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**Psychological Safety and Team Effectiveness – A Quantitative Study
of IT Teams from Sweden and The United States**

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Abstract

The modern economy has put an emphasis on team-led work in both large- and small-scale projects. This has led to ways to maximize the effectiveness of teams, with an increasing focus being put on one key concept: psychological safety. The aim of this study is to examine the relationship between psychological safety and team effectiveness through the use of a cross-sectional study design on an IT population. Team effectiveness was assessed using a comprehensive framework, which defines team effectiveness through team performance, team satisfaction, and team viability. Furthermore, team learning was evaluated as a mediator. Finally, a cross-cultural comparison was done on psychological safety between a competitive-driven work culture (USA) and a consensus-driven work culture (Sweden). We analyzed data collected from 128 participants (Sweden, $n_1 = 43$; USA, $n_2 = 85$) that are a part of information technology teams. The results indicate that psychological safety positively and significantly correlates with team effectiveness and its sub-dimensions, with team learning serving as a partial mediator for team viability and the combined measure of team effectiveness. In addition, no significant differences between the United States and Sweden in regard to the reporting of psychological safety was found. The results from this study add to the growing body of evidence of a relationship between psychological safety and the effectiveness of a work team. Additionally, it deepens the insight into the construct of team effectiveness especially team satisfaction and team viability which have not been addressed to a great extent in previous research. In the future, studies should focus on examining these relations longitudinally to gain information on causality.

Keywords: IT-teams, Psychological Safety, Team Effectiveness, Team Learning, Team Performance, Team Satisfaction, Team Viability, Work Culture

Psychological Safety and Team Effectiveness – A Quantitative Study of IT Teams from Sweden and The United States

Work organized in teams is one of the most common characteristics of modern work life. The modern economy has put an emphasis on team-led work in both large- and small-scale projects (Akan et al., 2020; Nicholson et al., 2006; Soboleva & Karavaev, 2020). This is due to the growth of complexity of work tasks which has put a greater need for humans to work together as a team to be able to successfully master the task (Forsyth, 2019). Teams can be found in many different workplaces. For example, in the IT-sector, employees in a myriad of roles work together, such as programmers, software engineers, and consultants (McMurtrey et al., 2002). This sector is one of the vast growing industries nowadays (Bajarin, 2016). In 2020 alone, the United States invested 144.3 billion dollars in the tech industry (Tech Nation, 2021). Additionally, investments in Europe rose up to 34 billion euros in 2020 due to the digital shift caused by the pandemic (Innovation Origins, 2020). This industry is built on teamwork, for a team to be successful and effective, they need to be able to collaborate and support each other's work. For just a singular worker operating independently, process loss may manifest itself in as much as 20 times the wage of that worker to the organization (Oxenburgh & Marlow, 2005). Indeed, as one may expect, this effect is much more pronounced when working as a part of a team. Unproductivity of one team member can affect the whole team's effectiveness and endanger the team's goals as well as the company's (Nicholson et al., 2006).

Steiner's (1972) framework of Group Effectiveness illustrates another approach to think of actual productivity loss by looking at it as a process loss combined with a synergy effect. In this model, the reasons for process losses can be numerous and far-reaching but can basically be thought of as anything that prevents the group from reaching their full potential productivity (Kerr & Tindale, 2004). One of the most common types of process loss within a team is conflict. Additionally, Steiner (1972) hypothesizes that the mechanism through which these teams interact is dictated by a concept that he refers to as synergy. It can usually be summed up by the term "greater than the sum of the parts", which is typically referring to a positive synergy effect, although a negative synergy is possible (Liemhetcharat & Veloso, 2014). An example of a team with good synergy would be one that coordinates their efforts efficiently and can resolve conflicts well (Presbitero, 2021). Both process losses and synergy effects are, at their core, interpersonal processes (Presbitero, 2021). Both can be improved or worsened depending upon the

interpersonal dynamics of the team. A notable interpersonal dynamic which has been found to have an impact on team effectiveness is psychological safety (Akan et al., 2020). For instance, organizational learning research has emphasized cognitive and interpersonal factors, such as psychological safety, to explain effectiveness. It showed, for example, that an individual's negative perception of interpersonal relationships can decrease learning behavior and increase ineffectiveness in organizations (Edmondson, 1999). Previous research has indicated that team learning may be a possible mediator on the relationship between team effectiveness and psychological safety, in the sense that psychological safety fosters the learning process within a team and therefore, the effectiveness of a team increases (Edmondson, 1999; Ortega et al., 2010; Sanner & Bunderson, 2015).

Aim of this Study

Considering this, the aim of this study is primarily to examine the relationship between team effectiveness and psychological safety in the IT-sector using Hackman's (1987) framework of team effectiveness. This framework suggests that team effectiveness should be assessed by looking at a team's performance, satisfaction, and viability. Not much research has been previously conducted on the sub-dimensions of team effectiveness, therefore, this study aims to address this research gap and gain more knowledge regarding this area. Additionally, our study will also assess the role of team learning as a possible mediator which has been identified by previous literature. Lastly, a cultural comparison will be conducted to assess whether there are differences in psychological safety between a competitive- and consensus-driven work culture by comparing the ratings of IT-workers in Sweden and the United States.

Literature Review on Previous Research on Team Effectiveness, Psychological Safety, and Team Learning

In this section, a brief overview of the current literature regarding team effectiveness, its aforementioned sub-dimensions, psychological safety, and team learning will be given.

Team Effectiveness

In studies of work teams in organizational settings, Hackman (1987) concludes that team effectiveness is facilitated by structural features like design of team task, team composition, and

context as for example availability of information, resources, and rewards. Whereas team effectiveness has been defined as team performance in many studies, Hackman (1987) provides a more holistic framework of team effectiveness. He suggests evaluating team effectiveness not only by measuring team performance, but also by team satisfaction and team viability (Hackman, 1987).

Conceptualization of Team Performance

Team performance, as a sub-dimension of team effectiveness, can be thought of as the ability of the team to improve existing team processes. This includes innovative ideas to enhance team processes and/or the team outcomes such as a shared to-do list which allows the team to have a better overview on the tasks. (Hackman, 1987; Paolucci et al., 2018). It contributes to team effectiveness as it describes the dynamics of the team members working together (Hackman, 1987).

Conceptualization of Team Satisfaction

The team satisfaction sub-dimension of team effectiveness can be defined as the degree of positive social climate within the group (Hackman, 1987; Paolucci et al., 2018). This is crucial to team effectiveness as the experience of teamwork can support the individual in its tasks when it is satisfying, while a frustrating experience can keep the individual in the team from what it wants or needs to do (Hackman, 1987).

Conceptualization of Team Viability

The team viability sub-dimension of team effectiveness can be conceptualized as the capacity of the team to adapt to new challenges and remain effective (Hackman, 1987; Paolucci et al., 2018). While teams usually overcome problems and reach their end goal, the handling of challenges makes a team more or less effective as a unit (Hackman, 1987).

Psychological Safety

Psychological safety is defined as “a shared belief held by members of a team that the team is safe for interpersonal risk taking” (Edmondson, 1999, p. 350) and is an important correlate to team effectiveness (Akan et al., 2020). It describes the experience of a safe

environment in which it is possible for every team member to speak up without being embarrassed, rejected, or punished by the team. Psychological safety grows in general from mutual trust and respect within a team (Edmondson, 1999). Throughout the literature, numerous beneficial outcomes have been linked to psychological safety, such as: better communication, knowledge sharing, speaking up behavior, and job satisfaction, as well as higher organizational commitment, work engagement, and team learning, and finally more feedback giving and seeking behavior (Akan et al., 2020; De Dreu & Weingart, 2003; Dusenberry & Robinson, 2020; Edmondson & Lei, 2014; Frazier et al., 2017; Gerlach & Gockel, 2018; Newman et al., 2017).

Association Between Psychological Safety and Team Effectiveness

Previous research has indicated a connection between psychological safety and team effectiveness (Akan et al., 2020). However, team effectiveness was often used interchangeably with team performance. As mentioned in the above section regarding the conceptualizations of the sub-dimensions, we consider team performance to be only a part of the overall construct of team effectiveness. Therefore, in this study the more holistic framework of Hackman (1987) is used to examine the relationship of team effectiveness and psychological safety.

Below, the three sub-dimensions and their associations with psychological safety will be reviewed.

