a variable at context level - is considered to affect the strength of the ties. We also advance some variables that mediate the influence of the psychological safety of a central member on the psychological safety of the team. Specifically,

Originality/value: To the best of our knowledge there is no significant research using social network analysis to explain the process by which a team becomes psychologically safe. On the other hand, because psychological safety tends to be a team construct it is important to understand how team dynamics, evidenced by social network analysis, influence the formation of psychological safety through contagion processes.

Key Words: Psychological safety, teams, social network analysis, contagion

Introduction

In the last years several studies have tried to shed light on what makes a "good team". However, they focused on an input-process-output framework, i.e. they have generally tried to understand the properties (e.g. size, ability, etc.) that produce desirable behaviours (e.g. quality of group performance), emotions (e.g. satisfaction) and other results (see Gist, Locke, & Taylor, 1987 for a review). Contrarily, Stacey (1996) states that teams are non-linear feedback networks that are continuously involved in ongoing processes of positive and negative feedback. On the other hand, Kozlowski and Ilgen (2006, p.78) argue that "teams are complex dynamic systems that exist in a context, develop as members, interact over time, and evolve and adapt as situational demands unfold". In this sense it is important to understand how the interaction between team members affects team functioning. So the traditional linear perspective has failed to capture the complex dynamics inherent in these strong interaction processes (Losada and Heaphy, 2004). In line with these perspectives, to have a clear understanding of the functioning of teams and to predict their effectiveness it is crucial to study personal relations within teams. In this sense, social network analysis (SNA) is a useful methodology to understand the intra-group relations, especially the informal relations within a team and consequently their result. For example, Coleman (1988) stressed the positive effect of cohesive social ties on the existence of effective norms and on the trustworthiness of social structures which diminishes the uncertainty of their exchanges and enhances their ability to cooperate.

On the other hand, the social environment in which these interactions occur plays a key role on team performance and effectiveness. In this article we intend to explore a specific dimension of the social environment - the psychological safety - defined as a shared belief held by the members of a team that the team is safe for interpersonal risk-taking (Emondson,

1999). Everyone has experienced situations in which they felt that the social environment was not safe to take interpersonal risk and, because of that, avoided to interact with others. For example, when a student notices a lecturer made a mistake he may feel reluctant in pointing out the mistake. This happens, not only because he is afraid of the lecturer's reaction, but also because he is afraid of the reaction of the entire class. This also happens in organizations, for example when a worker finds an error on the system but doesn't feel comfortable to talk about it. Edmondson (1999) advanced that individuals act like this in order to protect their personal image. For example, if a worker admits the error he may be seen as a negative person.

In this sense psychological safety is an individual psychological state (rather than a personal trait) in which individuals feel that the social context is not threatening, and it is safe for them to express themselves without hurtful consequences. According to Baer and Frese (2003), an individual's psychological safety reflects a work environment where employees can speak out without negative consequences. They refer to this safe environment as organizational climate for psychological safety. However psychological safety tends to be studied more at an individual or team level. For example, Edmondson (1999) related team psychological safety with learning behaviours. This author refers to psychological safety as a team concept. In this sense, the individual evaluation of the interpersonal risk should converge in the entire team. The research about team psychological safety focuses mainly on its antecedents and consequences. May et al. (2004), for example, focused on the influence of co-worker relations, supervisor relations and co-worker norms as antecedents of team psychological safety. On the other hand, Carmeli (2007) advanced that psychological safety is positively associated with failure-based learning behaviours. In the present paper, we advance a model focused on the team dynamics, i.e. the communication network, to explain the

emergence of the psychological safety. Based on several studies (e.g., Edmondson, 1999; Edmondson, 2003; May et al. 2004; Baer & Frese, 2003) we assume that higher levels of psychological safety will positively influence team and firm performance as well as team learning behaviours.

To the best of our knowledge there is no significant research using social network analysis to explain the process by which a team becomes psychologically safe. On the other hand, because psychological safety tends to be a team construct it is important to understand how team dynamics, evidenced by social network analysis, influence the formation of psychological safety through contagion processes. The goal of this paper is thus to propose a model to understand the influence of the features of the team social network on the psychological safety of team members through a social contagion process. In addition, we expect to contribute to the progress of the psychological safety field proposing a model to explain the emergence of psychological safety through the interactions between team members. Finally, we intend to make a call for further theoretical research to explain the process by which a team becomes psychologically safe.

In the remainder of the paper, we begin by reviewing the literature about psychological safety and social network analysis. Then we present an analysis of the interaction between team social network and psychological safety, and present the theoretical model. We conclude by discussing the implications of our theoretical propositions.

Psychological Safety

According to Edmondson (1999), psychological safety is defined as a shared belief that the team is safe for interpersonal risk-taking. Individuals within teams tend to adopt

passive behaviours concerning their personal relationships, in order to protect their personal image.

Edmondson (2003) states four personal risks that individuals face when working in teams: 1) when someone makes a question may be seen as ignorant; 2) when someone admits an error (or simply calls attention to it), asks for help or accepts the probability of failing, risks being seen as incompetent in general or in that specific task; 3) if someone who criticizes past or present events, may be catalogued as negative; 4) finally to avoid being seen as intrusive, people tend not to ask for feedback.

The psychological safety of a team is distinct from other relational constructs such as trust and perceived organizational support (Carmeli & Gifttell, 2009). Psychological safety goes beyond interpersonal trust as it refers to the climate within a team characterized by both interpersonal trust and mutual respect that allows people to be themselves (Edmondson, 1999). However Edmondson (1999) admits that trust may provide a foundation for further development of the interpersonal beliefs that constitute the psychological safety of a team.

Carmeli and Gifttell (2009) stressed that perceived organizational support is a related concept but not necessarily the same thing. Perceived organizational support emphasises the general beliefs about the appreciation of the organization for the work of their employees and the concern with their well-being (organization focused), while psychological safety is about feeling comfortable to take interpersonal risks (personal relations focused).

Because psychological safety is a belief, it should converge in a team once the team members are subject to the same set of structural influences and these perceptions develop out of salient experiences (Edmondson, 1999). This is consistent with the social processing theory of Salancik and Pfeffer (1978) which advocates that the social environment provides cues

which individuals use to make sense about reality and also provides information about what attitudes and behaviours are expected by the group. For example, if a team member is punished every time he/she makes a mistake, the team members feel that they cannot admit a mistake or will be punished. In this sense, the shared experience of team members ("a team member is punished every time he/she makes a mistake") is fundamental for the development of a common belief ("it is wrong to admit a mistake") and influences the individual behaviour ("don't admit mistakes"). In this case, the low psychological safety has been generated by the social context and previous experience.

According to May et al. (2004), the determinants of psychological safety include supportive supervisory relations, rewarding co-worker relations and adherence to behavioural norms. First, the relationship with one's supervisor can have an impact on an individual's perceptions of the safety of a work environment. Edmondson (1999) pointed that a supportive and coaching oriented leader that has non-defensive responses to questions and challenges will enable the psychological safety of the team members. Second, May et al. (2004) found that co-workers who support each other during tough times at work have mutual respect for one another and value each other's contributions help increase the levels of psychological safety. Third, May et al. (2004) found that normative rules in teams lead to feelings of low psychological safety. They refer to these normative rules as implicit norms that team members follow. So when team members tend to converge to shared normative values, they tend to act according to those rules and to avoid questioning the customary behaviour routines. In this sense, the team members will not take any interpersonal risk, which means they will have low psychological safety. Psychological safety has also been studied mainly as a predictor of learning behaviours (e.g. Edmondson, 1999; Carmeli & Gittell, 2009), firm performance (e.g. Baer & Frese, 2003), work engagement (e.g. May, Gilson & Harter, 2004) and accident

prevention (Probst & Estrada, 2010). Despite psychological safety being related to interpersonal risk-taking, the direct influence of social networks on the psychological safety of a team has received little attention. Due to this, the main goal of this paper is to propose a model to understand the influence of the social network features of a team on the psychological safety of its members.

Social Network Analysis

Social network research has attracted attention from different fields such as sociology, economics, anthropology, mathematics, political science, history and social psychology (Lusher, Robins & Kremer, 2010). Borgatti and Foster (2003) pointed out that the network literature has been growing exponentially since the second half of the 20th century, part of a general shift away from individualist, essentialist and atomistic explanations toward a more relational, contextual and systemic understanding. An advantage of social network analysis is the ability to analyse both the individual attributes (e.g. preferences, skills, abilities, etc.) and social structures (e.g. information flow within a team) (Robins & Kremer, 2010). In this sense, social network analysis might be a powerful tool to investigate complex relations both in organizations and teams.

There are many concepts related to social network analysis. However, for the purpose of this paper, only the more important ones are referred to. A key concept in social network analysis has been the notion of *centrality*. This refers to the importance of a node according to its structural position in the network. There are several concepts about centrality. One of the most known concepts related to centrality is *closeness*, a concept advanced by Freeman (1979) who defined it as the sum of the distances to or from all other nodes, where distance is defined graph-theoretically in terms of the number of links in the shortest path between two

nodes. Closeness is usually measured by averaging the path distances (direct and indirect links) to all the others. In this sense, direct links are counted as one and indirect links receive proportionately less weight.

We have *a structural hole* when two non-connected actors are connected to the same actor. The number of structural holes allows us to estimate the sparseness or closure of an ego network, and may be considered as a density measure when we consider the total number of structural holes in the whole network. According to Burt (2005:16), "structural holes are the empty spaces in social structure".

On the other hand, *closure* is the opposite of a structural hole and is measured as ego-network density. A network with complete closure is one in which all actors are connected to one another (see for example Figure 1b). In such cases, density reaches its theoretical maximum (Coleman, 1990). In this sense, closure may be seen as a density measure.

There are different views about *cohesion*, the most common is density and refers to the "number of ties among a set of nodes expressed as a function of the number of pairs of nodes" (Borgatti & Li, 2009: 11). Other concept of cohesion is the clique which refers to the maximal subset of nodes in which the density is 100%. Usually, we don't find perfect cliques with real data; however there are some techniques to find imperfect cliques.

A model of influence of the social network on psychological safety

In this article we consider the social network as a mechanism by which information flows through communication. The communication networks are the mechanism that exposes the individuals to information, attitudinal messages and others' behaviours (Monge and Contractor, 1999). It is also through communication (or the absence of it) that psychological

safety reveals itself. For example a team with low psychological safety is likely to have less communication levels because its members assume passive communication behaviours in order to protect their personal image.

On the other hand, several researchers (e.g. Rice and Aydin, 1991; Fulk, 1993; Scherer and Cho, 2003) argue that communication networks allow individuals to develop meanings about their social context.

Based on this we propose a model (see Figure 2) illustrating the impact of social network dynamics on the psychological safety of the team**.** The key concept underlying this impact is social contagion. In general we refer to social contagion as the process by which the team members adopt attitudes or behaviours of others in the social network with which they communicate (Scherer and Cho, 2003). In this sense we focus more on the process by which a team becomes psychologically safe than on the antecedents or outcomes of psychological safety.

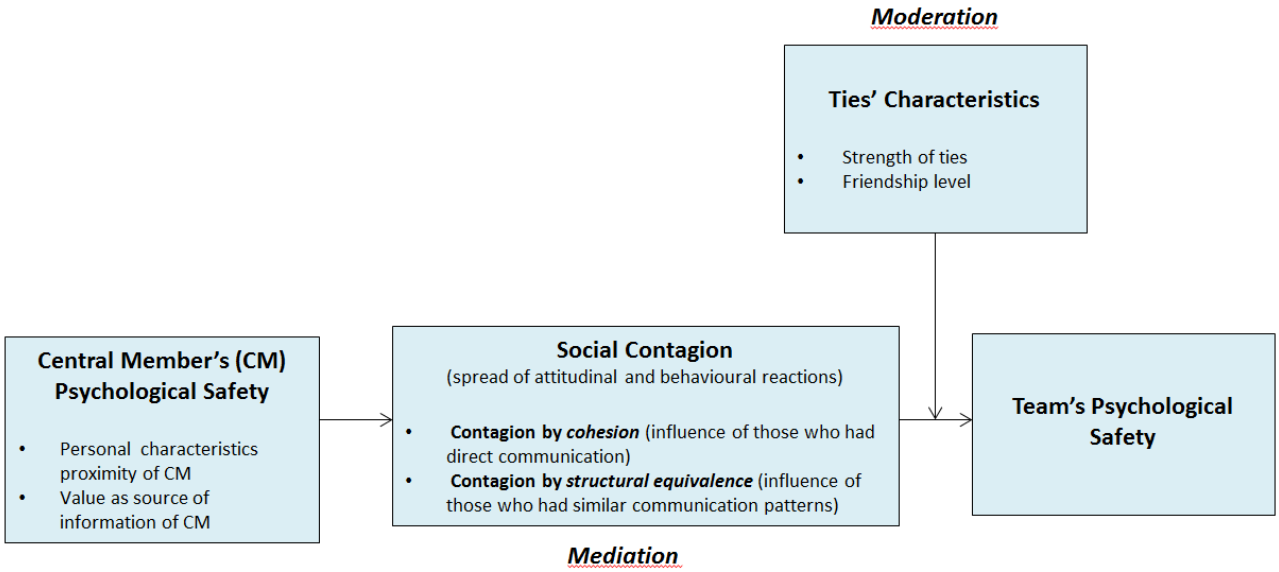

Figure 3 - Model of the influence of social nework on team psychological safety.

