Utrecht University

What makes a team resilient?

The moderating roles of cognitive diversity and team potency on the relationship of psychological safety and team resilience

Bernadette Paschertz (6029213)

Utrecht University

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Abstract

The present study contributes to the growing literature about the factors that contribute to team resilience. Specifically, it answers questions regarding cognitive diversity and team potency as circumstantial factors under which psychological safety is related to team resilience. The research questions were answered based on data collected from organizational teams working in different sectors who were from Germany, the Netherlands, the UK, and Italy. Team members rated psychological safety, cognitive diversity, team potency, team resilience, and the impact of COVID-19 on the team's functioning. The team-level data analyses revealed insignificant findings for the main effects and two-way interactions. Yet, the results showed that the relationship between psychological safety and team resilience is strengthened by low (high) cognitive diversity and high (low) team potency. Conversely, the three-way interaction revealed no significant results when cognitive diversity and team potency are both high or both low. To conclude, theoretical and practical implications are made, and limitations, as well as future directions, are discussed.

What makes a team resilient?

In this age, organizations have to be successful in a rapidly changing, complex, and uncertain globalized world (King et al., 2015). Adapting to adverse events becomes more complex and crucial for organizations as a means to compete with others. As businesses grapple with the social and economic consequences of the COVID-19 pandemic (Brammer et al., 2020), the effects of adversity and how to overcome them are more relevant than ever. In challenging times like these, the interdependent structures of organizations gain significance. As a result, the importance of a team's functioning for a company's success is increasing (Stoverink et al., 2020). A team is defined as a group of at least two people who are outcome interdependent (Sundstrom et al., 1990). For teams to achieve the desired outcome of their shared goals, team resilience is crucial (Mithani, 2020; Tannenbaum et al., 2020). The definition of team resilience varies between research studies, however, it is widely conceptualized as "a persistence, recovery, or growth trajectory of team functioning, following exposure to adversity" (Hartwig et al., 2020, p. 186). Hence, more resilient teams have the capacity to reattain a state of stability (Mithani, 2020). To illustrate this, imagine the following scenario: During a pandemic such as COVID-19, a member of a project team tests positive for the virus. This puts a risk on the health of each team member as well as on the team's functioning. To minimize the risk of infections, the organization decides to have their employees work from home. By staying in close contact through technology, distributing the work effectively, and filling in the gap caused by the missing team member, the team has the ability to bounce back from the event and finish the project successfully. In other words, the team acts resiliently. By now, it is a matter of common knowledge what team resilience looks like. Nevertheless, it is still unclear under which conditions a team is particularly resilient (Chapman et al., 2020).

Individual resilience has been pivotal in the literature since the 1970s. For example, the Conservation of Resources (COR) theory (Hobfoll, 2010) suggests that people gain resilience in stressful times through personal resources (e.g., optimism, confidence, safety, or mental models). Yet, the research on team resilience has only recently become more salient in the literature (Chapman et al., 2020). Despite the scarcity of empirical literature, the popularity and interest in team resilience increases. For instance, three literature reviews on team resilience were published in 2020 (Stoverink et al., 2020; Hartwig et al., 2020; Mithani, 2020). However, the reviews call for further empirical examination of factors that contribute to team resilience. The present study specifically seeks to answer questions regarding the impact of variables mentioned by Stoverink et al. (2020) and Hartwig et al. (2020) on team resilience.

Research has suggested a positive relationship between psychological safety and team resilience (Carmeli & Friedman, 2013). Psychological safety is the feeling of being safe to take interpersonal risks (Edmondson, 1999). Based on the literature, one can assume that teams with high psychological safety are more likely to have increased communication since team members may feel safer to share their perspectives (Hartwig et al., 2020) and seem more capable of processing the adverse situation through different opinions and perspectives (Stoverink et al., 2020). Nevertheless, besides highlighting the salience of team resilience, the reviews mentioned previously emphasize the lack of knowledge about and need for further empirical research on team resilience. Specifically, the relationship between psychological safety and team resilience needs to be investigated in more detail. The present study aims at contributing to the empirical literature by examining the conditions under which psychological safety is positively related to team resilience.