Team Performance

A large amount of research has been conducted on the relationship between psychological safety and team performance which was predominantly found to be significant and positive (Edmondson & Lei, 2014; Frazier et al., 2017; Jha, 2019). In addition, the IT-company Google conducted an internal study in 2014 which found that psychological safety was by far the most important factor which differentiated high-achieving teams from average teams (Cauwelier et al., 2016). On top of this, the results of a meta-analysis of 51 studies strongly suggested that the relationships between psychological safety and team performance was positive (Sanner & Bunderson, 2015). However, Sanner and Bunderson (2015) also found that there is high variability between studies in the magnitude of the relationship. They found that the mean estimate of the corrected population of $\rho = .32$ (95% CI [.07, .57]) showed 37 % of variance attributable to sampling and measurement errors.

A meta-analysis by Frazier et al. (2017) found that psychological safety was positively related to a group's task performance as well as job satisfaction. Moreover, a positive relationship was also found between psychological safety and commitment as well as satisfaction (Frazier et al., 2017).

Furthermore, a previous study suggested that relatively high levels of within-team trust, openness, and psychological safety can reduce the correlation between task and relationship conflicts and therefore, task conflict can have positive effects on team performance (De Dreu & Weingart, 2003). This means that task conflict can increase team performance when the conflict is handled constructively and the team has a high level of openness, psychological safety, and within-team trust (De Dreu & Weingart, 2003). A study of Bradley et al. (2012) reinforced these findings. Bradley et al. (2012) found that task conflict increased levels of team performance in teams with high levels of psychological safety. The authors speculated that in high psychologically safe teams, task conflict may stimulate richer interactions, leading to better performance.

Team Satisfaction

There has been previous evidence in the literature to suggest that team satisfaction and psychological safety are positively correlated (Akan et al., 2020; Ortega et al., 2010). Further investigation, however, suggests that the relationship of psychological safety and team satisfaction is mediated by a number of variables, such as team identification or team learning (Johnson & Avolio, 2019; Ortega et al., 2010). Additionally, psychological safety was also found to be a moderating variable in the relationship between psychological collectivism and team satisfaction, team identity, and willingness to work together (Mayfield et al., 2016).

Team Viability

Very little research has been conducted on the relationship of psychological safety and viability. Ortega et al. (2010) examined how team learning and team effectiveness (performance, satisfaction, viability) in Virtual Project Teams are related to beliefs about interpersonal context (psychological safety, task interdependence, collective efficacy). The study found a relationship of psychological safety and team viability which was partially mediated by team learning.

Team Learning in Relation to Psychological Safety and Team Effectiveness

Team learning is a continuous process of evaluating and responding to changes in the environment (Ortega et al., 2010). It has been consistently demonstrated to be a result of team psychological safety (Cauwelier et al., 2016; Ortega et al., 2010). Simply put, the higher the psychological safety level of the team, the more likely members are to speak up or take part in experimentation, which are two core team learning behaviors. Additionally, it has also been shown to be a mediator between psychological safety and the three sub-dimensions of team effectiveness; performance, satisfaction, and viability (Edmondson, 1999; Edmondson & Lei, 2014; Jha, 2019; Ortega et al., 2010; Sanner & Bunderson, 2015).

Work Culture – A Cultural Comparison

In the present study, we suggest comparing levels of psychological safety and effectiveness between two countries, the United States and Sweden. The reasoning for this being that we consider it to be a novel and scientifically interesting comparison due to the contrast between a consensus-driven and competitively-driven work culture (Omojola, 2011; Salminen-Karlsson, 2013). In Sweden, business culture can be characterized as having an emphasis on consensus-building, conflict avoidance, and caring for another employee's well-being (Salminen-Karlsson, 2013). Furthermore, Swedish organizations tend to also put emphasis upon greater equality within the workplace (Omojola, 2011). On the other hand, the business culture within the United States has been described as competitive and result oriented (Omojola, 2011). Another difference found between these countries is within work-life balance. In the 2020 Organization for Economic Co-operation and Development Better Life Index, which is made up of 40 countries, Sweden ranked 10th on the list for Work-Life Balance, whereas the United States ranked 29th (OECD, 2020).

Psychological Safety and Culture

National identity and culture have been shown to influence team psychological safety and the resulting team learning behaviors (Cauwelier et al., 2016). When looking at teams from the United States and France, two Western countries, the concept of team psychological safety was found to be applicable. Whereas the concept of team psychological safety was not present within teams in Thailand, an Eastern country. This suggests that, while not universally validated, there is

evidence to affirm that the concept of psychological safety is mostly present in Western countries.

To the best knowledge of us, little, if any, literature exists directly comparing psychological safety between a United States and Swedish sample. A study in 2019 compared Germany and Sweden using the Psychosocial Safety Climate (PSC) Questionnaire, which is designed to measure psychological health in the workplace and includes psychological safety (Berthelsen et al., 2019). It found, in reference to psychological safety, that the Swedish sample had no concerns to report and broadly felt that psychological health and communication was considered to be emphasized by the organization. As for Germany, it found that 12 out of 25 participants (48 %) reported that communication regarding psychological health was poor. In terms of the present study, this may be of note due to the similarities shared by German and United States organizations (Doetzer, 2020). Another study looking at PSC found that Sweden, as a consensus-driven country, topped the list of all the European countries (Dollard & Neser, 2013). Whereas, in the United States where workplaces are competitively-driven, one study found that psychological safety within the workplace was just average (Bradley et al., 2012). The study used Edmondson's team psychological safety measure, which has a scale of 1 - 9, and found the average score was 4.3, which indicates that psychological safety was moderate.

Research Questions

In light of the theoretical and empirical research discussed above, we developed three research questions to execute the aims of our present study. Those were to investigate the relationship between psychological safety and team effectiveness within IT teams, the role of team learning as a mediator, and the differences between a consensus-driven and competitive-driven culture.

Research Question 1: Does psychological safety correlate with perceived team effectiveness (as measured by team performance, team satisfaction, and team viability) of workers in the field of information technology (IT)?

To effectively answer this research question, we have developed four hypotheses. Given the evidence in the literature that psychological safety is positively correlated with team performance, our first hypothesis is as follows:

Hypothesis 1a: Psychological safety is positively correlated with team performance.

While there is plenty of literature evidence to support the hypothesis that there is a positive correlation between psychological safety and the first sub-dimension of team effectiveness, team performance, less research has been conducted on the relationship of psychological safety and the other sub-dimensions. Considering the research gap that exists when it comes to psychological safety and team satisfaction and team viability, there is not sufficient evidence to justify a positive directional hypothesis. Therefore, our hypotheses for the team satisfaction and viability aspect of the research question are as follows:

Hypothesis 1b: Psychological safety is correlated with team satisfaction.

Hypothesis 1c: Psychological safety is correlated with team viability.

As has been stated before, a large amount of research has been conducted on psychological safety and team effectiveness, although most of that research has focused on measuring team performance as a stand-in for team effectiveness (Edmondson & Lei, 2014; Frazier et al., 2017; Jha, 2019). We suggest that team effectiveness would be better measured by using Hackman's (1987) framework, which allows for a more comprehensive picture of a team's effectiveness and does not just examine performance. Therefore, even though the literature may indicate that psychological safety has a positive correlation to team effectiveness, we chose to make our *hypothesis 1d* non-directional due to the measures and methods potentially differing. Our *hypothesis 1d* is as follows:

Hypothesis 1d: Psychological safety is correlated with team effectiveness.

Research Question 2: Is team learning a mediator between psychological safety and team effectiveness within IT worker teams?

To answer this research question effectively, we have developed four hypotheses. Given the evidence that team learning has been shown to be a mediator between psychological safety and the three sub-dimensions of team effectiveness, our first three hypotheses are as follows:

Hypothesis 2a: Team learning mediates the relationship between psychological safety and team performance.

Hypothesis 2b: Team learning mediates the relationship between psychological safety and team satisfaction.

Hypothesis 2c: Team learning mediates the relationship between psychological safety and team viability.

The question as to whether it is a mediator for team effectiveness is somewhat more complicated. There has not been direct research on whether team learning is a mediator with the overall construct of team effectiveness, which has been assessed using Hackman's (1987) framework. One could argue that if evidence has been shown for team learning to be a mediator for the three sub-dimensions of team effectiveness, and team effectiveness is directly composed of those sub-dimensions, then it would be logical for it to be thought of as a mediator for team effectiveness. However, with all that said, there has not been direct research on whether team learning is a mediator with team effectiveness which has been assessed using the framework of Hackman (1987). Therefore, our final hypothesis for this research question is as follows:

Hypothesis 2d: Team learning mediates the relationship between psychological safety and team effectiveness.