This process is influenced by variables at three levels: a) the characteristics of the central member, b) the social contagion process and, c) the characteristics of ties. As for the characteristics of central members we propose three variables. First, we expect that the psychological safety of the central member will impact on the psychological safety of the network through a social contagion process. This happens because, according to Freeman (1979), the central member will be the one that is closest to the other members of the network. As such, the central member assumes a position that allows him/her to interact with a large number of team members in a shortest path. On the other hand, the mere exposition to others may be not enough to the contagion to occur. From this perspective, we sustain that two characteristics of the central member mediate the impact of the node's psychological safety on the network psychological safety – the value of the central member as a source of information and the strength of the proximity to the node's personal characteristics.

In this sense, and according to Rice and Aydin (1991), the mere exposition to others is not enough for social information to have an effect. Individuals must, in some way, value others as a source. This means that the target of influence must see the source of information as trustworthy and valuable. For example, a civil construction worker talking with a civil engineer about construction tends to see him as a valuable source of information because he is an expert. On the other hand, the strength of the proximity to the personal characteristics of a central member is determined by the similarities between the characteristics of that central member and those of others within the network, evaluated by a comparison process.

The contagion process occurs by two processes: contagion by cohesion and contagion by structural equivalence (Burkhardt, 1994). The contagion by cohesion refers to the influence of

those who had direct communication and the contagion by structural equivalence refers to the influence of those who had similar communication patterns.

At the level of tie properties we propose two variables that mediate the influence of the psychological safety of the central member and the psychological safety of his network– strength of ties and friendship levels. We refer strength of ties as the frequency of interaction between nodes. As previously mentioned, network density refers to "the number of ties among a set of nodes expressed as a function of the number of pairs of nodes" (Borgatti & Li, 2009 p.11). The friendship levels refer to the perception of friendship that an individual develops with whom he interacts. We now proceed to describe in more detail the influence of social contagion on the team´s psychological safety and the influence of each group of variables on the social contagion process.

The influence of the central member

Traditionally, the influence of an individual on the attitudes, beliefs and behaviours of the group has been studied by leadership scholars. For leadership theorists, the leader is mainly the middle or top management who has the responsibilities to manage other people. Over the past 60 years leadership research has focused on the leader's characteristics or behaviours and contextual factors, ignoring the structure of interpersonal relationships. According to Brass and Krackardt (1999), the twenty-first century leader has to identify and nurture potential relationships, putting the right people together in the right place at the right time. Therefore, the structure of interpersonal relationships influences the leadership outcomes. On the other hand, centrality is the key component for leadership in organizations (Brass & Krackardt, 1999) to the extent that there is a positive relationship between central network position and

power and influence (e.g. Brass, 1992). Thus the informal position of individuals (the social structure) is more important than the hierarchical position (formal structure).

In this sense the position within the network will be important for individuals to be considered as leaders by others. We therefore assume that any member of the team may occupy a central position within the network regardless of his formal position, enabling his influence on other's attitudes, beliefs and behaviours.

On the other hand, and according to the concept of closeness suggested by Freeman (1979), the central member is the one with shorter distances to or from all other nodes. Thus, the central member will communicate with a larger number of actors than others. However, because he is the one with the shortest path to all the others, the information that he provides will be less exposed to the interference generated by the interactions with several members. As such, the central member will be in a privileged position to influence the entire network. So taking into account the social contagion process and the privileged position of the central nember in terms of communication, we may advance the following proposition:

P1: The psychological safety of the team is positively related with the psychological safety of the central member.

However, the influence of the central member may be facilitated by his/her characteristics and by context. Considering the social information processing theory, already described in this paper, the influence of a person in others beliefs, attitudes and behaviours can be facilitated in two different ways. First, individuals must be proximate to the attitudes, information, or behaviour of others to be exposed to social information (Salancik & Pfeffer, 1978). According to Rice and Aydin (1991: 220), proximity is defined as the "extent to which one could be

exposed to social information in a given social system." Other authors (e.g. Borgatti and Foster, 2003; Ibarra, 1992) refer to another kind of proximity which results from the homophily principle, i.e. the tendency for people to interact more with those of their own kind (e.g. individual characteristics as race, gender, educational class, organizational unit). In this sense, we may consider two kinds of proximity: a) opportunity proximity, related with the opportunity that individuals have to interact; and b) personal characteristics proximity, related to the individual similarities between them.

In addition, the individual must value others as a source in some way, for the social information to have an effect (Rice & Aydin, 1991). We must not confuse the "value" of the source with the strength of the closeness in terms of personal characteristics. . The process by which an individual establishes the other's value depends merely on the evaluation of the other's qualities. In contrast, the strength of proximity of personal characteristics is determined by similarities between an individual and others evaluated by a comparison process. For example, a student may see the lecturer as a valuable source of information, not because of the similarities between them but because of his status.

In a social network based on the communication between actors, the central member is the one that communicates with more others and that can reach them in the shortest path. In this sense we may consider that the central member is the one seen as a valuable source of information and/or is the one that is the closest (opportunity or personal characteristics proximity) to a higher number of network members. In this sense, based on social networks, we identify three components that are important to an actor to become central in communication: a) opportunity to contact with a large number of members; b) similarity to a larger number of actors; and c) the actor is seen by others as a valuable source of information. This leads us to the following propositions:

P2a: The opportunities for the central member to contact with others have a positive impact on the strength of ties.

P2b: The proximity to the personal characteristics of the central member has a positive impact on the psychological safety of the team.

P2c: The value of the central member as a source of information moderates has a positive impact on the psychological safety of the team.

The influence of social contagion

In the literature, different terms are used to describe the process of influence of an actor by another. The contagion approach seeks to explain the knowledge, attitudes and behaviour of the organizational members on the basis of information, attitudes, and behaviour of others within the network to which they are linked (Monge and Contractor, 1999). On the other hand, social contagion suggests that actors adopt the attitudes or behaviours of the others in the social network with whom they communicate (Scherer and Cho, 2003). This influence may be conscious or unconscious and does not require that there is any intention to influence. Lenders (2002) also advocate that it does not matter whether the influence is intentional or unintentional. Therefore, the communication is the most important aspect for the contagion to occur regardless of intentionality.

Contagion can be distinguished into contagion by cohesion and contagion by structural equivalence (Burkhardt, 1994). The contagion by structural equivalence refers to the influence of those who had similar communication patterns. On the other hand, contagion by cohesion refers to the influence of those who had direct communication.

In this sense, the network has a special role since it is the mechanism that exposes individuals to information, attitudes, behaviours and beliefs through the contact with others. Thus, social network analysis allows us to identify the sources of information of each team member as the mere exposure of others' attitudes, behaviours and beliefs will influence one's own attitudes, behaviours and beliefs.

Other framework referring to the contagion is the social information processing approach of Salancik and Pfeffer (1978). This approach proceeds from the fundamental premise that individuals, as adaptive organisms, adapt attitudes, behaviour and beliefs to their social context and to the reality of their own past and present behaviour and situation. Therefore it emphasises the importance of social context as a determinant of an individuals' attitudes, behaviours and beliefs. In this sense, to understand individual behaviour we must understand the informational and social environment within which that behaviour occurs and to which it adapts. According to this approach communication is fundamental for individuals to gather information about social context.

Concerning the influence of social networks on social information processing, Rice and Aydin (1991) concluded that relational proximity (i.e. communication) is more important than spatial proximity, concerning the social information processing. Once again, communication between individuals is pointed out as fundamental to predict their attitudes, behaviours and beliefs. Indeed, Rice and Aydin (1991) support that the social networks based on communication are better predictors of social information processing than others, such as, for instance, those based on spatial positioning.

All these perspectives emphasize the influence of social and symbolic processes, like communication between individuals, on developing patterns of shared cognitions and behaviours. On the other hand, these theories focus more on different aspects of social

construction process than on conflicting premises (Fulk, 1993). Finally, all these perspectives advocate that communication is essential for individuals to develop meanings about their social context.

Considering psychological safety as a shared belief about the social context of individuals, we thus expect that the pattern of the network of communication strongly influences psychological safety. On the other hand, according to social contagion theory (Scherer and Cho, 2003), people tend to adopt the attitudes or behaviours of others in the social network with whom they communicate. So communication is the minimum condition to enable social contagion.

As such, we may expect that information shared by individuals may influence psychological safety, especially when it reports to situations of personal risk-taking with a negative impact. For example, a worker who faces a situation where he is attacked by colleagues because he pointed out a mistake tends to develop low psychological safety. If this worker reports this situation to another, the listener may develop a defensive behaviour (i.e. develop low psychological safety) in order to avoid the same negative reactions. In view of the above mentioned, we may advance the following proposition:

P3: The social contagion process (contagion by cohesion and contagion by structural equivalence) mediates the central member's influence on the psychological safety of the team

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The influence of tie characteristics

According to Granovetter (1973 p.1361) "the strength of a tie is a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding),

and the reciprocal services which characterize the tie". On the other hand, Monge and Contractor (2001) refer to the strength of tie as different measures, like amount of time, emotional intensity, intimacy and frequency, among others. The main difference between these two authors is that the first assumes that tie strength results from the combination of the dependent measures. Contrarily, the second assumes that tie strength may be measured using different and independent measures. On the other hand, McPherson et al. (1992) consider a multi-dimensional concept of strength of ties. These authors refer three aspects of tie strength: (1) the frequency of contact between two nodes, (2) the density of connection between the nodes, and (3) the sociodemographic distance between the nodes.

The contact frequency refers to the frequency of interaction, i.e. number of times a node communicates with another. High frequency of interaction will increase the amount of shared information, the emotional bond and so forth (McPherson et al., 1992). In line with this, Scherer and Cho (2003) found evidences that to be effective, communication must be frequent. Individuals who communicate with each other frequently are more likely to share knowledge effectively than those who communicate infrequently (Reagans & McEvlily, 2003). In this sense, the mere communication between individuals may not be enough for the contagion to occur if it is infrequent.

The density of connection between nodes refers to network density, i.e. the extent to which people are interconnected. According to McPherson et al. (1992), when the members are more interconnected they are likely to share tastes, outlooks, and other features, since their contacts also interact with each other. A denser network provides redundant information to the members, which may contribute to the emergence of a shared vision of the environment. On the other hand, a network with a higher number of "connections" will increase the psychological safety flow across the network. Finally, a high network density prevents the

emergence of cohesive subgroups that may stay away from the influence of the central member, and may develop a shared understanding of the environment that is different from the rest of the network and/or from other cohesive subgroups. In this sense, network density will enable the effect of the central member. This means that if the central member does not feel psychologically safe but the network has a low density the contagion of the whole network will be lower.

The sociodemographic distance refers to the dissimilarity of members in terms of demographic characteristics, such as education and age. Higher levels of dissimilarity in some variables may lead to the emergence of cohesive subgroups because the individuals with similar characteristics (different from the remainder group) will group themselves in subgroups. For instance, members in their 20s may prefer to interact to each other than with members in their 50s. However this is more evident concerning informal interactions. In terms of work related interactions, the members may have to interact with others from a different age in order to accomplish their tasks and goals. Thus homogeneous groups will be those with stronger ties.

There are many consequences of having a network with strong ties that may influence the psychological safety contagion process. For instance, at an ego level, McPherson et al. (1992) found evidence that strong ties with other members increase the duration of membership of team members. On the other hand, Lee and Kim (2010) evidenced that strong ties will promote the access to others in order to offer or receive social support. In turn, Granovetter (1973) states that if the members of a social group share strong ties between each other, then they tend to possess similar norms, attitudes, behaviours, and knowledge. Hence, the mere communication between individuals may not be enough for the contagion to occur. The contact frequency must be high, the network must be dense and the group must tend to be

homogeneous in terms of sociodemographic characteristics. In sum, the strength of ties has to be strong. This leads us to the following proposition:

P4: The strength of ties moderates the social contagion process impacting the team's psychological safety

Another characteristic of ties that may influence the contagion process is the level of friendship. A study led by Schulte, Cohen and Klein (2010), in which they advance with three sociopsychological mechanisms describing the influence of network ties on psychological safety.

First, the number of friendship ties to teammates will influence the perception of psychological safety, i.e. a greater number of friendship ties will be related with greater psychological safety feelings (retrospective sense-making). Second, also if a person has extended ties of friendship from many of his or her teammates, he or she will likely to infer that the team is psychologically safe (reaction). This happens because this person will tend to receive a lot of expressions of friendship from teammates. Finally, Schulte et al. (2010) advocate that the psychological safety of a person will be positively related with the psychological safety of those to whom he/she sends friendship ties. In this sense, the friendship network contributes to psychological safety.

In line with this perspective May et al. (2004) showed a positive relation between employees' perceptions of how rewarding their co-worker relations were and their perceptions of psychological safety. Trust may contribute to psychological safety (Edmondson, 1999), so the trust inherent to a friendship relation may foster psychological safety. So, if a central member in a communication network is also a central member in a friendship network he or she will have a greater influence in the psychological safety of the network. However,

friendship shouldn't be faced as a dichotomous dimension (to have or not have a friendship tie) but rather as a continuous variable. This means that people may feel different levels of friendship depending on the person with whom the friendship tie is established. Thus for the contagion process to occur the level of friendship feelings that an individual has towards others with whom he or she communicates is more important than whether there are or there are not friendship ties. So the interaction gives the indication of the communication and the friendship gives clues about the quality of the relationship. This leads us to the following proposition:

P5: The friendship level moderates the social contagion process impacting the team's psychological safety.