According to the Multilevel theory, higher-level phenomena such as team resilience emerge through affective, behavioural, cognitive, and interpersonal bottom-up processes (Kozlowski & Klein, 2000). That is to say, the degree to which a team is resilient derives from

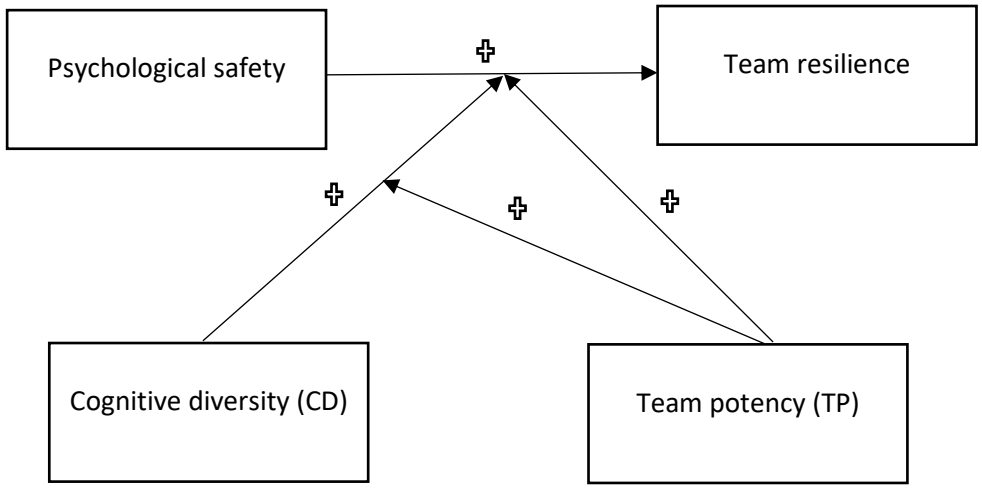
aggregated individual and interpersonal characteristics of its team members. Furthermore, Stoverink et al. (2020) argue that the COR theory can be translated to the team level based on the crossover model by Westman (2001) which states that individuals transfer their resources from one individual to another. In other words, since team members are outcome and goal interdependent, there has to be a high degree of interaction between them. Accordingly, whether a team can be resilient under adverse conditions may depend on team-level exchanges that emerge from interactions between team members.

Psychological safety facilitates this exchange as it promotes communication among team members, which, in turn, is associated with team resilience (Stoverink et al., 2020). This process might depend on various factors as highlighted in the most recent reviews (Stoverink et al., 2020; Hartwig et al., 2020; Mithani, 2020). Cognitive diversity, which is the degree to which team members differ in terms of knowledge, skills, worldviews, and beliefs (van der Vegt & Janssen, 2003) increases creativity (Woodman, et al., 1993), decision-making, and problem-solving (Williams & O'Reilly, 1998; van Knippenberg and Schippers, 2007) which are important skills for resilience (Stoverink et al., 2020). On the other hand, studies have also found negative effects of cognitive diversity on team outcomes (Jehn et al., 1999; Horwitz & Horwitz, 2007; van Knippenberg & Schippers, 2007). Lastly, team potency, which is "a team's shared belief that it can successfully resolve any task or demand it may confront" (Zaccaro et al., 1995, p. 314), may serve as a motivating factor given that it reminds a team of their capabilities to overcome adversity (Stoverink et al., 2020).

Therefore, the present study specifically sought to answer the question of whether psychological safety is related to team resilience, and, whether this relationship is jointly moderated by cognitive diversity and team potency. The proposed model is depicted in Figure 1.

Figure 1.

Proposed model of the present



Literature Review

Team resilience and psychological Safety

As specified by Kozlowski and Klein (2000) in their Multilevel theory, interaction processes between individual team members play a key role in higher-level phenomena (i.e., team resilience) (Hartwig et al., 2020). Further, research from various fields (i.e., Rosenbaum et al., 1980; Johnson & Johnson, 1989; Saavedra et al., 1993) has shown that factors, such as team members' confidence to share perspectives and knowledge, their trust to acknowledge mistakes, and the ability to accept others' standpoints, have a positive impact on organizational outcomes. Accordingly, psychological safety has recently been defined as a crucial factor of a team's functioning in adverse times such as during the COVID-19 pandemic (Tannenbaum et al., 2021).