Research Question 3: Is there a statistically significant difference in levels of psychological safety when comparing a consensus-driven and a competitively-driven work culture in the sector of information technology?

For the purposes of this study, we speculate that the Swedish sample would have a comparably higher psychological safety score than the United States. The reasoning for this is two-fold. First, Swedish companies demonstrate consensus-building in order to make decisions, which involves many people within the organization (Omojola, 2011; Salminen-Karlsson, 2013). Moreover, evidence in the literature suggests that Sweden appears to enjoy a high level of psychological safety within the workforce (Berthelsen et al., 2019; Dollard & Neser, 2013). Secondly, US-businesses are characterized as focusing on results and competition among employees (Omojola, 2011). Furthermore, some limited research suggests that the United States has an average-to-below average level of psychological safety (Bradley et al., 2012). Given that psychological safety grows by having a safe working environment, we would suppose that the competitive nature of the American work culture would subtract from it, whereas the

consensus-building in the Swedish work culture would improve it. Due to the limited amount of previous research comparing these two work cultures in the field of Information Technology, research question 3 will be studied in an exploratory fashion.

Method

Study Design and Study Context

To investigate the research questions addressed in this study, a cross-sectional design with questionnaires following a quantitative approach was used. Besides the growing importance of the IT-sector, we also choose one occupational area to better facilitate our interest in comparing the results cross-culturally between the United States and Sweden. Industries across cultures can vary significantly, so therefore our best course of action was to try to limit that variance by looking at one industry. Moreover, IT companies in Sweden typically have a strong understanding of English which added to convenience as our measures were in English.

A preliminary power analysis was performed to estimate how many participants need to be collected to have a power of 80 % in this study. The statistical program *G*Power version 3.1.9.4* was used to calculate the power analyses for the hypotheses. The calculations were based on achieving 80 % power with an alpha error of $\alpha = .05$ estimating medium effect sizes for all hypotheses. The medium effect sizes correspond to $r = .3$ for correlation analysis, Cohen's $f^2 = .15$ for regression analysis and Cohen's $d = .5$ for the analysis of differences in means. For the group comparison the highest number of participants were calculated and revealed a required sample size of $N = 102$ with 51 participants in each group. A medium effect size estimation was based on reported effect sizes in prior research and the criteria of the smallest effect size of interest (Lakens, 2021). For example, a difference between two groups with a medium effect size that has a tangible impact can help gain valid information and is therefore of interest for a research, whereas a small effect size which might not be notable in the population might not add information to the research and is therefore less interesting especially when considering the costs and benefits of a study (Lakens, 2021).

In order to recruit participants for our sample, we used a wide range of methods. We used social media, email, phone calls, and word of mouth to spread our survey to individuals working

in teams. The data was collected using an online survey, via Google Forms, which was sent to participants and ran from the 29th of March to the 10th of May 2021 (~ 6 weeks).

Ethical Considerations

The participants all had to be over the age of 18 and give their informed consent to participate in the survey by checking the box at the beginning of the survey. The participants were informed that the data contained no sensitive information and was completely anonymous. Furthermore, they had the right to withdraw from the survey at any time and were informed of this. While all the questions were required to be answered, the participants could choose not to answer the demographic questions (as outlined in the data collection section above). Additionally, there were thought to be no negative consequences that were likely because of taking this survey and no sensitive data was collected.

Participants

The target population of this study were working professionals who work in teams, as they would be subject to the conditions of team psychological safety, team learning behavior, and team effectiveness. The inclusion criteria were therefore: at least 18 years of age, informed consent of the participants, work in a team in the IT-sector, and the location of the workplace must be in either Sweden or the United States. If the inclusion criteria were not fulfilled, the participants were immediately removed from the survey in keeping with data collection procedures.

We initially recruited 137 participants, after removing eight participants that did not fulfill the inclusion criteria and one which was invalid, our final sample consisted of $N = 128$ participants. The Swedish sample contained $n_1 = 43$ participants and the US-American sample of $n_2 = 85$. The participants in the whole sample were on average 33.9 years old ($SD = 9.7$). The participants' age in the Swedish sample was 35.6 years on average ($SD = 8.9$) and was 33.1 years ($SD = 10.1$) in the US-American sample, while three participants preferred to not say their age. A detailed description of the sample can be found in table 1.

Table 1*Sociodemographic Characteristics of Participants*

| Characteristics | Full sample (<i>N</i> = 128) | | Employees in Sweden (<i>n</i> ₁ = 43) | | Employees in USA (<i>n</i> ₂ = 85) | | Chi-Square Test Sweden vs. USA |
|---------------------------------|----------------------------------|------|---|------|--|------|--|
| | <i>n</i> | % | <i>n</i> | % | <i>n</i> | % | |
| Gender | | | | | | | $\chi^2_{(1, N=128)} = 4.46, p = .107$ |
| Female | 19 | 14.8 | 10 | 23.3 | 9 | 10.6 | |
| Male | 107 | 83.6 | 33 | 76.7 | 74 | 87.1 | |
| Prefer not to say | 2 | 1.6 | 0 | 0 | 2 | 2.3 | |
| Method of Teamwork | | | | | | | $\chi^2_{(1, N=128)} = 5.34, p = .069$ |
| Mostly Face-to-Face | 19 | 14.8 | 2 | 4.7 | 17 | 20.0 | |
| Mostly Virtual (Zoom, etc.) | 104 | 81.3 | 39 | 90.6 | 65 | 76.5 | |
| Equally Face-to-Face & Virtual | 5 | 3.9 | 2 | 4.7 | 3 | 3.5 | |
| Time of Team Interaction | | | | | | | $\chi^2_{(1, N=128)} = 5.63, p = .229$ |
| Less than 25 % | 14 | 10.9 | 6 | 14.0 | 8 | 9.4 | |
| 25 % | 39 | 30.5 | 18 | 41.8 | 21 | 24.7 | |
| 50 % | 38 | 29.7 | 10 | 23.3 | 28 | 32.9 | |
| 75 % | 16 | 12.5 | 4 | 9.3 | 12 | 14.1 | |
| More than 75 % | 21 | 16.4 | 5 | 11.6 | 16 | 18.8 | |
| Time in Team | | | | | | | $\chi^2_{(1, N=128)} = 2.28, p = .684$ |
| Less than 1 year | 30 | 23.4 | 8 | 18.6 | 22 | 25.9 | |
| 1 – 3 years | 58 | 45.3 | 19 | 44.2 | 39 | 45.9 | |
| 3 – 5 years | 19 | 14.8 | 9 | 20.9 | 10 | 11.7 | |
| 5 – 10 years | 18 | 14.1 | 6 | 14.0 | 12 | 14.1 | |
| More than 10 years | 3 | 2.3 | 1 | 2.3 | 2 | 2.4 | |

Materials

Participants received a link that provided them with access to the survey. Participants were asked questions regarding basic demographic items (age, gender, nationality, and country of workplace), their workplace, and the questions of the measures listed in the Materials section below. If the participants did not give their informed consent or did not fulfill the inclusion criteria, such as working in a team, they were immediately sent to the final thank-you page of the survey. The survey, in its entirety, can be found below in Appendix A. Additionally, the scales referenced below can be found in their entirety in Appendix B

All the questionnaires and an example item for each are described in the following section.

Psychological Safety

Psychological Safety was measured using a scale that was developed by Edmondson (1999). The tool showed a Cronbach's alpha of $\alpha = .82$ in the original study, in this study Cronbach's alpha for the whole sample was $\alpha = .78$ (Sweden: $\alpha = .62$; USA: $\alpha = .80$). The measure consisted of seven items, one of which was, "If you make a mistake on this team, it is often held against you." The measure was rated on a 7-point Likert-scale from "Very Inaccurate" to "Very Accurate" in which higher values indicate a higher degree of psychological safety.

Team Learning

Team Learning was measured also using a scale developed by Edmondson (1999). It showed a Cronbach's alpha of $\alpha = .78$ in Edmondson's study and a Cronbach's alpha of $\alpha = .73$ in the present study for the whole sample (Sweden: $\alpha = .62$; USA: $\alpha = .76$). The measure consisted of seven items on a 7-point Likert-scale from "Very Inaccurate" to "Very Accurate", where higher values indicate a higher degree of team learning. A sample item from the measure is, "We regularly take time to figure out ways to improve our team's work processes."