Discussion

From our point of view, this integration of social network analysis with team psychological safety pushes the theory forward on two different fronts. First, it shifts the focus of the study of psychological safety from an input and output perspective to a process view. We propose a model based on the interactions between team members to illustrate the process by which a team becomes psychologically safe. Thus, our model proposes that central team members (central members) play a key role on the psychological safety of a team. On the other hand, network characteristics, namely friendship and the strength of ties moderate the social contagion process by which the central member contributes to the psychological safety of the whole team. Second, this paper focuses more on the process by which a team becomes psychologically safe than in the antecedents and consequences of psychological safety. Regarding this, the social contagion mediates the influence of central member´s on the psychological safety of the team. This doesn't mean that it is not important to understand the

antecedents and consequences of psychological safety; we just tried to fill a fundamental gap in the study of psychological safety, the influence that central member may have on team's psychological safety, the process by which that influence occur and moderator variables that contribute for that influence.

Implications

There are some potential implications from our propositions in terms of central member, network characteristics and context characteristics. Concerning the central member, future research might explore the role of the individual characteristics of the central member in the development of the psychological safety of the team. In this article we only include one personal characteristic of the central member - psychological safety. Indeed, all other characteristics, the personal characteristics of the node and the value of central member as a source of information are more related with the perceptions of others than with the node's "real" characteristics. So it would be important to explore the role of the other characteristics of the central member in the development of psychological safety. For instance, is the authenticity of central members related with higher levels of team psychological safety? It is also important to explore which behaviours of the central member most influence the psychological safety levels of the team. For example, it would be interesting to understand if the supportive behaviour of the central member influences the psychological safety of the team. Finally, it may also be important to understand if the formal position of the central member (e.g. formal leadership) on the organizational structure influences the contagion process.

In the present work, we advance with the strength of ties and network density as network characteristics that mediate the influence of the central member on the psychological safety of the team. However, it is important, in future research, to explore other network

features or team characteristics that may directly or indirectly influence the contagion process. For instance, the number of nodes may influence network density as it is easier for members in small teams to interact with all other peers than for members in big teams. On the other hand, there are other variables in social network theory that may influence psychological safety. For example, we may ask if the number of bi-directional interactions will influence the contagion process.

In the model proposed here interaction opportunities are referred to as context characteristics that influence the strength of ties. Further research is needed to understand the variables that will enable these opportunities. For example, future research might explore the influence of the office layout on providing interaction opportunities. On the other hand, these interaction opportunities may be influenced by other contextual or situational aspects not related with space characteristics.

Concluding remarks

In conclusion, an understanding of the influence of the social network on the team psychological safety give us important insights into the role of team member interactions in psychological safety. We considered that some team members (the most central) will play a key role in the construction of the psychological safety of a team. This understanding may lead us to a new way of approaching team management. Team managers can improve team performance by using social network analysis to identify central members, accessing their psychological safety, and improving the psychological safety of central members. They may also, for example, create interaction opportunities for team members to contact to each other. Finally, we hope that this work may contribute to the development of new intervention tools

to improve team performance, enable organizational learning and team learning behaviours such as available time to interact.

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Authentic Leadership And Psychological Safety: Features For A Better Academic Performance

Abstract

In this paper we attempted to explain how the authentic leadership of teachers and psychological safety of students relate to each other and how it influences the academic performance of higher education students. To do so we ran a questionnaire to 199 undergraduate students studying in a management higher education institution. In general we found a positive influence of both authentic leadership and psychological safety on academic performance. However we didn't find an influence of authentic leadership dimensions (self-awareness, relational transparency, balanced processing, and internalized moral perspective) on academic performance and on psychological safety. We have also considered a second order dimension of authentic leadership which showed to have a positive influence on psychological safety.

***Keywords*:** Psychological safety, authentic leadership, academic performance, business education.

Introduction

The teaching and learning experience in higher education is changing. In the last years we assisted a change from a purely lecture based teaching for a more participative approach. According to Healy, Flint and Harrington (2014), the engagement of students and staff effectively as partners in learning and teaching is one of the most important issues facing higher education today.

On the other hand, an OECD report led by Henard and Roseveare (2012) calls for a new approach in which teachers have to move from subject-specific experts into excellent teachers. This change includes the change of both students and teacher roles. This new

perspective includes a new approach in which the student is in the centre of the teaching and learning process. This requires, even more, leadership skills from teachers to act as knowledge facilitators.

All these changes have an impact on the behaviour expected from students. In this new paradigm, students have to be more participative, both inside and outside the classroom. It is expected that students engage in discussions, ask for help, and make questions during teaching sessions. Consequently they are more exposed to interpersonal risks. For example, when a student asks for help he assumes the risk of being seen as incompetent by the colleagues or the teacher. So the perception that the environment is safe for taking the interpersonal risk may be an important feature for students to learn. We may find in the literature the term psychological safety to refer these perceptions (Edmondson, 1999).

In line with this the skills of teachers will play a key role in the learning process. It is expected for instance that teachers contribute for a psychological safe environment in order to engage the students and consequently to contribute to their academic performance. In other words, it may be important that teachers assume, even more, a leadership role.

In this study we explore a specific type of leadership, authentic leadership, and its relationship with psychological safety and academic performance. Both concepts of authentic leadership and psychological safety have their roots in organizational studies and, to the best of our knowledge, have never been together neither in the educational setting nor at the organisational level. Thus the objective of this study is to test the relationship between the concept of authentic leadership and psychological safety and their importance for the academic performance. More precisely we intended to test the mediation effect of psychological safety in the relationship between authentic leadership and academic performance.

To do so, we start by presenting the concept of psychological safety and authentic leadership. Then we present the hypothesis regarding the relationship between psychological safety and authentic leadership. In the following section we present the method followed by the section dedicated to present the results. Finally we finish with the discussion which includes the findings and the implications, limitations and further research.

Psychological safety

Psychological safety refers to the perception of an individual that his/her team is safe to take interpersonal risk (Edmondson, 1999). This takes into account the premise that individuals in a group or team context tend to adopt passive behaviours in order to protect their personal image and preserve their personal relationships. According to Edmondson (2003), individuals face four different types of personal risks when working in teams: a) to be seen as ignorant when making a question; b) to be seen as incompetent in general or in a specific task when admitting an error (or simply call attention to it), asking for help or accepting the probability of failing; c) to be catalogued as negative when criticizing past or present events; and d) to be seen as intrusive when asking for feedback.

Edmondson (1999) emphasized the importance of team members shared experiences on the development of a shared psychological safety. This is consistent with the social processing theory of Salancik and Pfeffer (1978) which advocates that the social environment provides cues used by individuals to make sense about reality. This means that when individuals are exposed to the same environment they tend to develop shared meanings about the reality. However this approach ignores the importance of individual features on the development of perceptions about the group and situation.

These individual features include previous experiences in similar contexts, knowledge, skills and personality. For example, if a new student came from a school with a teacher-centred approach he may be reluctant to call attention for an error committed by the new teacher. Thus, taking into account the importance of previous individual experiences, we assume in this study a more individualistic approach to psychological safety, considering the perception of authentic leadership and psychological safety as individual constructs. With this individualistic approach we don't intend to diminish the importance of the group, but rather explore the importance of individual perceptions of psychological safety and authentic leadership on individual academic performance.

Moreover, this individualistic approach is not new in the literature about psychological safety. A recent review led by Edmondson and Zhike (2014) found that psychological safety has been studied as an important variable at three levels: organizational, group and individual. Thus our choice is consistent with previous research in the field of psychological safety (e.g. Gong, Cheung, Wang and Huang, 2010; Siemsen, Roth, Balasubramanian and Anand, 2009).

To the best of our knowledge there are no studies about psychological safety in the educational setting. The concept of psychological safety has its roots in organizational studies and has been studied as an antecedent of innovation and firm performance (Baer and Frese, 2003), learning from failures (Carmeli and Gittell, 2008) and team learning behaviours (Edmondson, 1999).

Authentic leadership

According to Luthans & Avolio (2003, p.243) authentic leadership is "a process that draws from both positive psychological capacities and a highly developed organizational context, which results in both greater self-awareness and self-regulated positive behaviours on

the part of leaders and associates, fostering positive development." In other words, authentic leaders' behaviours are transparent and consistent with their feelings and values.

Several studies present authentic leadership as composed by four dimensions: self-awareness, relational transparency, balanced processing, and internalized moral perspective (e.g. Hinojosa, McCauley, Randolph-Seng and Gardner, 2014).

Self-awareness refers to be aware of their strengths and weaknesses, traits characteristics, and emotions (Kernis, 2003). Self-awareness is gained in the contact with others and includes the awareness on how leader's actions do have impact on others. Thus, individuals with high self-awareness tend to seek feedback, to know when it is time to re-evaluate their position and to be aware about how others view their capabilities.

Relational transparency involves showing to others the true self including both the good and the bad side. According to Kernis (2003, p.15) "authentic relations involve a selective process of self-disclosure and the development of mutual intimacy and trust". Therefore, leaders with high relational transparency say exactly what they mean including the hard truths, admit mistakes when they are made and display emotions exactly in line with their feelings.

Balanced processing refers to leaders that take decisions based on data .Ilies, Morgeson and Nahrgang (2005) use the term unbiased processing when referring this concept. Leaders who exhibited unbiased processing will show integrity and character what will influence their behaviours. Thus they don't deny, distort, exaggerate or ignore private knowledge, internal experiences and externally based evaluative information (Kernis, 2003). This means that these leaders usually listen different points of view before come to a

conclusion. Thus, balanced processing is the process by which leaders engage followers and use them as sources of information for decision making.

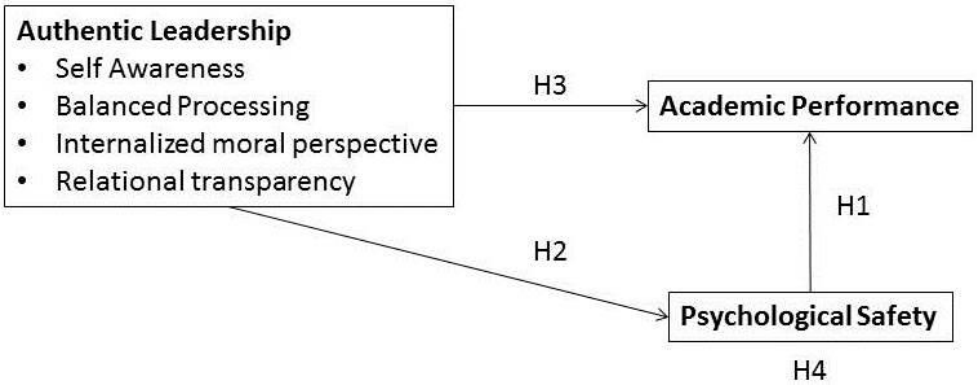
Finally, internalized moral perspective refers to a self-regulation guided more by moral standards and values than by group, organizational, or societal pressures. So the behaviours of the leader, resulted from the decision making process, are consistent with his or her internalized values (Gardner et al. 2005).

Despite the fact that the literature considers four dimensions of authentic leadership, it also considers authentic leadership as a multidimensional construct with a second order dimension which results from the aggregation of all the four dimensions. This is consistent with the notion that authentic leadership is a result of these four related dimensions and all of them contribute for an individual to be considered an authentic leader.

Psychological safety and authentic leadership

In this study we present a model of influence of authentic leadership and psychological safety on academic performance (see Figure 1). Thus, our research model considers the academic performance as the dependent variable and authentic leadership and psychological safety as independent variables. It also considers psychological safety as a mediator of the relationship between authentic leadership and academic performance.

Figure 4 – Conceptual model of the influence of authentic leadership on academic performance and the mediation role of psychological safety.



Psychological safety was originally studied in organizations as a team level concept acting as an antecedent of innovation (Baer and Frese, 2003), learning behaviours from failure (Carmeli, 2007), learning behaviour in work teams (Edmondson, 1999) and individuals' feelings of vitality at work (Kark and Carmeli, 2009). According to Soares and Lopes (2014), the psychological safety of individuals is influenced by the social context and previous experience. One of the main sources of information in a classroom context is the teacher and the relationship he/she establishes with students. For example, if a student is punished by the teacher every time he/she makes a question he/she will avoid making questions in the future to escape the punishment, developing a low psychological safety.

On the other hand, taking into account the types of personal risks presented by Edmondson (2003), a student with low psychological safety will avoid behaviours that may be important for their academic performance such as make questions, ask for help, ask for feedback, admit the error and criticize past or present events. On the basis of this rationale, we suggest the following hypothesis:

Hypothesis 1: Psychological safety has a positive and direct impact on the academic performance.

According to Kark and Shamir (2002) personal identification is a process by which individual's belief about a person becomes self-referential or self-defining. One of the features of authentic leaders is the stimulation of personal identification among their followers (Avolio et al., 2004). Moreover authentic leaders lead by example (i.e. role modelling) through setting high moral standards, honesty and integrity.

Thus, through a process of personal identification, students tend to use their teachers as a main source of information to make sense about the reality. On the other hand authentic leaders tend to behave according to their beliefs, values and emotions. By behaving in that way these teachers will send a message to their students that they can also show authentic behaviours. This allows students to make questions, to admit an error, to ask for help and to criticize. Based on this assumption we draw the following hypothesis:

Hypothesis 2: Authentic leadership perceptions have a positive and direct impact on the psychological safety.

Authentic leadership implies the creation of a safe and supportive environment in which people feel safe to take risks, make mistake and create dialogue (Berson, Nemanich, Waldman, Galvin and Keller, 2006). Therefore, it is expected that teachers with higher authentic leadership capabilities will be able to engage their students and promote open, transparent and unbiased communication both inside and outside of the classroom.