Previous studies have reported that team members have difficulties asking for help, requesting feedback, or admitting mistakes (Ipsos, 2012, as cited in Kim, Lee, & Connerton, 2020) because they perceive such vulnerability as a threat (Brown, 1990). However, Carmeli and Friedman (2013) argue that psychological safety is especially crucial when adversity

strikes as it encourages team members to discuss issues openly. This is in line with Weick's taxonomy (1993) of team resilience which identified psychological safety as a key resource for a team to be resilient. Furthermore, Stoverink et al. (2020) support the hypothesis that psychological safety is positively related to team resilience. They emphasize the importance of teams communicating their thoughts in order to process the problems they encounter.

Following the literature, it is expected that a team that feels safe to take interpersonal risks is more resilient compared to a team that does not feel safe to take interpersonal risks.

Hypothesis 1: Psychological safety is positively related to team resilience.

Interaction of psychological safety and cognitive diversity

Although empirical evidence points to a positive relationship between psychological safety and team resilience, the strength and even direction of this relationship may be influenced by other factors. Previous research is calling for a more circumstantial approach when analyzing complex organizational constructs such as team resilience (Vecchio, 2003; Stoverink et al., 2020; Hartwig et al., 2020; Mithani et al., 2020). To better understand the relationship between psychological safety and team resilience, the present study investigates some of these contextual elements.

Following the literature, cognitive diversity might make a team more resilient by increasing their creativity, which might be needed during adversity. For instance, Woodman et al. (1993) theory of organizational creativity identifies several contextual factors contributing to team creativity, such as a team being composed of members that cognitively differ. The reasoning behind that theory is that employees' creativity increases through the inspiration of different views and perspectives from colleagues. With increased creativity, teams can be more resilient during adversity as it enhances a team's capacity to improvise and find alternatives (Stoverink et al., 2020; Hartwig, et al., 2020). This is in line with the decision-making perspective, which states that cognitive diversity improves decision-making and problem-

solving processes given a larger knowledge and perspective base (Williams & O'Reilley, 1998; De Dreu & West, 2001; van Knippenberg & Schippers, 2007). Joniaková et al. (2021) examined the effect of cognitive diversity on team performance during adversity and found that cognitive diversity increased team performance through positive decision-making. Furthermore, differences among team members, in terms of knowledge, may facilitate the transactive memory of a team as team members become more aware of each other's knowledge (Stoverink et al., 2020). This speeds up the distribution of tasks and enhances team resilience (Gomes et al., 2014).

A recent study found that psychological safety was positively related to team creativity (Hu et al., 2021). Specifically, psychological safety compensates for factors that may threaten creativity, such as risks, obstacles, and uncertainties. As psychological safety and cognitive diversity are both positively related to creativity which, in turn, is positively related to team resilience, one may assume that psychological safety and cognitive diversity interact in their relationship with team resilience. Moreover, researchers have found an interaction effect of psychological safety and cognitive diversity on team performance such that cognitive diversity was positively related to team performances when a team was high on psychological safety (Olson et al., 2007; Martins et al., 2013; Diegmann & Rosenkranz, 2017).

On the contrary, previous research suggests that cognitive diversity decreases team satisfaction (Kurtzberg, 2005) and increases interpersonal conflicts (Jehn et al., 1999), which may cause problems that mitigate a team's capability to be resilient in adverse times. Team members may lack trust and thus, focus more on personal rather than professional issues. The negative effects of cognitive diversity in a team can be explained by the social-categorization theory, according to which diversity causes a lack of integration, resulting in intergroup conflict (Horwitz & Horwitz, 2007; van Knippenberg & Schippers, 2007).

Because of its inconsistent findings, cognitive diversity is often referred to as a double-edged sword (Milliken & Martins, 1996). Nevertheless, following the theoretical frameworks and research findings of both psychological safety and cognitive diversity, one might assume that psychological safety will be more positively related to team resilience when a team is cognitively diverse as adverse situations require problem-solving and creativity (Stoverink et al., 2020).