Team Effectiveness – Performance

To measure team performance, a sub-dimension of team effectiveness, we used a scale developed by Lurey and Raisinghani (2001). This questionnaire consisted of four items, with a sample being, "In the past, the team has been effective in reaching its goals." The measure rated

team performance using a 5-point Likert-scale from “Strongly Disagree” to “Strongly Agree”, where higher values indicate a higher degree of team performance. Lurey and Raisinghani (2001) reported a Cronbach’s alpha of $\alpha = .82$ and the scale showed a Cronbach’s alpha of $\alpha = .71$ for the whole sample in the present study (Sweden: $\alpha = .79$; USA: $\alpha = .66$).

Team Effectiveness – Satisfaction

To measure team satisfaction, a sub-dimension of team effectiveness, we also used a scale developed by Lurey and Raisinghani (2001). This questionnaire consisted of five items, with a sample being, “I feel my input is valued by the members of the team.” The measure rated team satisfaction using a 5-point Likert-scale from “Strongly Disagree” to “Strongly Agree” in which higher values indicate a higher degree of team satisfaction. The scale had a Cronbach’s alpha of $\alpha = .82$ in the original study (Lurey & Raisinghani, 2001). In this study the scale showed a Cronbach’s alpha of $\alpha = .62$ for the whole sample (Sweden: $\alpha = .55$; USA: $\alpha = .65$). However, by deleting one item, “In the future, I would be interested in participating in another team,” the internal consistency of the scale improved to $\alpha = .82$ for the whole sample (Sweden: $\alpha = .70$; USA: $\alpha = .85$). Additionally, the removal of this item was supported by qualitative feedback from the participants. Therefore, the fifth item was not included in the final scale for the analysis.

Team Effectiveness – Viability

To measure team viability, we used a scale that was developed by Tekleab et al. (2009). This scale had five items in the questionnaire, with a sample being, “This team was not capable of working together as a unit.” The measure used a 7-point Likert-scale from “Strongly Disagree” to “Strongly Agree”, whereby higher values indicate a higher degree of team viability. The internal consistency of Cronbach’s alpha was $\alpha = .89$ in the original study of Tekleab et al. (2009) and was $\alpha = .85$ for the whole sample in the present study (Sweden: $\alpha = .82$; USA: $\alpha = .86$).

Team Effectiveness

To evaluate team effectiveness the three sub-scales were combined. However, the sub-scale of viability had a 7-point scale. To facilitate analysis more easily, the 7-point scale was converted into a 5-point scale, according to a procedure suggested by Lewis and Sauro (2020). Accordingly, the scores were converted [old score = new score; 1 = 1; 2 = 1.667; 3 = 2.333;

4 = 3; 5 = 3.667; 6 = 4.333; 7 = 5]. After translating the scale in question to the new format, all three sub-scales (viability, satisfaction, and performance) were weighted equally. The scale consisted of 13 items and showed an internal consistency of $\alpha = .89$ for the whole sample (Sweden: $\alpha = .86$; USA: $\alpha = .90$). Higher values on this scale indicate a higher degree of team effectiveness.

Data Analysis

All data analysis was conducted using *IBM SPSS Statistics version 27* and *RStudio version 4.0.3*. In general, the hypotheses were tested using two-tailed tests and the limit for rejecting the null-hypothesis was $p < .05$, if not stated otherwise.

The specific statistical methods used for each research question and their corresponding hypotheses are detailed below. Unless otherwise stated, all linearity tests were conducted with a visual inspection of the data, all homoscedasticity tests were conducted with both a visual inspection of the data and the Breusch-Pagan test, and all normality tests were conducted with Shapiro-Wilkes.

The effect sizes for the different calculations were expressed as Spearman's rho correlation coefficient r_s for *hypotheses 1a to 1d*, the explained variance R^2 for *hypotheses 2a to 2d* and Cohen's r (1988) for *research question 3*.

Procedure on Assumption Checks

Unless otherwise stated, our data analysis procedure was that if the data for a specific hypothesis violated the assumption of normality, we would use a non-parametric test if possible, and if not available we would use a stricter p -value interpretation ($p < .01$ instead of $p < .05$) to account for any minor reliability issues, as shown by Lumley et al. (2002). Additionally, if the data violated the assumption of homoscedasticity, we removed any outliers that were more than three standard deviations from the mean.

Research Question 1

Normality was found to be violated, so therefore *hypotheses 1a to 1d* were tested using Spearman's rho correlation coefficient. The assumptions were met, which are at least ordinal scaled data, paired observations, and a monotonic relationship between the variables.

Research Question 2

Hypotheses 2a to 2d were evaluated with a mediation analysis. The mediation analysis method chosen was one initially proposed by Baron and Kenny (1986). In this method, the independent variable (psychological safety) must first be tested to predict the dependent variable. Secondly, the independent variable must be tested to predict the mediator (team learning). Thirdly, the mediator must be tested to predict the dependent variable. Finally, if all three previous tests indicated significance, then one can proceed to the fourth and final step, which is testing both the dependent variable and mediator to predict the independent variable.

Hypotheses 2a - 2d. In accordance with the method of Baron and Kenny (1986), three linear regression models and one multiple regression model were created for each hypothesis. While running several models with and without outliers, we found the same results. This led us to make the decision to exclude outliers, so as to not violate the assumption of homoscedasticity. The final models are described below.

Hypothesis 2a. For all four models, normality was found to be violated. For *Model 2a.2*, homoscedasticity was also found to be violated and two outliers were removed.

Hypothesis 2b. The assumption of normality was violated for *Model 2b.2* and *Model 2b.3*. Additionally, *Model 2b.1*, *Model 2b.2*, *Model 2b.3* and *Model 2b.4* violated the assumption of homoscedasticity and therefore two, two, four, and two outliers were removed, respectively.

Hypothesis 2c. For all four models, normality and homoscedasticity were found to be violated. For *Model 2c.1*, *Model 2c.2*, *Model 2c.3*, and *Model 2c.4*; one, two, two, and one outlier(s) were removed, respectively.

Hypothesis 2d. The assumption of normality was violated for all four models. Additionally, *Model 2d.2* and *Model 2d.3* violated the assumption of homoscedasticity and therefore two and one outlier(s) were removed, respectively.

Research Question 3

The US-American sample violated the assumption of normality and therefore *research question 3* was examined using the Mann-Whitney U test. No issues with the assumptions were reported and the data of the two groups followed the same general shape. To calculate the effect

size of the Mann-Whitney U test, we followed the recommendation of Fritz et al. (2012) to calculate Cohen's r (1988).

Results

In the following section, the results of the conducted statistical analysis were reported.

Data summary

Table 2 provides a summary of the variables in our dataset and their inter-correlations.

Research Question 1

Spearman's rho coefficient was used to examine the associations stipulated in *hypotheses 1a to 1d*, that is, the associations between psychological safety on one hand and on the other hand team performance, team satisfaction, team viability, and overall team effectiveness.

Hypothesis 1a – Psychological Safety and Team Performance

The correlation was significant ($p < .001$, one-tailed) with a positive effect of $r_s = .43$ (95% CI [.27, .57]), which indicates that higher values in psychological safety relate to higher team performance values, and vice versa ($N = 128$).

Hypothesis 1b – Psychological Safety and Team Satisfaction

The correlation was significant ($p < .001$, two-tailed) with a positive effect of $r_s = .56$ (95% CI [.41, .69]), which indicates that higher values in psychological safety relate to higher team satisfaction values, and vice versa ($N = 128$).

Hypothesis 1c – Psychological Safety and Team Viability

The correlation was significant ($p < .001$, two-tailed) with a positive effect of $r_s = .59$ (95% CI [.43, .70]), which indicates that higher values in psychological safety relate to higher team viability values, and vice versa ($N = 128$).