One of the primary mechanisms, but not the only one, whereby authentic leaders influence the development of followers is through the modelling of positive values,

psychological states, behaviours and self-development, which they oftentimes learn vicariously through observations of other leaders.

This positive modelling has its roots in the work of Bandura (1997) on self-efficacy. According Bandura (1997) the credibility, prestige, and trustworthiness of the person being modelled are important to being salient and valued by the observer and to gain the observer's attention and motivation to learn. Thus it is expected that a teacher acting like an authentic leader will positively influence the students, contributing for their academic performance. Considering this, we present the following hypothesis:

Hypothesis 3: Authentic leadership perceptions have a positive and direct impact on the academic performance.

The behaviours of authentic leaders contribute to a climate that encourages openness, transparency and dialogue (Mazutis and Slawinski, 2007). The context both psychological and physical emerges in the literature about leadership as having a mediation effect between the leadership and followers' behaviours (e.g. Mazutis and Slawinski, 2007; Berson et al, 2006). In the education setting we may consider the psychological safety as a psychological contextual feature and the academic performance a result of both students and teachers behaviours.

Thus it is expected that the influence of student's perception of authentic leadership on academic performance should occur because teachers acting as authentic leaders will create an environment psychologically safe in which the students may act in a climate of openness, transparency and dialogue. In other words, by acting as authentic leaders, the teachers will create an enabling environment for the development of a better academic performance. This

means that authentic leaders have a positive impact on academic performance by creating an environment psychologically safe. Thus we present the following hypothesis:

Hypothesis 4: The psychological safety mediates the relationship between authentic leadership and academic performance.

Method

Sample and procedures

Participants in the study were 199 undergraduate students from different courses studying in a business higher education institution in Portugal. All the students present in the teaching session in which data collection took place responded the questionnaire. The students belong to 13 different classes and each class had a different teacher. Of the entire sample, 58 per cent were female, and the average age was 23 (SD = 5.71). Of the entire sample, 30.3 per cent were students from first year, 47 per cent from the second year and the remaining 22.7 per cent were from the third year.

After obtaining permission from the presidency of the institution we approached the module leaders/teachers to schedule the data collection. We conducted a longitudinal study with two moments of data collection. In the first moment the students filled a questionnaire about psychological safety and about the authenticity of the tutor. This first moment of data collection took place between seven and nine weeks after the beginning of the module and between five and seven week before the teaching assessment. In the second moment tutors have been asked to send the students marks to researchers. Only the marks of first opportunity have been used, we didn't take into account the re-sit marks to avoid different conditions on students' assessments (e.g. students that re-sit had more time to study). Due the necessity to establish relationship between tutor authenticity, students' psychological safety and the marks of students we were not able to guarantee the anonymity of the participants. However, all

participants have been informed that the study wasn't anonymous but all their answers were confidential and only the researchers could access it.

Authentic leadership measurement

For this study we used a modified version of the 16 five-point items of Authentic Leadership Questionnaire (Copyright 2007 Authentic Leadership Questionnaire (POQ) by Bruce J. Avolio, William L. Gardner, & Fred O. Walumbwa. All rights reserved in all medium. Published by Mind Garden, Inc. www.mindgarden.com. This instrument was modified by the authors of this article from the original) for measuring authentic leadership. The questionnaire measures four dimensions: self-awareness, relational transparency, internalized moral perspective, and balanced processing. The modifications of the instrument consisted on the exchange of the term "leader" by the expression "this module teacher".

In this questionnaire the individuals have been asked to report the frequency (from 0: "not at all" to 4: "frequently, if not always") with which their tutors adopt 16 behaviours/attitudes). We conducted a confirmatory factor analysis (using SPSS AMOS 20) to test the four factor model. In the original validation of the Authentic Leadership Questionnaire one single second order factor emerged from the analysis (Walumbwa, Avolio, Gardner, Wernsing and Peterson, 2008). As in the original study we have also considered a second order factor, where the four AL dimensions load on a higher AL factor. The results revealed an acceptable model fit (SRMR=.06; RMSEA=.07; TLI=.90; CFI=.92). Thus, in this study we have considered the original four factors model: relational transparency (sample item: says exactly what he or she means), internalized moral perspective (sample item: demonstrate beliefs that are consistent with actions), balanced processing (sample item: listen carefully to different points of view before coming to conclusions) and self-awareness (sample item: seeks feedback to improve interactions with others) and general authentic

leadership as a second order factor. The internal consistency of all dimensions, measured by the Cronbach Alpha, is good with the exception of the dimension balanced processing which has an acceptable internal consistency (see Table 1).

Table 4 – Student-reported authentic leadership: Confirmatory factor analysis.

	SMR	RMSEA	TLI	CFI	Cronbach alphas
Self-awareness					**.85**
Balanced processing					**.64**
Internalized moral perspective					**.70**
Relational Transparency					**.76**
Authentic Leadership					**.90**
Model Fit	.06	.07	.9	.92	

Psychological safety measurement

To measure psychological safety, we adapted the original seven item team psychological safety scale developed by Edmondson (1999). Taking into account the measures used by other researchers to measure psychological safety, we added three more items what resulted in a final 10 items scale. To access psychological safety of the students in the classroom context, we replaced the word “team”, as originally used by Edmondson, with the word “class”. In doing so, we preserved the theoretical meaning of the assessed construct.

Sample items are: ‘‘If you make a mistake in this organisation, it is often held against you (reverse scored item)’’, ‘‘It is safe to take a risk in this organisation’’, and ‘‘No one in this organisation would deliberately act in a way that would undermine my efforts’’. Items were all anchored on a seven-point scale ranging from 1 strongly disagree to 7 strongly agree. The Cronbach’s alpha for this measure was .66. Hence, this scale has an acceptable internal consistency.

Academic performance measurement

To measure academic performance, we used the students official marks of modules in which data collection took place. Marks were expressed in a scale between 0 and 20 and students fail the module when have a mark bellow 9.5. In the institution where we collected the data students have several attempts in different moments after the end of the module. However we have only considered the marks of the first attempt in order to avoid differences in the assessment circumstances within the same class (e.g. different assessment methods, students learning with the first attempt, more time to study, etc.).

Results

Descriptive statistics

In the correlation table (see table 2), both authentic leadership and psychological safety are positively related with academic performance ($r=.32$, $p<.01$ and $r=.17$, $p<.05$, respectively). This supports the fundamental premise of this study that there is a positive relationship between the psychological safety and authentic leadership and the academic performance of students.

As expected authentic leadership dimensions are strongly positively related with general authentic leadership: relational transparency ($r=.87$, $p<.01$). Internalized moral

perspective (r=.83, p<.01), balanced processing (r=.83, p<.01), self-awareness (r=.84, p<.01). These results reinforce the idea that authentic leadership is a multidimensional concept composed by all four dimensions represented in the analysis. Furthermore all dimensions authentic leadership showed to have good relations between them (r>.60, p<.01). The exception was self-awareness and internalized moral perspective with a correlation value slightly lower (r=.55, p<.01).

Finally, authentic leadership and psychological safety revealed to be weakly related (r=.19, p<.01). Thus students that view their teachers as an authentic leader tend also to present high values of psychological safety about their cohorts. Additionally all authentic leadership dimensions have weak positive relations (r<.25, p<.05)) with psychological safety, with the exception of internalized moral perspective (r=.11, p>.05).

Table 5 – Inter-correlations between the variables in study

	Mean	**SD**	**1**	**2**	**3**	**4**	**5**	**6**
1. Academic Performance	7.80	6.08	-					
2. Relational Transparency	3.00	.75	.32**	-				
3. Internalized Moral Perspective	2.73	.72	.26**	.63**	-			
4. Balanced Processing	2.76	.76	.23**	.60**	.65**	-		
5. Self-awareness	2.98	.77	.27**	.64**	.55**	.66**	-	
6. Authentic Leadership	2.88	.64	.32**	.87**	.83**	.83**	.84**	-
7. Psychological Safety	5.35	.70	.17*	.19**	.11	.15*	.17*	.19**

*p<.05. **p<.01

Hypothesis testing

To test our hypothesis related with the influence of psychological safety and authentic leadership on academic performance (H1, H3) we conducted a series of regression analyses, using the student marks as the dependent variable. We considered psychological safety, authentic leadership and the different dimensions of authentic leadership (self-awareness, balanced processing, internalized moral perspective and relational transparency) as regressors. The results are shown in table 3.

First, we tested the influence of authentic leadership and psychological safety in the academic performance in two separated models (model 1 and model 2). Regressing authentic leadership on academic performance reveals that authentic leadership is a significant predictor of academic performance (β=3.1, $p<.01$), supporting H3 (model 1). In the same way the regression of psychological safety on academic performance reveals a significant influence of psychological safety on academic performance (β=1.44, $p<.05$), supporting H1 (model 2).

We also tested a model that includes both authentic leadership and psychological safety (model 3). In this analysis, authentic leadership accounts for less variance than when considered as a single regressor. However the relationship is still positive and relevant (β=2.90, $p<.01$). Inversely the psychological safety lost is effect on the academic performance.

We then introduced additional regressors to model 2. Thus we considered a model with psychological safety and authentic leadership dimensions (i.e. self-awareness, balanced processing, internalized moral perspective and relational transparency) as regressors and academic performance as dependent variable (model 4). In this model only relational transparency accounts for the variance of academic performance (β=1.71, $p<.05$). Finally we

decided to remove the psychological safety variable from this model (model 5). However we found similar results with relational transparency being the only predictor of academic performance (β=1.84, p<.05).

Table 6 – Simple linear regression models of authentic leadership, psychological safety and authentic leadership dimensions (n=199).

DV= academic performance	**Model**				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Constant	-1.14	0.10	-5.66	-5.57	-1.21
Authentic Leadership	3.1**		2.90**		
Self-awareness				.63	.69
Balanced processing				-.10	-.06
Internalized moral perspective				.63	.59
Relational Transparency				1.71*	1.84*
Psychological Safety		1.44*	.95	.92	
Adjusted R-squared	.11	.02	.11	.10	.10

*p<.05; **p<.01

To test the hypothesis related with the influence of authentic leadership and authentic leadership dimensions on psychological safety we conducted two regression analyses considering psychological safety as the dependent variable. Moreover we considered authentic leadership and authentic leadership dimensions (self-awareness, balanced

processing, internalized moral perspective and relational transparency) as regressors. The results are shown in table 4.

In the first model we considered authentic leadership as a single regressor and psychological safety as the independent variable (model 1). The results show a positive and significant relationship between authentic leadership and psychological safety (β=.21, p<.01), supporting H2. In the second model we tested the influence of authentic leadership dimensions on psychological safety (model 2). In this regression we didn't find any significant relationship.

Table 7 – Simple linear regression models of authentic leadership and authentic leadership dimensions (n=199).

DV= psychological safety	**Model**	
	(1)	**(2)**
Constant	4.76	4.76
Authentic Leadership	.21*	
Self-awareness		.07
Balanced processing		.04
Internalized moral perspective		-.05
Relational Transparency		.14
Adjusted R-squared	.03	.04

*p<.01

To test our hypothesis related with the mediating role of psychological safety in the influence of authentic leadership on academic performance (H4) we used the procedures recommended by Baron and Kenny (1986). There are three steps to test mediation linked with three conditions: 1) the proposed mediator significantly predicts the dependent variable, 2) the independent variable significantly predicts the mediator, and 3) the contribution of the independent variable drops substantially for partial mediation and becomes insignificant for full mediation when entered into the model together with the mediator (Baron and Kenny, 1986). In our study we verify the first two conditions i.e. psychological safety significantly predicts academic performance (β=1.44, $p<.05$) and authentic leadership significantly predicts psychological safety (β=.21, $p<.01$). However, the contribution of authentic leadership don't drop so much when entered into the model together with psychological safety (from β=3.1 to β=2.90). These results don't support our hypothesis.

Discussion

Findings

Psychological safety and authentic leadership in the classroom can be important features for the academic performance. In our study we tried to understand how these two variables relate with each other and how they could impact the academic performance. Relying in previous research about psychological safety (Edmondson, 1999; Baer and Frese, 2003; May, Gilson and Harter, 2004; Carmeli and Gittell, 2009) and authentic leadership (Gardner, Cogliser, Davis and Dickens, 2011; Avolio and Gardner, 2005) we proposed that psychological safety and authentic leadership have a positive impact on academic performance. On the other hand we advanced with the hypothesis that authentic leadership has positive influence on the psychological safety. Finally we presented the hypothesis that

psychology safety would be the vehicle by which authentic leadership impacts the academic performance assuming a mediating role.

Therefore this study presents conclusions at three levels: influence of authentic leadership on academic performance, influence of psychological safety on academic performance and influence of authentic leadership on psychological safety. First we found a direct relationship between authentic leadership and academic performance. This means that students that perceive their teachers to be authentic tend to present better academic results (i.e. better marks). The same happens with psychological safety. Students that perceive their environment as safe to take interpersonal risk tend to perform better.

On the other hand, when analysing the influence of the authentic leadership dimensions on academic performance we conclude that only relational transparency has a positive impact. Thus students perform better when they perceive the teacher as someone transparent in his relationship with students. This means that students value when the teacher says exactly what he or she means, admits mistakes when they are made, encourages them to speak their mind, tells the hard truth and display emotions in line with feelings.

We also found that authentic leadership has a positive influence on individuals' psychological safety. So when students perceive their teachers as being authentic they tend to develop psychological safety feelings. One explanation for this fact is that the teacher may influence the students by giving the example. For example, if the teacher assumes the mistake may transmit the impression that the group is safe for taking interpersonal risk.