In conclusion, it is expected that the degree to which team members differ cognitively has a positive impact on their ability to take interpersonal risks in a way that facilitates team resilience. This leads to the following hypothesis:

> *Hypothesis 2:* Cognitive diversity moderates the relationship between psychological safety and team resilience such that the relationship is stronger in teams that are cognitively diverse compared to cognitively homogeneous teams.

Interaction of psychological safety and team potency

Another team characteristic contributing to team resilience is team potency (Guzzo, Yost, Campbell, & Shea, 1993; Shea & Guzzo, 1987a; Gully et al., 2002; Costa, Passos, & Bakker, 2014). For teams affected by adversity, it is crucial to be confident about the team's ability to succeed under difficult circumstances, or, in other words, to have collective efficacy (Tannenbaum et al., 2021). Efficacy is not the same as potency since team potency refers to the belief that the team is generally capable to succeed while team efficacy refers to the belief that the team is capable of succeeding in tasks under specific circumstances. However, research found a high weighted average correlation ($G(r) = .65$) between team potency and collective efficacy (Stajkovic, Lee, & Nyberg, 2009) so that it stands to reason that team potency may be equally beneficial for teams during adversity. To support this reasoning, Stajkovic et al. (2009) provided evidence for a positive relationship between team performance and team potency.

Moreover, Stoverink et al. (2020) suggest that team potency and psychological safety are not merely separate resources (Weick, 1993). Rather, their impact on team resilience is an interplay of both of them. This is consistent with the COR theory discussed earlier stating that teams' resources are closely intertwined (Hobfoll, 2010). For instance, social support by team members may be facilitated when team members boost each other's confidence (Edmonson, 1999). Consequently, in a team that is more confident compared to a less confident team, team members may gain trust in their colleagues when it comes to mutual respect for differing perspectives.

Nonetheless, to the knowledge of the author, the interaction effect of team potency and psychological safety on team resilience has not been examined yet, which leaves an empirical gap for the theoretical assumptions. As a conclusion of the reasoning so far, it is expected that a team that feels safe to take interpersonal risks will be more resilient in adverse times when it is confident in its abilities.

> *Hypothesis 3:* Team potency moderates the relationship between psychological safety and team resilience such that the relationship is stronger when teams have high potency rather than low.

The three-way interaction of psychological safety, cognitive diversity, and team potency

As Stoverink et al. (2020) and Hartwig et al. (2020) illustrate in their reviews, there is evident empirical and theoretical ground suggesting that variables such as psychological safety, cognitive diversity, and team potency impact team resilience. Despite their relevance for team resilience, previous research has not examined the interaction between these constructs yet. Therefore, in addition to examining the two-way interactions of cognitive diversity and team potency with psychological safety, this research further investigates the impact of the different levels of cognitive diversity and team potency on the relationship between psychological safety and team resilience, thus examining the three-way interaction.

Joshi and Roh (2009) point out that the impact of cognitive diversity on team outcomes depends on other team-level perceptual variables. Thus, team potency might be a factor that influences the effect of cognitive diversity on the relationship between psychological safety and team resilience. According to social identity theory, the cognition of team members is not only shaped on the individual level but, mainly, on the team level (Tajfel et al., 1979). When a team shares a collective sense of confidence in their abilities, their social team identity increases (Fransen et al., 2015). Moreover, social team identification is an important factor for cognitive diversity to positively impact team outcomes such as team performance (van der Vegt & Bunderson, 2005; Kearney et al., 2009). Therefore, it can be assumed that a team with confidence in their ability to manage difficult tasks is more likely to use their cognitive diversity effectively, rather than let cognitive diversity cause interpersonal conflicts. In other words, differing perspectives within a team may not unsettle confident teams as easily as uncertain teams. Consequently, the following hypothesis for the three-way interaction of cognitive diversity and team potency on psychological safety and team resilience was inferred:

> *Hypothesis 4*: Psychological safety, cognitive diversity, and team potency interact to affect team resilience in such a way that when cognitive diversity and team potency are high (low), there is a stronger (weaker) relationship between psychological safety and team resilience.