Table 2*Descriptive Statistics and Spearman Correlations for Study Variables*

| Variable | <i>n</i> | <i>M</i> | <i>SD</i> | 1 | 2 | 3 | 3a | 3b | 3c | 4 | 5 | 6 | 7 |
|---|----------|----------|-----------|-------|-------|-------|-------|-------|-------|------|------|------|---|
| 1. Age | 125 | 33.92 | 9.71 | — | | | | | | | | | |
| 2. Psychological Safety | 128 | 5.74 | 0.89 | .19* | — | | | | | | | | |
| 3. Team Effectiveness | 128 | 4.25 | 0.59 | .24** | .59** | — | | | | | | | |
| 3.a. Team Performance | 128 | 4.12 | 0.69 | .32** | .43** | .81** | — | | | | | | |
| 3.b. Team Satisfaction | 128 | 4.23 | 0.77 | .18 | .56** | .87** | .55** | — | | | | | |
| 3.c. Team Viability | 128 | 4.40 | 0.65 | .08 | .59** | .83** | .51** | .65** | — | | | | |
| 4. Team Learning | 128 | 4.91 | 0.92 | .03 | .59** | .44** | .34** | .42** | .40** | — | | | |
| 5. Team Interaction Method ^a | 128 | 1.34 | 0.72 | -.09 | .04 | .11 | .06 | .13 | .04 | -.02 | — | | |
| 6. Team Interaction Time ^b | 128 | 2.93 | 1.24 | -.05 | .01 | .09 | .00 | .08 | .18* | .16 | .10 | — | |
| 7. Time in Team ^c | 128 | 2.27 | 1.05 | .43** | .00 | .03 | .06 | -.03 | .05 | -.10 | -.06 | -.04 | — |

Note. ^a 1 = Mostly Virtual, 2 = Equal time Face-to-Face and Virtual, and 3 = Mostly Face-to-Face. ^b 1 = Less than 25 %, 2 = 25 %, 3 = 50 %, 4 = 75 %, and 5 = More than 75 %. ^c 1 = Less than 1 year, 2 = 1-3 years, 3 = 3-5 years, 4 = 5-10 years, and 5 = More than 10 years.

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

Hypothesis 1d – Psychological Safety and Team Effectiveness

The correlation was significant ($p < .001$, two-tailed) with a positive effect of $r_s = .59$ (95% CI [.45, .71]), which indicates that higher values in psychological safety relate to higher team effectiveness values, and vice versa ($N = 128$).

Research Question 2

To evaluate whether team learning mediates the relationship between psychological safety on one side and on the other side team performance, team satisfaction, team viability, and team effectiveness, as stated in the *hypotheses 2a to 2d*, a mediation analysis was conducted. This mediation analysis is described in the method section above.

Hypothesis 2a – Psychological Safety, Team Learning, and Team Performance

The first model tested the direct effect between psychological safety and team performance. The results for the model indicated significance and were $F(1, 126) = 27.95$, $p < .001$ [two-tailed], $R^2 = .18$.

The second model tested the effect between psychological safety and team learning, the mediator. The results for the model indicated significance and were $F(1, 124) = 76.46$, $p < .001$ [two-tailed], $R^2 = .38$.

The third model tested the effect between team learning and team performance. The results for the model indicated significance and were $F(1, 126) = 18.66$, $p < .001$ [two-tailed], $R^2 = .12$.

The final model tested the effect between psychological safety, team learning, and team performance. The results for the model indicated collective significance and were $F(2, 125) = 15.65$, $p < .001$ [two-tailed], $R^2 = .19$. Individually, psychological safety was found to be significant at $p = .001$, while team learning was found to be non-significant. This suggests that team learning does not act as a mediator to the effect of psychological safety on team performance.

Hypothesis 2b – Psychological Safety, Team Learning, and Team Satisfaction

The first model tested the direct effect between psychological safety and team satisfaction. The results for the model indicated significance and were $F(1, 124) = 127.00$, $p < .001$ [two-tailed], $R^2 = .50$.

The second model, which was testing the effect between psychological safety and team learning, was the same as in *hypothesis 2a* above.

The third model tested the effect between team learning and team satisfaction. The results for the model indicated significance and were $F(1, 122) = 30.95$, $p < .001$ [two-tailed], $R^2 = .20$.

The final model tested the effect between psychological safety, team learning, and team satisfaction. The results for the model indicated collective significance and were $F(2, 123) = 84.03$, $p < .001$ [two-tailed], $R^2 = .57$. Individually, psychological safety was found to be significant at the $p < .001$ level, while team learning was found to be non-significant. This suggests that team learning does not act as a mediator to the effect of psychological safety on team satisfaction.

Hypothesis 2c – Psychological Safety, Team Learning, and Team Viability

The first model tested the direct effect between psychological safety and team viability. The results for the model indicated significance and were $F(1, 125) = 45.61$, $p < .001$ [two-tailed], $R^2 = .26$.

The second model, which was testing the effect between psychological safety and team learning, was the same as in *hypothesis 2a* above.

The third model tested the direct effect between psychological safety and team viability. The results for the model indicated significance and were $F(1, 124) = 27.66$, $p < .001$ [two-tailed], $R^2 = .18$.

The final model tested the effect between psychological safety, team learning, and team viability. The results for the model indicated collective significance and were $F(2, 124) = 26.37$, $p < .001$ [two-tailed], $R^2 = .29$. Individually, psychological safety was found to be significant at the $p < .01$ level, while team learning was also found to be significant at the $p < .001$ level. This suggests that team learning acts as a partial mediator to the effect of psychological safety on team viability.

Hypothesis 2d – Psychological Safety, Team Learning, and Team Effectiveness

The first model tested the direct effect between psychological safety and team effectiveness. The results for the model indicated significance and were $F(1, 126) = 111.13$, $p < .001$ [two-tailed], $R^2 = .46$.

The second model, which was testing the effect between psychological safety and team learning, was the same as in *hypothesis 2a* above.

The third model tested the effect between team learning and team effectiveness. The results for the model indicated significance and were $F(1, 125) = 47.16$, $p < .001$ [two-tailed], $R^2 = .27$.

The final model tested the effect between psychological safety, team learning, and team effectiveness. The results for the model indicated collective significance and were $F(2, 125) = 61.92$, $p < .001$ [two-tailed], $R^2 = .49$. Individually, psychological safety was found to be significant at the $p < .001$ level, while team learning was found significant at the $p = .008$ level. This suggests that team learning does act as a mediator to the effect of psychological safety on team effectiveness.

Research Question 3

To examine *research question 3* on whether there are differences in psychological safety between employees working in IT-teams in Sweden and the United States, a Mann-Whitney U Test was conducted.

Psychological Safety and Work Culture

The Mann-Whitney U Test showed no significant difference ($U = 1611,500$; $z = -1.092$; $p = .138$, one-tailed) in the perception of psychological safety in IT-work teams in Sweden ($Mdn = 5.857$, $n_1 = 43$, higher values indicate higher psychological safety) and the United States ($Mdn = 5.857$; $n_2 = 85$). The calculated effect size was $r = -.097$.

Discussion

In the present study, we examined the relationship between team effectiveness and psychological safety in the IT-sector using Hackman's (1987) framework of team effectiveness that stipulates that team effectiveness should be assessed by looking at a team's performance,

satisfaction, and viability. In addition, we examined whether team learning could be considered to be a mediator between team effectiveness and psychological safety and whether there were differences in psychological safety between a competitive- and consensus-driven work culture, as exemplified by comparing IT-workers in Sweden and the United States.

The Association between Psychological Safety, Team Effectiveness, and its Sub-dimensions

Regarding the first research question, the association between psychological safety and team effectiveness, as well its sub-dimensions, were broadly in line with previous research and matched our expectations. All effects were highly significant and the Spearman rho correlation coefficients could be considered to be moderately strong, though one should note that these cutoff points are arbitrary and should therefore be used cautiously (Akoglu, 2018; Dancey & Reidy, 2007; Schober et al., 2018).

Despite the focus of previous research on the relationship between team performance and psychological safety, these results suggest that more attention should be paid to the other aspects of team effectiveness, namely team satisfaction and team viability. In the following section, the relationship of psychological safety and team effectiveness, as well as its sub-dimensions, will be discussed more thoroughly.

Psychological Safety and Team Performance

The results of a one-directional examination of the association between psychological safety and team performance showed a moderately strong positive correlation which is in line with results found in previous studies. A possible explanation is that psychological safety fosters the willingness to be physically, cognitively, and emotionally involved during role performance (Kahn, 1990). This enables an individual to be more engaged at work which affects the individual's performance in the team, resulting in a higher team performance. Moreover, psychological safety affects speaking-up and voice behavior so that team members feel more comfortable to challenge the status quo or make suggestions on how to improve team processes (Edmondson & Lei, 2014). It was also found to increase knowledge creation (Choo et al., 2007), which is together with speaking-up and voice behavior vital for teams to learn and enhance their performance.