This is also consistent with the social processing theory which supports the idea that the social environment is important for individuals to make sense about how safe is the group (Salancik and Pfeffer, 1978). So the teacher as an element of the social environment will have

a key role on the development of students' psychological safety by giving them cues used to make sense about reality.

Implications, limitations and further research

This study has both theoretical and practical implications. Concerning the theoretical implications we made a call for the importance in studying the group dynamics in the educational setting. We do so by highlighting the influence of psychological safety and authentic leadership in academic performance. We also presented a perspective about the importance of authentic teachers both in academic performance and psychological safety. On the other hand we introduced the concept of psychological safety, originally from organizational studies, as an important variable for learning in higher education.

At a practical level this study may help teachers to understand how they can influence the academic performance by creating a psychological safe environment. At the same time we highlight the importance of teachers adopting authentic behaviours in order to promote trust and increase the engagement of their students. They can do this for instance encouraging everyone speaking their mind, soliciting views that challenge students deeply held positions, etc.

However, this study is only a first approach to the study of psychological safety and authentic leadership in educational settings. Thus it is not free of limitation. First we ignored the nature and structure of modules. The type of sessions may influence the importance of psychological safety. For example, a module based on seminars needs more engagement of students than a module based on lectures.

In our study we focused only on the individual perceptions about the teacher and about the social context. However it could be interesting in future studies to analyse the importance

of the collective perceptions about the authenticity of the teacher and about the psychological safety. I would be also interesting not focusing only on the perception of students but also on the perception of teachers.

Moreover, it is important to develop an understanding about what strategies may contribute for the development of psychological safe environment and at the same time to increase the authenticity of teachers. Finally we make a call for more studies about these two features in the educational context relating them with other variables than academic performance (e.g. student satisfaction, skills development, student engagement, etc.).

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Exploring The Role Of Psychological Safety, Authentic Teachership And Network Density On Academic Performance

Abstract

This paper resulted from a study of the impact of authentic teachership, psychological safety and network density on academic performance. It was also our intention to explore the relationship between network density, psychological safety and authentic teachership. To do so we ran a questionnaire to 199 undergraduate students studying in a business higher education institution. We found a positive impact of authentic teachership and psychological safety on academic performance. We also found that students from high density groups tend to show better academic performance, higher psychological safety and tend to see their teachers as being more authentic.

***Keywords*:** business education, psychological safety, social networks, academic performance, social cohesion, network density, authentic teachership.

Introduction

When you were a student you have already probably faced a situation in which you had a doubt about what the teacher said but was afraid to question him/her about it. In most of the cases students are afraid of asking both because of what the teacher would think and of what colleagues would think about them. In organisational studies this feeling has been called psychological safety (e.g. Kahn, 1990; Edmondson, 1999, 2003), and occurs because in social situations individuals tend to assume a passive behaviour in order to protect their personal image.

After the first weeks of teaching, students may develop a higher or lower psychological safety depending on many factors. For instance, Edmondson and Lei (2014) identified leadership behaviours has an antecedent of psychological safety. On the other hand,

Soares and Lopes (2014) presented a theoretical model about the influence of social networks on psychological safety. By allowing students to interact more freely between them and with the teacher, psychological safety might contribute for knowledge sharing and consequently for a better academic performance. Drawing on this, we explore in this paper the relationship between social networks, more precisely network density, and students' psychological safety and also the importance of psychological safety for academic performance.

An important aspect is the fact that in the last decades a perspective of students as knowledge partners has become "trendy" in the wider European Higher Education Area (Crawford et al., 2015). This approach demands from teachers (even) more relational skills once they will assume a role of facilitators of knowledge generation. In this paper we develop the concept of authentic teachership based on the concept of authentic leadership from organisational studies (e.g. Luthans and Avolio, 2003; Kernis, 2003) and assess the impact of authentic teachers on academic performance. On the other hand, just like the leadership process the teaching and learning experience involves the interaction not only between the students and the teacher but also between students themselves. Thus, another objective of this paper is to analyse the relationship between social networks, more precisely density, and the perceptions of authentic teachers.

Another important concept for the purposes of this paper is social network cohesion. Cohesion can be defined as the process of keeping members of a group together and united to varying degrees (Dion, 2000). In social network analysis, cohesion refers to the connectedness of individuals from the same group/network. In this paper we use the concept of density, originated in social network theory as a measure of cohesion. In our paper, density refers to the degree of connectivity among students within a specific class. In this paper we explore the importance that density, as the result of the interactions between students, may have on

psychological safety. Thus we take into account the social nature of the learning process advocated, for example, by Bandura (1997).

In summary, the purpose of this paper is to explore the impact of authentic teachership, psychological safety and network density on academic performance, and also explore the relationship between network density, psychological safety and authentic teachership. To do so, we start by presenting the concept of psychological safety and leadership and its potential impact on academic performance, followed by a section where we present the concepts related with social network analysis and the relationship between network density, authentic teachership, psychological safety and academic performance. In the next section, we present the method followed by the results section. Finally, we present the discussion which includes the main findings and some suggestions for future studies.

Psychological safety

In his seminal work, Kahn (1990: 708) defined psychological safety as a "feeling able to show and employ oneself without fear of negative consequences to self-image, status, or career." On the other hand Edmondson (1999) has presented the concept of team psychological safety as the perception of an individual that the group or team is safe to take the personal risk. Both definitions have in common the fact that in social situations and environments individuals tend to protect their personal image in order to preserve their personal relationships. Based on this, our paper will adopt a definition of psychological safety as the degree in which an individual feels that the social environment allow him/her to assume the personal risk.

There are four different types of personal risks that individuals face when interacting with others: a) to be seen as ignorant when asking a question; b) to be seen as incompetent in general or in a specific task when admitting an error (or simply call attention to it), asking for

help or accepting the probability of failing; c) to be catalogued as negative when criticizing past or present events; and d) to be seen as intrusive when asking for feedback (Edmondson, 2003).

According to the social processing theory, social environment provides cues used by individuals to make sense about reality (Salancik and Pfeffer, 1978). On the other hand the team/group members shared experiences will have an impact on the development of a shared psychological safety. Hence, when individuals are exposed to the same environment they will develop a shared meaning about reality (Edmondson, 199). However, this approach ignores the importance of the individual experiences within and outside of the group. Accordingly, Soares and Lopes (2014) developed a model of contagion based in social networks that highlights the importance of the key members in developing a group level psychological safety. For example, the psychological safety of a member that most interacts with others in a group may influence the psychological safety of the entire group.

A recent review by Edmondson and Zhike (2014) found that psychological safety has been studied as an important variable at three levels: organizational, group and individual. At the organisational level this concept has been studied mainly as an antecedent of organisational performance and organisational learning (Edmondson and Zhike, 2014). At this level Carmeli and Gittel (2009) found a relationship between high-quality relationships, psychological safety and learning from failures. The explanation for this relationship may be that when the individuals feel psychological safe they are more willing to admit and discuss the error, ask for feedback and ask for help in solving it. Moreover, it is expected that by doing so they will learn and share the knowledge by contacting with others. According to this, it is expected in the educational context that by being more willing to discuss their errors or

simply asking feedback, the students will develop a deeper knowledge influencing the quantity and quality of what they learn.

The study of psychological safety at the group/team level has its roots on the research led by Edmondson (1999). This concept has been studied as an antecedent, outcome, a mediator and moderator. Just like in the organisational level, also at the group level the concept of psychological safety has been studied as positively related with team learning behaviours (e.g. Edmondson, 1999; Choo, Linderman and Schroeder, 2007) and learning practices in teams (e.g. Huang, Chu and Jiang, 2008; Tucker et al., 2007). For instance, a study developed in the healthcare sector showed that psychological safety mediates the relationship between leadership and team learning behaviours in healthcare teams (Ortega et al., 2014).

Finally at the individual level, psychological safety has been studied mainly as an antecedent of job engagement, organizational commitment, quality internal auditing, creative work environment and knowledge sharing (Edmondson and Zhike, 2014). Despite there are just a few studies about learning behaviours in the educational context, there is evidence that psychological safety increases the motivation for knowledge sharing between individuals (Siemsen et al., 2009). Hence if students feel psychologically safe they will be more motivated to share the knowledge with colleagues contributing for their colleagues and their own academic performance.

According to this, we outline that psychological safety may play an important role on academic performance by providing a social environment in which students feel free to share knowledge, ask for questions and for feedback and discuss their performance. On the other hand, taking into account the types of personal risks presented by Edmondson (2003), a student with low psychological safety will avoid behaviours that may be important for their

academic performance such as ask questions, ask for help, ask for feedback, admit the error and criticise past or present events. Based on this rationale, we suggest the following hypothesis:

Hypothesis 1: Psychological safety has a positive impact on academic performance.

Authentic teachership

Authenticity implies that "one acts in accord with the true self, expressing oneself in ways that are consistent with inner thoughts and feelings" (Harter, 2002: 382). This concept contrasts with false self which implies that one hides the true self and his/her acts are contradictory with it. It is important to note that acting differently in different relational contexts does not necessarily constitute a lack of authenticity (Harter, 2002). For example, it is not expected from a teacher exactly the same behaviour at the classroom that they have when they are with their family or friends.

Based in this definition, Luthans and Avolio (2003: 243) presented the concept of authentic leadership as "a process that draws from both positive psychological capacities and a highly developed organizational context, which results in both greater self-awareness and self-regulated positive behaviours on the part of leaders and associates, fostering positive development." In other words, authentic leaders are aware of their feelings, thoughts, emotions, needs, preferences and beliefs, and act according to those.

Several studies consider authentic leadership as composed of four dimensions: self-awareness, relational transparency, balanced processing, and internalized moral perspective (e.g. Hinojosa et al, 2014). Self-awareness refers to be aware of his strengths and weaknesses, traits characteristics, and emotions (Kernis, 2003). Self-awareness is gained in the contact with others and includes the awareness on how leader's actions do have impact on others. Thus, individuals with high self-awareness tend to seek feedback, to know when it is time to

re-evaluate their position and to be aware about how others view their capabilities. For example, a teacher with high self-awareness will be more aware about the reaction of the students when he is teaching, allowing him to correct his language style if needed.

Relational transparency involves showing to others the true self including both the good and the bad side. According to Kernis (2003: 15) "authentic relations involve a selective process of self-disclosure and the development of mutual intimacy and trust". Therefore, a teacher with high relational transparency say exactly what they mean, admit mistakes and show a consistency between the emotions they are feeling and the ones the display. This component will allow, for example, the teacher to admit an error when it occurs having the chance to correct it. On the other hand, by saying exactly what they mean, teachers with high relational transparency will show a clearer communication what may improve the students' understanding about the message they want to communicate.

Balanced processing refers to leaders that take decisions based on data. Ilies et al. (2005) used the term unbiased processing when referring to this concept. Leaders who exhibited unbiased processing will show integrity and character what will influence their behaviours. Thus they don't deny, distort, exaggerate or ignore private knowledge, internal experiences and externally based evaluative information (Kernis, 2003). This concept assumes that all individuals are subjected to bias and flaws when processing information and that one of the characteristics of authentic leaders is to avoid this by listening to different points of view before coming to a conclusion. Therefore, teachers with high balanced processing engage the students and use them as sources of information for decision making. By doing so they choose their teaching styles, classroom dynamics and other important features for student experience taking into account the perspective of their students. This may contribute for students' academic performance.

Finally, internalized moral perspective refers to a self-regulation guided more by moral standards and values than by group, organisational, or societal pressures. So the behaviours of the leader, resulted from the decision making process, are consistent with his or her internalized values (Gardner et al. 2005). Other authors (e.g. Kernis, 2003; Ilies et al., 2005) call it simply as authentic behaviours/actions. However this doesn't mean that leaders can't adopt their behaviours to the circumstances. Actually internalized moral perspective is deeply connected with self-awareness, once authentic leaders have to be aware of the impact of their choices on others but without losing authenticity in their actions/behaviours.

On the other hand, to consider authentic leadership as a core construct is also conceptually plausible (Rego et al., 2009). This is supported by empirical evidence showing that the variance imputable to overall authentic leadership is more important that the one imputable to each individual constructs (e.g. Kernis and Goldman, 2005). Based on the information above, authentic teachers will be the ones that are aware of the reactions of the students to their behaviours, will engage them in finding the appropriate pedagogic strategies and will use a clear communication by saying exactly what they mean. By doing so they will be more effective in sharing knowledge, answering the questions of students and provide support whenever the students need it. Thus we suggest the following hypothesis:

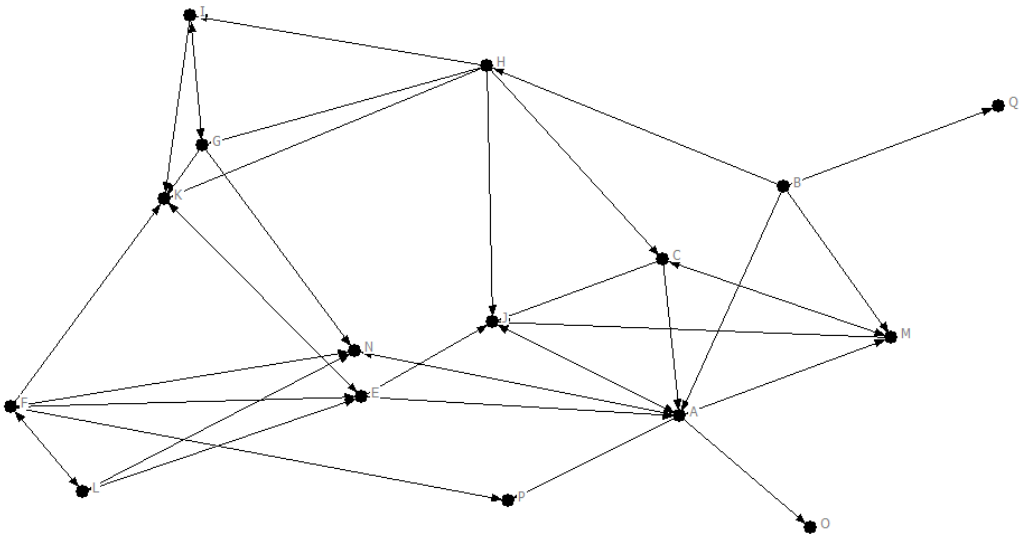
Hypothesis 2: Authentic teachers have a positive impact on academic performance

Social networks

"A network consists of a set of actors or nodes along with a set of ties of a specified type (such as friendship) that link them" (Borgatti and Halgin, 2011: 2). In its simplest format in network theory usually the actors are graphically represented by dots and the ties by edges. The ties may represent many different types of relationship such as: friendship,

communication, participation in the same events, etc. For the purpose of this paper we consider communication networks with three different types of communication content: problem solving, decision making and personal life. Consider for example the network of decision making – real group from our data – shown in Figure 1. In this case we may conclude, for example, that individual B turned to Q to ask for advice on decision making matter.

Figure 5- Example of a decision making network from our data.



Social network analysis has become more popular in the first decade of this century. This is evident in a review by Borgatti and Halgin (2011) that found an exponential increase in the number of articles indexed in Google Scholar with the social network in the title. Social network theory helps in answering the question that has worried social philosophy since the time of Plato: how autonomous individuals can combine to create enduring, functioning societies? (Borgatti et al., 2009).

Moreover, social network analysis allows the analysis of both individual attributes (e.g. preferences, skills, abilities, etc.) and social structures (e.g. information flow within a group/team) (Robins and Kremer, 2010).Therefore social network analysis may be a useful tool to investigate relations in organisations and groups (Soares and Lopes, 2014). In this study we consider teaching classes as groups on which its member stablish many different types of connections (e.g. friendship, communication, etc.) and have the academic success as the main objective. Based on this assumption, social network analysis may give a meaningful insight about how the interactions between members influence their academic performance.

In a review about the micro foundations of organisational social networks, Tasselli, Kilduff and Menges (2015) identified three different positions: 1) people make the network; 2) the network makes the people; or 3) people and networks coevolve. The research about how people make the network assumed that individuals with characteristics traits and cognitions influence the network structure. For example, Smith and Thompson (2012) developed a study about how the status differences (i.e. differences on the perception of social class one belongs) influences the cognitive activation of social networks. In this case, the status as a personal characteristic influenced the activation of their networks when they had to find subsequent employment. An example in an educational context is when the most academically successful students tend to interact more with others with the same success.

On the other hand, the view that "network makes the people" argues that individuals' psychological states depends on the social context in which people find themselves (Tasselli et al., 2015). Thus, according this perspective, the individuals psychological states will be influenced by others with whom they contact. This is consistent with some classic theories on social relations, such as the social processing theory (Salancik and Pfeffer, 1978), which advocates that the social environment provides cues used by individuals to make sense about

reality and the positive modelling concept (Bandura, 1997), that advocates that the credibility, prestige and trustworthiness of someone that will function as a model are important features to become salient and valued by the observer and to gain their attention and motivation to learn.

The third perspective, coevolution of people and network, results from a junction between social psychology (e.g. emphasis on the socio cognitive processes) and structure (e.g. an emphasis on the relationship patterns that characterises a group) (Taselli et al. 2015). In other words, emergent psychological states, such as psychological safety, and social networks are mutually influential. According to this the perceptions of the members of a group will not only result from but also influence the extent to which they turn to another for advice, help, and support (Umphress et al., 2003). According to Schulte et al. (2010) it is intuitively obvious that group members' perceptions and group social networks coevolve however it is much more difficult to explain how.

Density, Academic Performance, Psychological Safety and Authentic Teachers

In this paper we draw on this perspective to assume that social networks (i.e. network density) and individual psychological states (i.e. psychological safety and perceptions of authentic leadership) are mutually influential and contribute for the academic performance of higher education students. Thus we do not intend to establish a cause-effect relationship between social network, psychological safety and authentic leadership, but to compare the differences of perceptions on groups with high density and groups with low density.

Social networks may be analysed taking into account many different measures, mainly at four levels: actor level, i.e. individual level; dyadic and triad level, i.e. between two or three members of a network; subgroups level, i.e. cohesive subgroups within a broader network;

and at the entire network level. In this study we will focus only in a specific feature at the entire network level: cohesion. Cohesion is related with the idea of connectedness. In other words, it refers to the extent to which all the members are connected to each other. Several measures of cohesion have been used to measure the cohesion of a social network, however in this paper we only focus on density as it is the simplest and more common measure.

Network density refers to the degree of connectivity within a network and is measured by the ratio of the number of actual ties in a network divided by the number of al possible ties (Borgatti et al., 2013). For example, when students attend the first teaching session probably nobody knows each other what means that in the first moment the network density is null. However, it is normal that after some weeks the students already had the opportunity to interact with each other increasing the density of the network.

Social cohesion has a positive effect on knowledge transfer by influencing the motivation of the members of the cohesive group to transfer knowledge between them (Reagans and McEvily, 2003). At the educational level this means that students from cohesive cohorts will be more willing to share knowledge with colleagues what will contribute for their academic performance. On the other hand by interacting with each other students will have the chance to ask for help to solve problems or make decisions related with the module what can also lead to a better academic performance. Thus we advance with the following hypothesis:

Hypothesis 3: Network density is positively related to academic performance.

According to McPherson et al. (1992), members from highly interconnected networks tend to share tastes, outlooks, and other features, that can be transmitted through the network once their contacts also interact with each other. Moreover a denser network provides

redundant information to the members, which may contribute to the emergence of a shared vision of the environment (Soares & Lopes, 2014).

Adding to this, Schulte and Klein (2010) found a positive relationship between network density and psychological safety in friendship networks. According with these authors network density and psychological safety coevolve, what means that groups with higher density tend to have higher values of psychological safety and vice-versa. For example, if students feel that the class is safe for them to assume interpersonal risk so they will tend to communicate more often and freely with their colleagues. At the same time by contacting more often with their colleagues the students will develop trust within the group what may lead to a higher feeling of psychological safety. According to this we advance the following hypothesis:

Hypothesis 4: Network density is positively related to students' psychological safety.

Authentic leaders encourage sharing and partnership based on recognition and interdependence in relationships by nurturing, inspiring and empowering their followers (Bhindin and Duignan, 1997). On the other hand, authentic leaders create environments in which authentic conversations are encouraged, what will facilitate learning of individuals and groups (Mazutis and Slawinski, 2007). Therefore, authentic teachers will create an environment within and outside of the classroom that encourages the students to interact with each other and sharing knowledge. It is then expected that authentic teachers will contribute to classes characterised by open communication between students, i.e. to high density classes.

On the other hand, members that are more interconnected tend to share meanings about the social environment (McPherson et al., 1992). This means that a denser network will contribute for the emergence of shared meaning about the teacher, namely in terms of

authentic teachership. According to this it is expected that students from high density classes will see their leaders as being more authentic than individuals from classes with low density through two interdependent processes: influence of authentic teachers on density and influence of density on the development of a shared perception about the teachers. In other words students will interact more with each other when they see their teachers as authentic and at the same time will share that perception with others with whom they contact. Based on this we present the following hypothesis:

Hypothesis 5: The density level of a network is positively related to authentic teachership.

Method

Sample and Procedures

Participants in this study were 199 undergraduate students from different modules and courses studying in a business higher education institution in Portugal. The students belong to 13 different classes and each class had a different teacher. Of the entire sample, 58 per cent were female, and the average age was 23 (SD = 5.71). Of the entire sample, 30.3 per cent were students from first year, 47 per cent from the second year and the remaining 22.7 per cent were from the third year.

After obtaining permission from the board of the institution we approached the module leaders/teachers to schedule the data collection. We conducted a longitudinal study with two moments of data collection. In the first moment the students filled a questionnaire about psychological safety and about the authenticity of the teacher. This first moment of data collection took place between seven and nine weeks after the beginning of the module and

between five and seven week before the teaching assessment. In the second moment tutors have been asked to send the students marks to researchers. Only the marks of first attempt have been used, we did not take into account the re-sit marks to avoid different conditions on students' assessments (e.g. students that re-sit had more time to study). Due to the fact we used social network analysis method, we were not able to guarantee the anonymity of the responses, however all the participants were informed of this fact and advised that all the data is confidential.

Measures

Psychological Safety. For the purpose of this study we used a modified version of the original team psychological safety developed by Edmondson (1999). The original scale is composed by seven items. However, taking into account the measures used by other researchers to measure psychological safety we decided to add three more items what resulted in a final 10 item scale. We also replaced the word "team", as originally used by Edmondson, with the word "class" in order to adapt the instrument to the educational context. In doing so, we preserved the theoretical meaning of the assessed construct.

Sample items are: ''If you make a mistake in this organisation, it is often held against you (reverse scored item)'', ''It is safe to take a risk in this organisation'', and ''No one in this organisation would deliberately act in a way that would undermine my efforts''. Items were all anchored on a seven-point scale ranging from 1 strongly disagree to 7 strongly agree. The Cronbach's alpha for this measure was .66. Hence, this scale has an acceptable internal consistency.

Authentic Teachership. For this study we used a modified version of the 16 five-point items of Authentic Leadership Questionnaire (Copyright 2007 Authentic Leadership Questionnaire (POQ) by Bruce J. Avolio, William L. Gardner, & Fred O. Walumbwa. All rights reserved in all medium. Published by Mind Garden, Inc. www.mindgarden.com. This instrument was modified by the authors of this article from the original) for measuring authentic teachership. The modifications of the instrument consisted on the exchange of the term "leader" by the expression "this module teacher".

In this questionnaire the individuals have been asked to report the frequency (from 0: "not at all" to 4: "frequently, if not always") with which their tutors adopt 16 behaviours/attitudes). Sample items are: "demonstrate beliefs that are consistent with actions", "demonstrate beliefs that are consistent with actions", "listen carefully to different points of view before coming to conclusions" and "seeks feedback to improve interactions with others".

Density Measurement. Density measure was collected by asking participants to nominate up to 5 same-class colleagues enrolled in a specific module whom they would turn to: 1) talk about their personal life (personal life network); 2) ask advice for decision making related with the module (decision making network); and 3) ask advice for problem solving related with the module (problem solving network). After collecting the data we have calculated the density for each class and network using the software UCINET 6 for Windows developed by Borgatti et al. (2002). After having all density values we have divided the classes into high density and low density classes according if they had a density higher or lower than the overall density mean for each type of network (personal life, decision making and problem solving).

Academic Performance. To measure academic performance, we used the students' official marks of modules in which data collection took place. Marks were expressed in a scale between 0 and 20 and students fail the module when have a mark bellow 9.5. In the institution where we collected the data students have several attempts in different moments after the end of the module. However we have only considered the marks of the first attempt in order to avoid differences in the assessment circumstances within the same class (e.g. different assessment methods, students learning with the first attempt, more time to study, etc.).

Results

To test our hypothesis related with the influence of psychological safety and authentic leadership on academic performance (H1, H2) we tested three different models through three different regression analysis, using the student grade as the criteria variable. We considered authentic teachership and psychological safety as regressors. The results are shown in Table 1. In the first regression we used psychological safety as a regressor and academic performance as dependent variable. The results show a significant influence of psychological safety on academic performance (β=1.44, $p<.05$), supporting H1 (model 1)

We found similar results when testing the influence of authentic leadership on the academic performance (model 1). The regression analysis reveals that authentic leadership is a significant predictor of academic performance (β=3.1, $p<.01$), supporting H2.

Table 8 – Simple linear regression models of authentic leadership, psychological safety and authentic leadership dimensions (n=199).

DV= academic performance		
	(1)	**(2)**
Constant	0.10	-1.14
Psychological Safety	1.44*	
Authentic Leadership		3.1**
Adjusted R-squared	.02	.11

*p<.05; **p<.01

Regarding the problem-solving network, results of the two-independent samples t-test shows that academic performance differs between low density group (M= 5.53, SD= 6.04, n= 110) and high density group (M= 10.60, SD= 4.85, n= 89) at a .01 level of significance (t= -6.56, df= 196.00, p< .01, CI for mean differences -6.59 to -3.54). According to this results, on average individuals from the group of high density tend to have better academic performance than individuals from low density in problem solving networks.

In the same direction the results of the two-independent samples t-test within personal life network shows that academic performance differs between low density group (M= 5.84, SD= 6.07, n= 125) and high density group (M= 10.93, SD= 4.65, n=74) at a .01 level of significance (t=-6.515, df=184.20, p<.01, CI for mean differences -60.51 to -3.48). Therefore, just like in the problem solving network, individuals from the classes with high density showed better academic performance.

Finally, the results of decision-making network are similar to the results for problem solving and personal life and decision making networks. Results of the two-independent samples t-test shows that academic performance significantly differs between low density group (M= 6.66, SD= 6.26, n=115) and high density group (M= 9.41, SD= 5.50, n= 83) at a .01 level of significance (t=-3.27, df=188.41, p>.05, CI for mean differences -4.40 to -1.09). Therefore, the results support the hypothesis 3 for all three networks analysed.