Nevertheless, high performing teams might also experience higher levels of psychological safety due to already existing favorable team processes. On one hand, it can lead to the experience of synergy within the team that favors the development of interpersonal relations such as respect and trust which are the basis for psychological safety (Edmondson, 1999; Kahn, 1990). On the other hand, there might not arise feelings of psychological unsafety if the team functions properly and has no need to take a risk that could be followed by rejection, punishment, or embarrassment.

Psychological Safety and Team Satisfaction

Psychological safety and team satisfaction showed a moderate positive correlation, similar as in previous studies. Psychological safety descends from trust and respect within a team (Edmondson, 1999; Kahn, 1990). This means that the development of the belief of whether one is given the benefit of the doubt is dependent on the extent to which trust and respect are existent within the team (Kahn, 1990). In turn, being able to speak openly about problems and mistakes, helps to develop the team's work and processes, so it seems reasonable that the satisfaction with the team rises too. However, team satisfaction, the degree of positive social climate in a team, is also dependent on trust and the respect team members pay each other, how much for example ideas or input are valued, as well as the team members morale (Lurey & Raisinghani, 2001). All factors that seem to be connected to the development of psychological safety. For example, if the team members morale status is high one would not expect punishment or embarrassment when admitting a very simple but severe mistake. If input and ideas are valued in the team, it is more likely that a greater range of ideas are presented, not only the exceptional ones where one does not need to take the risk of, for example, sounding "stupid".

However, it is also imaginable that members of a well-functioning team experience high team satisfaction and psychological safety because they have not been in the situation where they needed to take a risk or experience something unsatisfying. It can therefore be assumed that the team satisfaction or security in risk taking has not been challenged in these teams. As the sample in this study shows rather high psychological safety and team satisfaction overall, this can be a possible explanation for the moderate effect size of the association between these two variables. Nevertheless, it is unlikely that teams face no problems in reaching their goals at all but those can

be minor so that whether one is given the benefit of the doubt by their team members is not relevant to address these problems, as for example, simple miscommunication.

Considering this, psychological safety and team satisfaction seem to not only be associated with each other through possible effects on each other, but also because they stem from similar variables important in the interpersonal interaction between team members. Considering this, we recommend that future research should examine the causality in this relationship.

Psychological Safety and Team Viability

Team viability, the ability to adapt to new situations as a team, was found positively associated with psychological safety. This means in a highly viable team psychological safety will also be high or vice versa, a team that reports high psychological safety will also show high team viability. These results show no causality, therefore the underlying theoretical mechanisms can be manifold. Team viability, as described in the literature, is the ability of a team to deal with challenges so that the team is able to survive as a team, and to maintain or even enhance the performance of the team as a unit. This ability develops through social processes within the team (Hackman, 1987; Paolucci et al., 2018). Psychological safety can function as one of these social processes. A viable team detects challenges or addresses mistakes and problems through open communication and speaking-up behaviors of team members, both are dependent on the team members own beliefs of being able to take such a risk without fearing negative consequences. However, members that feel “unsafe” are more likely to silence doubts or errors, and avoid addressing important subjects (Edmondson, 2003), which in turn can decrease the team's capacity of staying sustainable and capability to grow or further develop.

On the other hand, team viability also describes growth and development of a team to succeed and be capable of living. In this progress, that is dependent on social processes, it is possible that psychological safety grows as well. So, while the team strengthens their viability, it also improves their psychological safety through, for example, development of interpersonal features such as trust and respect.

Although causality cannot be assumed due to the cross-sectional design and the statistical examination that had been performed, this result contributes to previous research and helps to

develop scientific knowledge about team viability, a variable that has not received a lot of attention so far (Mathieu et al., 2008).

Psychological Safety and Team Effectiveness

A correlation was found between psychological safety and team effectiveness. Considering that team effectiveness was measured using the three sub-scales of its sub-dimensions, it is fairly logical to find this relationship as these were correlated to psychological safety as well. This finding generally supports previous research which also looked at team effectiveness, as for example Akan et al. (2020). However, following Hackman's (1987) framework of team effectiveness, a bigger focus should be placed on the team effectiveness sub-dimensions to better understand how psychological safety connects to team effectiveness.

Team Learning: A Possible Mediator between Psychological Safety and Team Effectiveness

Regarding the second research question, the results of our mediation analysis found somewhat unexpected findings. For our *hypotheses 2a* and *2b*, we found team learning to not be a significant full or partial mediator. However, for *hypothesis 2c*, we found team learning to be a significant partial mediator ($p < .001$). For *hypothesis 2d*, we also found team learning to be a significant partial mediator ($p < .01$).

Previous studies have evaluated whether team learning has served as a mediator between psychological safety and team effectiveness sub-dimensions (performance, satisfaction, and viability), and found there to be a significant link (Edmondson, 1999; Edmondson & Lei, 2014; Jha, 2019; Ortega et al., 2010; Sanner & Bunderson, 2015). Therefore, we had expected that team learning would be a significant mediator between psychological safety and all of the aforementioned sub-dimensions, as well as the overall measure. We did not entirely find that to be the case, however, and only found team learning to be a significant partial mediator on team viability and the overall measure. We will now present some possible explanations for this and detail its importance to future research.

Team Viability

Team learning was found to be a significant partial mediator of the effect between psychological safety and team viability. Our present study also reinforces a previous finding in a

study conducted by Ortega et al. (2010), which likewise found team learning to be a mediator between psychological safety and team viability. Simply taking this at face value, this does make logical sense. Since team viability is the ability of the team to adapt to and face new challenges whilst still remaining successful, one may expect that team learning would go hand-in-hand with adaptation (Paolucci et al., 2018). It is possible that team learning may play a larger role in team viability than any other facet of team effectiveness.

Team Effectiveness

Interestingly, we found team learning to be a significant partial mediator of the effect between psychological safety and team effectiveness. This is interesting because the team effectiveness measure we used was simply an equal-weighted combination of team performance, team satisfaction, and team viability. So, while we did not find team learning to be significant for either team performance or team satisfaction, it was for the overall measure. In our minds, this could indicate one of two possibilities. First, for the one sub-dimension that was found to be significant, team viability, its effect was so strong that it pulled the overall measure into significance. Alternatively, it could be that team performance and team satisfaction were close to being significantly mediated by team learning, and so a slight pull from team viability could have affected the overall measure.

Investigating this, we found that the most likely answer would be somewhere in between the two above. Team satisfaction was the variable that was the least affected by the mediation of team learning, with a p -value of greater than .2, when .01 was needed for significance. Team performance, on the other hand, leaned more towards significance with a p -value of .08. Whilst still statistically insignificant, its relatively lower p -value compared to team satisfaction suggests that team learning potentially played more of a role with team performance than with team satisfaction. Finally, team viability had a p -value of less than .001, which is particularly strong. Given that it would then have a 1/3 stake in overall team effectiveness, its effect should be readily apparent.

Task Environment

Another potential roadblock, when it comes to evaluating team learning's effect as a mediator through psychological safety, is the task environment. A meta-analysis conducted by

Sanner and Bunderson (2015) found that the environment of a workplace (e.g., type of work) has an immense effect on whether team learning is found to be a mediator. Simply put, they found that psychological safety does not promote learning in an environment that does not benefit by learning. Therefore, it should be kept in mind that while we did try to limit the work type to just IT teams, there is still a large degree of variance that remains within that. This can be seen in the many job titles that people in IT may have, such as: Systems Analysis, Programmer, Software Engineer, Consultant, etc. (McMurtrey et al., 2002).

Psychological Safety: Are there Cultural Differences between Consensus-driven and Competitively-driven Work Cultures?

In consideration to the third research question, the results of the one-tailed Mann-Whitney U test showed no significant difference between the psychological safety scores of the United States sample and the Swedish sample. This came as a surprise, as we had speculated that the Swedish sample would be significantly higher than the United States sample in psychological safety. While there was a research gap when specifically comparing levels of psychological safety within teams in the United States and Sweden, previous literature had indicated that we may have expected to find differences. For instance, previous studies have shown Sweden to be seemingly strong in terms of psychological safety (Berthelsen et al., 2019; Dollard & Neser, 2013). Conversely, a study in the United States showed the levels of psychological safety for them to be somewhat average (Bradley et al., 2012). However, it should also be noted that in Edmondson's (1999) original study on psychological safety, she found the mean value on her 7-point scale to be 5.25 when using a presumably United States sample, although she does not specify the nationality of the participants or company. In our current study, we found the mean value of psychological safety for the United States sample to be 5.64 (*Mdn* = 5.86) and 5.93 (*Mdn* = 5.86) for the Swedish sample. While the Swedish sample's score was high, which was in line with our expectations, the US's was also high, which surprised us. Our mean United States sample score of 5.64 far outpaced both the original study of Edmondson (1999) and the more recent study of Bradley et al. (2012).

Psychological Safety in the United States

Given that the United States sample seemingly overperformed our measure, we will offer a few possibilities as to why. First, it may be due to the concept of psychological safety becoming more prevalent over time. While originally coined in the 1960's, it received little attention until it experienced a revitalization in the 1990's (Edmondson & Lei, 2014). Furthermore, following the study of Bradley et al. (2012), Google released an internal study just two years later which found psychological safety to be the single most impactful item when assessing team effectiveness (Cauwelier et al., 2016). This 2014 Google study would have certainly increased the visibility of the concept, especially in American and tech circles. Therefore, given the ramp-up in prevalence of psychological safety research, both in academic and more mainstream channels, it may have been possible that United States information technology companies put more of an emphasis on it in the years following the Google study. This could, in part, explain the higher average of the United States score when compared to previous research.

Another potential reason for the United States score to be so high is that it may be simply normal for tech companies to score highly on psychological safety. Tech companies, such as Google, are notorious for having a varied environment with employee wellness services and flexible working hours (Moore, 2016). So, it may be possible that the organizational culture at tech companies may inflate the average level of psychological safety compared to other organizations.

Strengths, Limitations, and Recommendations for Future Research

In the following section the strengths, limitations, and recommendations for future research are described.

Strengths

The strengths of the present study are that it addresses a research gap on a topic within an important population. This study reinforces the notion that in order to evaluate the true effectiveness of a team, one should evaluate it holistically and not purely based on performance. The concepts of team viability and team satisfaction, specifically, should be further looked at by future research due to their limited past evaluation by previous studies. Additionally, the present study analyzes the aforementioned construct of team effectiveness through the prism of the

information technology field, which is becoming increasingly important to society. While previous research has certainly been conducted on the topic of information technology teams, very little, if any, have done this with regards to a comprehensive framework of team effectiveness.

Limitations, Implications, and Future Research

Several limitations, varying in size and scope, are present in the current paper. We will first discuss those limitations which may only affect a specific research question and then subsequently discuss those limitations which affect the paper en masse. Subsequently, we will discuss theoretical and practical implications, as well as directions for future research.

Materials. A limitation of this study relates to the materials that were used to assess the dependent and independent variables. The measures used in this study were self-rated scales that assessed the subjects' view on psychological safety, team effectiveness, and its sub-dimensions. While this is not a problem for psychological safety and team satisfaction, which are from a person's own subjective perspective, team effectiveness should be additionally assessed through a separate objective measure to get a “real” picture of the status, independent of an individual. For the purposes of future research, we suggest measuring this through two ways. First, it would be beneficial to make all available attempts to assess the entirety of the team using the individual assessments. This would help to remove a possibility of self-selection bias (e.g., those who feel their team is really good would be the only ones to respond). Additionally, getting access to that team's key performance indicator, which is used by the organization to evaluate success, would allow the researchers to compare and contrast this hypothetically objective benchmark to the participants' subjective responses. However, with both the benchmark and individual responses, one should try to take into account which field the team is in and what their primary responses are.

Another limitation concerns the measurement of team effectiveness. In this study, the three sub-dimensions were used to create a measure for team effectiveness, as suggested by Hackman (1987). Up until now, no validated measurement for this construct has been introduced, to the best of our knowledge. The three sub-dimensions were equally weighted within the team effectiveness measurement as there were no theoretical suggestions as to whether one has more weight than another. Interestingly, previous research has not addressed whether any of team

performance, viability or satisfaction has an oversized effect on whether a team is truly more effective. Perhaps this could be due to the difficulties in defining what “effectiveness” means. Which sub-dimensions are more effective may depend on the goals of the team and what they give importance to. If a team’s effectiveness is determined by their level of success, then team performance may be the most important. However, if instead a team’s effectiveness is determined by the longevity of the team, then team viability may be more important. Future research should focus on determining which sub-dimension, if any, is more important to team effectiveness and if it is dependent upon a team’s priorities and responsibilities.

Sample and Statistics. Another limitation had to do with the size of the sample in the third research question. While the study consisted of $N = 128$ participants and was an appropriate size to examine research questions 1 and 2, it was underpowered for research question 3. A discrepancy in size existed with the groups for research question 3, the cultural comparison. While the initial power analysis suggested that groups would have to have at least 51 participants in each, they ended up being quite different in size (Swe: $n_1 = 43$; USA: $n_2 = 85$). This meant that the statistical analysis for this research question became slightly underpowered. Our study struggled to attract Swedes, in comparison to Americans, for a few reasons. First, neither author of this study is Swedish, which meant that they suffered from language/cultural barriers and additionally lacked the networking that would be beneficial to gather participants in our target population. Secondly, Sweden is a significantly smaller country than the United States in terms of population and since we used social media to gather participants, it would be logical to assume that it would be easier to find a willing American participant than a willing Swedish one. Future research should focus on attaining groups that are both equal and larger to increase the statistical power of the analysis so that all research questions can be fully and appropriately, assessed.

Secondly, our study is limited in its representativeness. Our main issues revolved around self-selection bias and other, similar, biases due to our nature of recruitment being online. This may possibly lead to a younger sample which would not be representative of the population as whole. Furthermore, this would tend to exclude those who may not use the platforms in which the survey was advertised. Moreover, the sample consisted mostly of participants in relatively young teams (1 - 3 years) that have been working together mostly virtual. Now, this could be due to the Covid-19 pandemic which required people to work from home and therefore, the interaction medium shifted from face-to-face to virtual. However, this might change again when the

pandemic situation has passed. Which also leads us to the consideration that the participants answering the survey have been experiencing changes in their everyday work life which may have influenced their perception of psychological safety, team effectiveness, and team learning. Therefore, research should be conducted when the pandemic situation is overcome to test whether the results of this study are only representative in a pandemic. Additionally, it would be interesting to comment on the validity of viewing the United States as a cultural monolith, meaning that the different regions of the United States are similar in culture and societal attitudes. In the view of the authors, it would be very difficult to claim that they are indeed uniform. One can look no further than to the stark divides between the north and south of the United States, as well as the east and west. However, while we did not ask for the geographic location of our United States respondents, and to do so would certainly not harm the studies prospects, we wish to slightly push back against this line of criticism. Again, while we do not see the United States as one culture in its entirety, our line of inquiry does not require this to be answered. Our study simply asks whether the United States, as a whole, can be considered a competitive culture. To this, it is our opinion that the answer is a yes due to the evidence that we encountered in the literature (Omojola, 2011).

Finally, another issue that concerns the sample is in regard to the distribution of the data. Examination of the variables showed that for the dependent and independent variables generally high values were reported by the participants. However, the few participants reporting lower values were more than three standard deviations away from the mean and therefore statistically considered as outliers even though there were no practical indications that the information given by these participants should be discounted. Due to this we used, when possible, non-parametric tests in order to keep the outliers present in the analysis, as we considered them to be valid. Future research should gather a larger sample size in an attempt to find out whether the population is truly distributed like this.

Design. Finally, this study used a cross-sectional design to examine our research questions. One large issue with this is that it cannot comment on causality. For our study's purposes, this is especially relevant for our mediator analysis. Future research should assess this subject using a longitudinal study, which would allow for implications of causality. Specifically, it would be very interesting to see whether teams start with a strong culture and sense of psychological safety and then become more effective or vice versa.

Conclusion

Our present study adds to the growing body of evidence that psychological safety does, at least, strongly correlate with the effectiveness of a work team and gives a deeper insight into the construct of team effectiveness. Team learning was found to be a partial mediator to team effectiveness and its sub-dimension team viability. Additionally, it was found that the level of psychological safety was consistent across two countries with different work cultures, competitively-driven and consensus-driven. Future studies should focus on studying this issue longitudinally to determine causality. Finally, given that teams are here to stay as an adaptation to the modern working life, it seems vital for employers to develop systems to monitor and improve the levels of psychological safety within a team.

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Appendix A - Survey

This appendix consists of the survey used in this study in its entirety.