Table 9 – Comparison of the academic performance means between high and low density networks

	Density	N	M	SD	SEM
AcadPerform (Problem Solv)	Low	110	5.53	6.04	.576
	High	89	10.60	4.85	.514
AcadPerform (Decision)	Low	115	6.66	6.26	.583
	High	83	9.41	5.50	.604
AcadPerform (Personal Life)	Low	125	5.84	6.07	.543
	High	74	10.93	4.65	.541

The results of the comparison of psychological safety values between high and low density networks showed that they are significantly different only in the problem solving and personal life networks.

The results of the two-independent samples t-test of problem solving network shows that mean psychological safety differs between low density group (M= 5.22, SD= .70, n= 110) and high density group (M= 5.50, SD= .69, n= 89) at a .01 level of significance (t= -3.00, df=

189.53, p< .01, CI for mean differences -.49 to -.10). According to this results, on average individuals from the group of high density tend to have higher psychological safety.

In turn, results of the two-independent samples t-test of personal life network shows that mean psychological safety differs between low density group (M= 5.22, SD= .68, n= 125) and high density group (M= 5.58, SD= .69, n=74) at a .01 level of significance (t=-3.484, df=151.56, p<.01, CI for mean differences -.55 to -.15). In this case, just like in the problem solving, the individuals from the group with higher density showed a higher level of psychological safety.

In contrary, results of the two-independent sample of decision-making network t-test shows that mean psychological safety doesn't significantly differs between low density group (M= 5.33, SD= .700, n=115) and high density group (M= 5.39, SD= .72, n= 83) at a .05 level of significance (t=-.59, df=174.532, p>.05, CI for mean differences -.26 to -.14). This means that, contrarily to what happens in the problem solving and personal life networks, there are not significant differences in the average psychological safety between individuals from the group of high density and the group of low density in the decision making network. Thus, these results support hypothesis 4 only for the personal life and problem solving networks.

Table 10 - Comparison of the psychological safety means between high and low density networks

	Density	N	M	SD	SEM
PsychSaf (Problem Solv)	Low	110	5.22	.70	.066
	High	89	5.52	.69	.073
PsychSaf (Decision)	Low	115	5.33	.70	.065

	High	83	5.39	.72	.079
PsychSaf (Personal Life	Low	125	5.22	.68	.061
	High	74	5.58	.69	.080

Finally we tested the differences of authentic teachership between high and low density groups in the three networks: problem solving, personal life and decision making. Regarding the problem solving network, results of the two-independent samples t-test shows that mean authentic leadership differs between low density group (M= 2.71, SD= .71 , n=110) and high density group (M= 3.09, SD= .46, n=89) at a .01 level of significance (t= -4.34, df= 197, p< .01, CI form mean differences -.55 to -.21). Thus the members from groups with high density in the network of problem solving tend to see their teacher as being more authentic than the individuals from low density ones.

In turn, results of the two-independent samples t-test shows that in the personal life network mean authentic leadership differs between low density group (M= 2.67, SD= .69 , n=115) and high density group (M= 3.18, SD= .40, n=83) at a .01 level of significance (t= -5.91, df= 196, p< .01, CI for mean differences -.67 to -.33). Therefore we may conclude that members from high density in the network of decision making tend to see teacher as being more authentic than the individuals from low density groups.

Finally, in the same direction, the results of the two-independent samples t-test shows that mean authentic leadership differs between low density group (M=2.72, SD= .69, n=125) and high density group (M= 3.16, SD= .41, n= 74) at a .01 level of significance (t= -5.07, df= 197; p<0.01, CI for mean differences -.62 to -.27). This means that the individuals from high

density groups see teacher as being more authentic that the individuals from low density groups. Therefore, these results support hypothesis 5 for both three networks analysed.

Table 11 - Comparison of the authentic teachership perceptions between high and low density networks

	Density	N	M	SD	SEM
Authentic Teachership (Problem Solving)	Low	110	2.71	.71	.068
	High	89	3.09	.46	.048
Authentic Teachership (Decision making)	Low	115	2.67	.69	.065
	High	83	3.18	.40	.044
Authentic Teachership (Personal Life)	Low	125	2.72	.69	.062
	High	74	3.16	.41	.048

Discussion

The main purpose of this paper was to explore the impact of authentic teachership, psychological safety and network density on academic performance and also explore the relationship between network density, psychological safety and authentic teachership. Thus, it presents findings at four levels: impact of psychological safety and authentic leadership on academic performance, the academic performance in high and low density networks, the psychological safety in high and low density networks and the authentic teachership in high and low density networks.

Firstly, we may conclude that both psychological safety and authentic teachership have a positive impact on academic performance. These results evidence the importance of

having a social environment where students feel free to make questions, discuss their doubts and ask for feedback without fearing negative consequences. Despite the difference between organisational and educational context, this is consistent with the literature on learning behaviours in organisations (e.g. Edmondson, 199; Carmeli, 2007; Choo and Linderman, 2007).

On the other hand it is important, for academic performance, that teachers assume a clear communication by saying exactly what they mean, engage the students in finding the appropriate pedagogic strategy and be aware of the reactions of students to their behaviour. This influence of authentic teachership may occur due to two main reasons. Firstly, by assuming a clear communication teachers will improve the students' understanding about what is being said. Secondly, by being aware about the reactions of students and engaging them in finding appropriate pedagogic strategies teachers will not only be able to adopt the most appropriate behaviour but will also contribute for the students' perception that they are truly concerned with their learning experience and academic performance. This image may contribute for a greater engagement from the students, contributing for their academic performance.

Secondly, our results showed that academic performance is better in high density networks than in low density networks in all networks we studied. This means that when there are a high portion of interactions between students for advice in terms of decision making and problem solving and also to talk about personal life they tend to have better grades. An explanation for these results may be the fact that by seeking advice from others in terms of decision making and problem solving students will be equipped with more knowledge and will have the chance to see their doubts clarified.

A high density in personal life may indicate that group members trust in each other and have positive relationships, which may contribute towards a more positive social environment. The results are consistent with the idea that social cohesion influences the motivation of group members to transfer knowledge between them (Reagans and McEvily, 2003). On the other hand, the academic performance is affected not only by issues related directly with the module but also by personal life issues. For example, if for a personal reason a student is absent for a long period he/she may be affected in terms of academic performance. In this case, by talking with other colleagues about their personal life, they may get help to overcome the consequences of being absent.

Thirdly, our results showed that students from high density networks tend to have higher psychological safety than the ones from low density networks, but only for problem-solving and decision-making networks. Thus hypothesis 4 was partially confirmed. One explanation for these results may be the fact that psychological safety enables the interaction between members, once the social environment is safe for them to assume the interpersonal risk. In turn, it is expected that by interacting with each other the students will develop trust and consequently a feeling of psychological safety. Therefore this may be faced as a two way process, i.e. psychological safety influences density and density influences psychological safety.

The results of personal-life networks contradict the conclusions presented previously on the literature (e.g. Schulte and Klein, 2010). The differences of the results may be explained by the contextual differences. In our study, the two first networks - problem-solving and decision-making - were directly related with the module but the network about personal life may have been seen by the participants as unrelated with the module. On the other hand,

the studies about the relationship between density and psychological safety did not focused on the educational context.

Finally, the results showed that members from high density groups tend to see their teachers as being more authentic than those from low density groups in all three networks analysed. Just like the results of the relationship between density and psychological safety also theses ones can be explained by two simultaneous processes. First, by encouraging knowledge sharing and partnership (Bhindin and Duignan, 1997) authentic teachers will influence the interactions between team members contributing for group density. For example, it is expected that an authentic teacher stimulates discussion in the classroom contributing directly to increase the number of interactions between students.

At the same time, members that are more interconnected tend to share meanings about social environment (McPherson et al, 1992). This means that the perceptions of authentic leadership will be shared among the group through the interaction between the students, which may explain the high values of authentic teachership among individuals from high density groups.

This study has both theoretical and practical implications. At the theoretical level we advanced with important clues about the role of group dynamics and interpersonal relationships for the academic performance of higher education business students. According to our results it seems plausible to think that both the teacher behavioural choices and the relationship between students may influence the academic performance and to influence each other. We also developed the concept of authentic teachership which seems to be important for the teaching and learning experience.

At the practical level this study may help teachers and academic leaders to understand how they can improve academic performance by developing an authentic teachership style. Thus higher education institutions may include in their training plans programmes related with the development of authentic skills for teachers. On the other hand, this paper may help teachers to understand the importance of promoting a psychological safe environment inside and outside the classroom. Finally, by being aware of the importance of relationships between students for their academic performance teachers may develop initiatives inside and outside the classroom to promote the cohesion within the group.

Just like all studies this one is not free of limitations. First we have ignored the nature of the module and type of assessment. For instance a module based on seminars may require more interaction and a more psychological safe environment than a module based on lectures. Also a module in which the assessment is based on group coursework may require more interaction between students and a higher psychological safety, especially within the coursework subgroups, than an assessment based on an exam.

For future studies it is important to go deeper into the study of the relationship between network density, psychological safety, authentic teachership and academic performance, by studying for example causal effects and/or mediation/moderation effects. It is also important to study the influence of other variables in these relationships, such as the nature of the modules, the type of assessment and the dimension of the group.

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CHAPTER 3 – GENERAL DISCUSSION

General Findings and Conclusion

The present study aimed: a) to expand the study of groups and teams through the development of a psycho-structural approach, b) understand the development of psychological safety using a psycho-structural approach, c) understand the importance of psychological safety and the psycho-structural approach to the study of groups on the higher education context, and d) to understand the importance of psychological safety, authentic leadership/teachership and social networks on the academic performance.

In the first article a psycho-structural approach has been used to develop a model about the emergence of psychological safety, contributing to the objective of developing a new approach to the study of groups and teams. The main conclusion of this article is that by using simultaneously a psychological (psychological safety) and a structural approach (social networks) we open new possibilities and explanations of the complex group dynamics. In this case, this study advances with the idea that group members' interactions will have an impact on the psychological safety of the group. It focused more precisely on how social contagion contributes to enhance the influence of central member on the psychological safety of the group. It also assumes that this influence occurs through a social contagion process, composed by two components: cohesion and structural equivalence. This is consistent with the work of Burt (1987) that considers that the mere expositions of actors to others behaviours an attitudes will influence their own attitudes and behaviours (cohesion) and that members in the same position will share the same experiences and then develop shared understandings (structural equivalence).

On the other hand, this article advanced with some clues on the importance of individual constructs on the development of shared constructs. For example, the perception that the central member of the group is a good source information will positively influence the

contagion process, contributing to a higher value of psychological safety of the entire group. This is grounded not only on the theory about social contagion but also on the theory about social information processing. For example, Rice and Aydin (1991) argue that for the social information processing have an impact, individuals must value the source of information, the central member in the case of this paper. Another important conclusion of this paper is that friendship and strength of ties have an important role, moderating the influence of central member on the psychological safety of the team. This conclusion is in line with the idea that positive relations between group members influence psychological safety (May et al. 2004). In turn, aspects such as frequency will contribute to expose more often individuals to the attitudes and behaviours of central member, increasing the chances of the contagion occur. On the other hand, members of groups or teams tend to possess similar norms, attitudes, behaviours and knowledge when they share strong ties between them (Granovetter, 1973).

The second article showed the importance of authentic leadership and psychological safety on the educational setting. In other words, the results of this study showed a positive impact of both authentic leadership and psychological safety on academic performance. On the literature psychological safety has been shown as an important antecedent of learning behaviours in working teams (e.g. Edmondson, 1999) and learning from failure (e.g. Carmeli, 2007). Therefore, this study expanded the impact of psychological safety on learning to the educational context, by showing that individuals with higher levels of psychological safety tend to have better academic performance. On the other hand, also authentic leadership showed to be an important antecedent of academic performance. This means that students that perceive their teachers as being authentic tend to have better academic performance. Authentic leadership implies the creation of a safe and supportive environment in which people feel safe to take risks, make mistake and create dialogue (Berson, Nemanich,

Waldman, Galvin and Keller, 2006) Thus one explanation of this results is that teachers that show more authentic behaviours will be able to promote open, transparent and unbiased communication, contributing for a better academic performance of students (Mazutis and Slawinski, 2007).

Moreover, by creating this positive social environment it is expected that the group also develops higher values of psychological safety. There this paper hypothesized that authentic teachers would create an environment psychological that in turn would contribute to the academic performance. In other words, it is expected that psychological safety assumes a mediation role between academic authentic leadership and academic performance. However the results of this study didn't support this hypothesis. This may due the fact that each group of students has many different teachers and all of them may have an impact on overall psychological safety of the group. For example, the teacher that has been studied in this study may have a high rate of authentic leadership, but if all other teachers of the same group present few authentic behaviours then the group may develop lower levels of psychological safety.

The third paper of this work expands the study of the impact of authentic leadership and psychological on academic performance by asking what is the importance of social interactions on this three variables. It studied mainly the impact of network density on authentic teachership, psychological safety and academic performance. By doing so it contributes for the objective related with the importance of using a psycho-structural approach to the study of groups in the higher education context. The first contribution of this paper is the development of the concept of authentic teachers, based on the traditional concept of authentic leadership (Luthans and Avolio, 2003), as being aware of the reactions of the

students to their behaviours, engaging them in finding the appropriate pedagogic strategies and using a clear communication by saying exactly what they mean.