Survey Introduction

Hello and welcome to our project! We are two Master's students at Lund University in Sweden working on our Master's Thesis in Psychology. By participating in this survey you will be assisting us in our research which we would greatly appreciate.

This survey will take approximately 10 minutes to complete and it is completely voluntarily. Additionally, it is important to note that you can leave at any time and for any reason by closing out of the page.

The survey will ask about work and team-related behaviors, as well as a few demographic questions, and it will be anonymous. All data received will only be handled by us, as students, or our supervisor. Furthermore, all data will only be displayed as a group collection, with no individual results shown. All data received will be anonymous.

If you have any questions or concerns, feel free to contact us at the following email addresses:

Alexander Reppond: al1713re-s@student.lu.se

Yvonne Steinmeyer: yv5422st-s@student.lu.se

If you still wish to continue on with the survey, then select "I consent" below. If you do not wish to continue on with the survey, then select "I do not consent" and your entry will be terminated. Additionally, you must be 18 years or older to participate in this study.

Thank you!

Alexander & Yvonne

Consent

Please indicate your consent:

- I consent and am at least 18 years of age. Begin the Study.
- I do not consent or am under the age of 18. Do not begin the Study.

Demographic Questions

In this section, you will be asked to fill out a few questions describing yourself and your job.

What is your age?

- _____

What is your gender?

- Female
- Male
- Prefer not to say
- Other: _____

What is your nationality?

- United States of America (American)
- Swedish
- Prefer not to say
- Other: _____

What is the country that you work in?

- United States of America
- Sweden
- Other: _____

Questions about the Job

In this section, you will answer a question about the nature of your job.

Would you consider yourself to work in an Information Technology (IT) or IT-related field?

- Yes
- No

Questions about the Workplace

In this section, you will answer a question about your workplace.

Would you consider yourself to work in a team? (We define team as meaning that you work with at least one other person and that you would be unable to reach either your overall goals or the company's, without their work)

- Yes
- No

Questions about the Team

Since you indicated that you currently work in a team, in this section you will be asked to provide a little more detail about your relationship with them.

How much time do you spend working or interacting with this person or group of people in an average week? (Does not have to be physically/virtually working with the team at the same time, but one example of working together would be working on the same project or task.)

- Less than 25 % of the time (almost never)
- 25 %
- 50 %
- 75 %
- More than 75 % of the time (almost always)

In the past 12 months, has your team been mostly virtual or face-to-face?

- Mostly Virtual (Zoom, Skype, Microsoft Teams, etc.)
- Mostly Face-to-Face (In the office)
- Equal time Face-to-Face and Virtual

How long have you been together with this group of people?

- Less than 1 year
- 1 – 3 years
- 3 – 5 years
- 5 – 10 years
- More than 10 years

Questions about the Teamwork

In this section, you will answer some questions about your current work team.

For these questions, please select the option that best represents the accuracy of the statement.

For example, if you think that the statement is completely accurate as it relates to you and your team, then you should select "Very Accurate". If you feel that the statement is not accurate at all, then you should select "Very Inaccurate".

- If you make a mistake on this team, it is often held against you.
- Members of this team are able to bring up problems and tough issues.
- People on this team sometimes reject others for being different.
- It is safe to take a risk on this team.
- It is difficult to ask other members of this team for help.
- No one on this team would deliberately act in a way that undermines my efforts.
- Working with members of this team, my unique skills and talents are valued and utilized.
- We regularly take time to figure out ways to improve our team's work processes.
- This team tends to handle differences of opinion privately or off-line, rather than addressing them directly as a group.

- Team members go out and get all the information they possibly can from others-such as customers, or other parts of the organization
- This team frequently seeks new information that leads us to make important changes.
- In this team, someone always makes sure that we stop to reflect on the team's work process.
- People in this team often speak up to test assumptions about issues under discussion.
- We invite people from outside the team to present information or have discussions with us.

In this section, you will answer some questions about your current work team.

For these questions, please select the option that best represents your agreement with the statement. For example, if you agree completely with the statement as it relates to you and your team, then you should select "Strongly Agree". If you do not agree with the statement at all, then you should select "Strongly Disagree".

- This team should not have continued to function as a team.
- This team was not capable of working together as a unit.
- This team probably should never work together in the future.
- If I had the chance, I would have switched teams.
- I would be happy to work with the team members on other projects in the future.

In this section, you will answer some questions about your current work team.

For these questions, please select the option that best represents your agreement with the statement. For example, if you agree completely with the statement as it relates to you and your team, then you should select "Strongly Agree". If you do not agree with the statement at all, then you should select "Strongly Disagree".

- In the past, the team has been effective in reaching its goals.
- The team is currently meeting its business/organizational objectives.
- When we complete the work, it is generally on time.
- When we complete the work, it is generally within the budget.
- There is respect for individuals in the team.

- I feel my input is valued by the members of the team.
- Team member morale is high in the team.
- I enjoy being a member of this team.
- In the future, I would be interested in participating in another team.

Additional Thoughts

If you have anything more that you think we should know or any general thoughts, compliments, or criticisms of the survey, please fill them out in the box below. If you have nothing to add, you may skip it.

Final words

Congratulations!

You are now done with the survey, please click "Submit" to be sure that your response was recorded. We thank you for taking the time to take our survey and if you have any questions or concerns at all, please do not hesitate to contact us at the following email addresses:

Alexander Reppond: al1713re-s@student.lu.se

Yvonne Steinmeyer: yv5422st-s@student.lu.se

To give you a little more information about our project, we are looking at the levels of psychological safety within work teams as well as how effective these teams are. Furthermore, we are comparing the results between Swedish and US American work teams to investigate if there is a noticeable difference between the cultures.

Once again, thank you for your time and participation and please do not forget to click the "Submit" button.

In case you participated via SurveySwap use the following link to receive the credits.
Need survey respondents? Click this link to receive credits that earn you free respondents at SurveySwap.io. --> <https://surveyswap.io/sr/Mkq21s5meZhmNP6y>

Not Eligible for the Survey

Due to your indicated answers, you are unfortunately not eligible for this survey. Your responses and any data collected will be deleted. Thank you for your time and we hope you have a great day!

The possible reasons for being ineligible are as follows:

- Do not consent to taking part in the survey
- Not over 18 years of age
- Not working full or part-time in either the United States or Sweden
- Not working in IT or IT-related Field
- Not working in a team

If you feel that this was in error, you can hit the back button and return to the question.

If you have any questions, then please feel free to contact us at al1713re-s@student.lu.se or yv5422st-s@student.lu.se

You may close out of the survey at this time.

Appendix B – Questionnaires

This Appendix Section contains the scales in their entirety used in this study. The “*” indicates reversed scoring.

Psychological Safety Scale (Edmondson, 1999)

1. If you make a mistake on this team, it is often held against you.*
2. Members of this team are able to bring up problems and tough issues.
3. People on this team sometimes reject others for being different.*
4. It is safe to take a risk on this team.
5. It is difficult to ask other members of this team for help.*
6. No one on this team would deliberately act in a way that undermines my efforts.
7. Working with members of this team, my unique skills and talents are valued and utilized.

Team Learning Behavior Scale (Edmondson, 1999)

1. We regularly take time to figure out ways to improve our team's work processes.
2. This team tends to handle differences of opinion privately or off-line, rather than addressing them directly as a group.*
3. Team members go out and get all the information they possibly can from others-such as customers, or other parts of the organization
4. This team frequently seeks new information that leads us to make important changes.
5. In this team, someone always makes sure that we stop to reflect on the team's work process.
6. People in this team often speak up to test assumptions about issues under discussion.
7. We invite people from outside the team to present information or have discussions with us.

Team Viability Scale (Tekleab, Quigley, & Tesluk, 2009)

1. This team should not have continued to function as a team.*
2. This team was not capable of working together as a unit.*
3. This team probably should never work together in the future. *
4. If I had the chance, I would have switched teams.*
5. I would be happy to work with the team members on other projects in the future.

Team Performance Scale (Lurey et al., 2001)

1. In the past, the team has been effective in reaching its goals.
2. The team is currently meeting its business/organizational objectives.
3. When we complete the work, it is generally on time.
4. When we complete the work, it is generally within the budget.

Team Satisfaction Scale (Lurey et al., 2001)

1. There is respect for individuals in the team.
2. I feel my input is valued by the members of the team.
3. Team member morale is high in the team.
4. I enjoy being a member of this team.
5. In the future, I would be interested in participating in another team. *(Item was removed during the analysis due to low internal consistency.)*