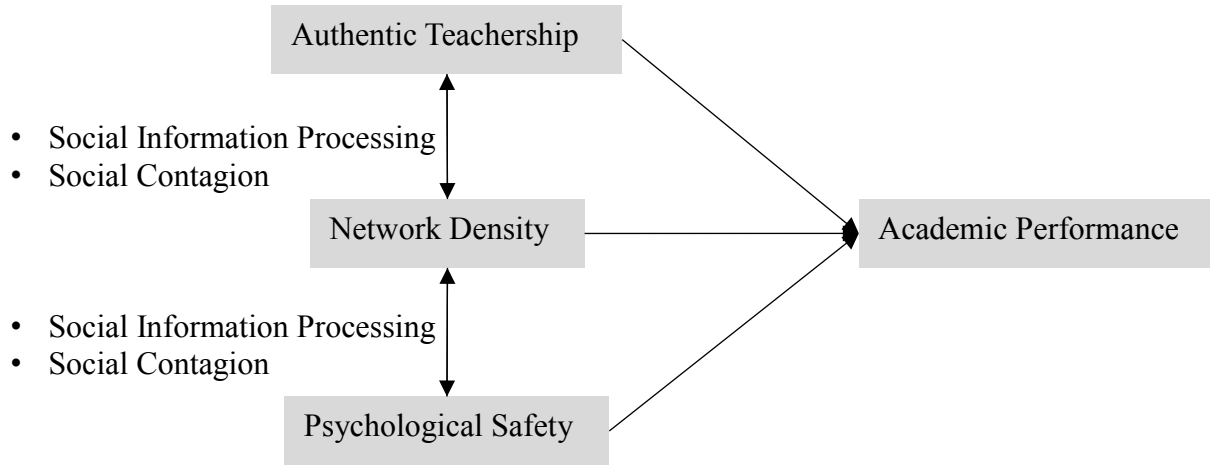
In this study, network density showed to be positively related with academic performance, psychological safety and authentic teachership perception. The impact of network density on academic performance may be due the fact that social cohesion has a positive effect on knowledge transfer among the members of the group (Reagans and McEvily, 2003). In other words, by interacting more with each other the group members will be more motivated to share knowledge and to talk about issues and doubts they may face about learning issues related with a specific module. In turn, the impact of network density on psychological safety may occur because by being part of a cohesive group students will develop friendship ties and trust what contributes for their psychological safety. This is consistent, for instance, with a study conducted by Schulte, Cohen and Klein (2010) that found a positive relationship between network density and psychological safety in friendship networks.

Network density may be positively related with authentic teachership perceptions mainly through two different processes. First by being authentic teachers will encourage sharing and partnership based on recognition and interdependence in relationships by nurturing, inspiring and empowering their followers (Bhindin and Duignan, 1997). Thus it is normal to think that authentic teachers will create more dense networks. At the same time members that are more interconnected tend to share meanings about the social environment (McPherson et al., 1992). Therefore network density and psychological safety co-evolve through two interdependent processes: influence of authentic teachers on density and influence of density on the development of shared perception about teachers. This can be explain through the psycho-structural approach already presented in this work. By showing

authentic behaviours teachers will provide clues that this is the right manner to act in this context (social processing information) what will encourage students to interact with each other increasing network density and at the same time by interacting with each other the students will expose themselves to others behaviours and attitudes contributing for the development of a shared perception of authentic teachership (social contagion). This process can also be applied to the relationship between network density and psychological safety.

In summary, the studies developed on behalf of this thesis allow us to conclude that authentic teachership, network density and psychological safety have a positive impact on academic performance. It also showed a relationship between authentic teachership and network density and between network density and psychological safety, being social contagion and social information processing important features in these relationships. Figure 6 presents a psycho-strutural model that results from the three articles of this work.

Figure 6 – A psycho-structural model of influence of authentic teachership, network density and psychological safety on academic performance.



Theoretical Implications

This study presents several implications. First, it presents some clues about the importance of adopting both a psychological and structural approach when studying group and team dynamics. The study of both psychological constructs and structural aspects of groups and teams is not entirely new. For example Schulte, Cohen and Klein (2010) studied the coevolution of network ties and perceptions of psychological safety. However, this is one of the few studies that use social networks and a group psychological construct to explain group dynamics. On the other hand, by advancing with the conceptualisation of psycho-structural approach this study makes a clear call for a better understanding of groups taking into account both the psychological and the structural approach.

In a recent article, Edmondson and Lei (2014) make a call for more studies making use of a dynamic view of psychological safety to provide insights about how psychological safety unfolds and builds. On the other hand, they make advance that future studies should use a multilevel and cross-level research approach (Edmondson and Lei, 2014). Based on this, the current work presents a dynamic explanation on how psychological safety develops from the interaction between members, more specifically using social network analysis, social contagion and social information processing to explain how psychological safety emerges. Moreover, social network analysis may be a powerful tool to study psychological safety at a multilevel and cross level. For example, the third article of this thesis studied the influence of network density and psychological safety (group level variables) on academic performance (individual level variable).

Finally, this study expands the study of psychological safety, authentic leadership and social networks to the higher education context. By doing so, it advances with some clues that the study of group concepts in different social contexts may help to shed some light about the

complexity of human social interactions, more specifically at the group level. In other words it calls for a better integration of psychological concepts in different contexts. For instance, the concept of psychological safety has been advanced in the literature within organisations science but can be used to understand group and individual behaviour in other contexts such as the educational one.

Limitations and Future Research

Most of the limitation and future research suggestions have been presented in each article of this thesis, however it is important to present some general ideas about this topic. First, it is important that future studies test the relationship between authentic leadership, psychological safety and social networks at the organisational level. The hypothesis advanced by the articles can also be used in the organisational level, once the main literature that support them has its roots on the organisational science literature. However, the results may be different by many reasons. For example, the group life cycle of a higher education class is usually shorter (approximately three years) tan the life cycle of a group or team from organisations, what may have an impact, for instance, on the development of shared constructs. However, the studies developed in this thesis may be important, for example, for a comparison from short term groups (higher education setting) and long term groups (organisational setting).

It is also important, in future studies, to understand how the psycho-structural approach presented in this study may contribute for an explanation of organisational behaviour and how it can impact the practice of managers and human resources managers in organisations. For example, it could be interesting to study the impact of network density of friendship networks and psychological safety on talent retention. In other words, this study is only a starting point that, to have a real impact, need to be complemented with more applied

research. On the other hand, it is important to go deeper on the study of social contagion and social processing information in the psycho-structural models and theories. This may be seen as the main limitation of this study, however I see this as a natural choice for this study once the main focus has been the relationship of psychological safety, authentic leadership and social network and also the relationship of these variables on academic performance.

Regarding the higher education context it is important to develop more studies using both authentic teachership, psychological safety and social networks. For instance it is important to understand the relationship between psychological safety and the pedagogic strategy adopted. For example, it is expected that a more active pedagogic method will require higher values of psychological safety than traditional lectures. On the other hand, the vast majority of the participants in this study are Portuguese, what makes hard to generalize these results to other cultures. Therefore, future studies should focus on the impact of cultural difference on psychological safety and social networks. One example of a research question is "what's the difference between culturally homogeneous and culturally heterogeneous classes in terms of psychological safety and network density".

Concluding remarks

This thesis was drawn specially on previous literature about psychological shared constructs, social networks and psychological safety and had as the main goal to develop a new approach, the psycho-structural approach, to the study of groups and teams. Therefore this thesis is just one small contribution to the study of groups and teams, trying to combine two different traditions: the psychological approach, mainly from psychological sciences, and the structural approach mainly from sociology and organisation sciences.

In sum, I hope that the reader of this thesis become an active contributor to a more holistic approach to the study of teams and groups, by taking into account both the psychological and the structural approach (psycho-structural approach) and at the same time to take into account a cross contextual view (educational and organisational contexts, in this case).

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APENDIX A

O presente questionário insere-se num estudo acerca do funcionamento de grupos e equipas, mais precisamente acerca da forma como as relações interpessoais influenciam o seu funcionamento. O preenchimento do questionário deverá levar, aproximadamente, 15 minutos. Não existem respostas certas ou erradas, pelo que pedimos que responda com a maior sinceridade. Todos os dados recolhidos serão tratados de forma confidencial. Pedimos-lhe que seja o mais sincero(a) possível nas suas respostas. Informamos ainda que pode desistir do estudo em qualquer momento. Agradecemos a sua colaboração.

Os investigadores responsáveis pelo estudo agradecem a sua colaboração!

Dados Demográficos	

Nome:_____

Sexo:____ **Idade:**____

Curso:_____ **Ano do Curso**_____

Unidade Curricular_____

Secção A	

1. Indique cinco colegas dentro da sua turma a quem recorra (ou recorreria) para falar acerca de <u>aspetos da sua vida pessoal</u>:

		Em que medida recorreu a este colega nos últimos 6 meses?						
Colega I:	_____	1	2	3	4	5	6	7
Colega II:	_____	1	2	3	4	5	6	7
Colega III:	_____	1	2	3	4	5	6	7
Colega IV:	_____	1	2	3	4	5	6	7
Colega V:	_____	1	2	3	4	5	6	7

2. Indique cinco colegas de turma a quem recorra (ou recorreria) <u>quando tem que tomar uma decisão importante ou difícil relacionada com esta unidade curricular</u>:

		Em que medida recorreu a este colega nos últimos 6 meses?						
Colega I:	_____	1	2	3	4	5	6	7
Colega II:	_____	1	2	3	4	5	6	7
Colega III:	_____	1	2	3	4	5	6	7
Colega IV:	_____	1	2	3	4	5	6	7
Colega V:	_____	1	2	3	4	5	6	7

2. Indique cinco colegas da sua turma a quem recorra (ou recorreria) <u>quando tem um problema relacionado com esta unidade curricular</u>:

		Em que medida recorreu a este colega nos últimos 6 meses?						
Colega I:	_____	1	2	3	4	5	6	7
Colega II:	_____	1	2	3	4	5	6	7
Colega III:	_____	1	2	3	4	5	6	7
Colega IV:	_____	1	2	3	4	5	6	7
Colega V:	_____	1	2	3	4	5	6	7

Secção B	

Pense nos cinco colegas de turma que a/o fazem <u>sentir mais otimista</u> quando interagem consigo. Indique os seus nomes e o grau em que cada um deles o faz sentir otimista:	Indique em que grau cada uma delas a/o fazem sentir assim, sendo que 1 equivale a pouco e 7 totalmente:
	1 2 3 4 5 6 7
	1 2 3 4 5 6 7
	1 2 3 4 5 6 7
	1 2 3 4 5 6 7
	1 2 3 4 5 6 7

Secção C	Indique o seu nível de concordância com cada das seguintes afirmações, <u>acerca da sua turma (nesta unidade curricular),</u> sendo que 1 equivale a "discordo totalmente" 7 a "concordo plenamente".

Se comete um erro na sua turma, este é frequentemente utilizado contra si.	1	2	3	4	5	6	7
É permitido aos membros da sua turma desta unidade curricular apresentarem problemas e questões delicadas	1	2	3	4	5	6	7
Os membros da sua turma por vezes rejeitam outros por serem diferentes.	1	2	3	4	5	6	7
É seguro assumir riscos na sua turma.	1	2	3	4	5	6	7
É difícil pedir ajuda a outros membros da turma.	1	2	3	4	5	6	7

Ninguém da sua turma seria capaz de agir deliberadamente para minar os seus esforços.	1	2	3	4	5	6	7
Quando trabalha com os membros da sua turma, as suas competências e talentos pessoais são valorizados e utilizados.	1	2	3	4	5	6	7
Não tenho medo de ser eu próprio nesta turma.	1	2	3	4	5	6	7
Tenho medo de expressar as minhas opiniões no seio desta turma.	1	2	3	4	5	6	7
Existe um ambiente ameaçador nesta turma	1	2	3	4	5	6	7

Secção D	Por favor, refira a frequência com que o professor desta Unidade Curricular adota os seguintes comportamentos. Utilize a seguinte escala :

Nunca	**Uma vez por outra**	**Por vezes**	**Com alguma frequência**	**Frequentemente, senão sempre**
0	**1**	**2**	**3**	**4**

Diz exatamente o que pensa.	0	1	2	3	4
Assume os erros que comete.	0	1	2	3	4
Encoraja todos a dizer o que pensam.	0	1	2	3	4
Diz as duras verdades.	0	1	2	3	4
Mostra as emoções que correspondem ao que sente.	0	1	2	3	4

As suas ações são consistentes com as suas crenças.	0	1	2	3	4
Toma decisões baseadas nos seus valores fundamentais.	0	1	2	3	4
Pede-me para tomar posições de acordo com os meus valores essenciais.	0	1	2	3	4
Toma decisões difíceis baseadas em elevados padrões éticos.	0	1	2	3	4
Solicita-me pontos de vista que questionem as suas (dele/a) posições mais profundas.	0	1	2	3	4
Analisa informação relevante antes de tomar uma decisão.	0	1	2	3	4
Ouve cuidadosamente os diferentes pontos de vista antes de tirar conclusões.	0	1	2	3	4
Procura obter informação (feedback) das pessoas para melhorar as interações com elas.	0	1	2	3	4
Tem uma noção clara do modo como os outros encaram as suas (dele/a) capacidades.	0	1	2	3	4
Sabe quando é a altura de reavaliar as suas posições em assuntos importantes.	0	1	2	3	4
Compreende como as suas ações têm impacto nos outros.	0	1	2	3	4