Method

Design

To answer the research questions, a quantitative study with a cross-sectional design was conducted. Via two online surveys (one for the team members and one for the team leader), data were collected from various teams. The present study was part of a greater project study conducted by a total of five Master's students at the Utrecht University who jointly collected data. Each student investigated different research designs with different variables.

Sample

Data was collected through convenience and snowball sampling by the five respective researchers. The inclusion criteria for the selected teams were as follows: (1) a minimum number of two and a maximum number of 20 team members, (2) the teams had a leader to make sure that they were not self-managing, (3) the team members worked interdependently, and (4) the teams were located in Europe. The countries of origin were selected based on two criteria: (1) their shared GLOBE cultural cluster according to Dastmalchian et al. (2020) and (2) the researchers' network.

In total, data of 48 teams was collected. After checking for these criteria, five teams had to be discarded due to missing data from team members. The final sample included 135 team members and a total of 43 teams (N=43). Of the team members, 56.3% were female, the mean age was 36.87 years (*SD*=11.12), the mean job tenure was 43.44 months (*SD*=73.68), mean work experience was 13.88 years (*SD*=10.91), and 57.8% had at least a Bachelor's, Master's or Doctorate degree. Among the teams' companies, 18.6% were from the educational, scientific, and/or technical sector or the health care and/or social sector, 20.9% delivered other services, 14% were from the information and communication sector, 7% from the financial and/or insurance sector, 9.3% from the manufacturing & production sector, and 11.6% were from other sectors. The average team size was 7.35 members (*SD*=3.77). Most of the teams were from Germany (48.8%), the Netherlands (37.2%), and the UK (9.3%). There was also one team recruited from Italy. It consisted of English teachers from the UK who worked at a school in Italy and was therefore kept in the sample. Table 1 provides an overview of the frequencies and percentages of the teams' countries and industries.

Table 1

Frequencies and Percentages of the teams' countries (N = 42) and industries (N = 43)

		Frequency	Percentage
Country	Germany	21	50.0
	Netherlands	16	38.1
	UK	4	9.5
	Italy	1	2,4
	Total	42	100
Industry	Information and communication	6	14
	Educational/ scientific/ technical	8	18.6
	Health care/ social	8	18.6
	Other services	9	20.9
	Manufacturing & production	4	9.3
	Financial/ insurance	3	7
	Other	5	11.6
	Total	43	100

Procedure

The researchers contacted team members or leaders via phone, email, or LinkedIn. A leaflet with a summary of the information was then sent to the contact person. The leaflet contained information about the purpose of the study, the durability of the questionnaire, the possibility of winning a 25€ Amazon voucher for two teams, the offer of presenting the results to the team, and the importance of their participation. The next step was to inform the contact person about the following procedure and the links to the surveys were shared. The links were either sent to each participant individually, or the contact person only, for them to distribute to the rest of the team. The type of distribution procedure depended on the nature of the contact that the researcher had with the team. With the distribution of the links, the participants were informed about how and where they could select their language of choice (English, Dutch or

German). To minimize the possibility of problems regarding the coordination of team-level data, teams were explicitly instructed to fill in the correct team's name and this information was used to aggregate the individual-level responses to the team level.

Measures

Two surveys were distributed, one for the team leader and one for the team members. However, the data from the leader surveys are not relevant for the present study and will not be further discussed. The survey for the team members consisted of items that measured psychological safety, cognitive diversity, team potency, and team resilience as well as variables that were relevant for the greater research project but not for the present study. The original language of the scales was English. Items were translated into German and Dutch. The translations were then conveyed to independent native German or Dutch speakers, respectively, who were fluent in English. The translations were back-translated into English based on Brislin's model of back-translations for cross-cultural research (Brisli, 1970). The original English items and the back-translated items were compared and changes were made accordingly. Before the surveys were distributed, they were forwarded to independent native speakers again (one English, one German, one Dutch) as a means to make final corrections where needed.

Team resilience was measured using a scale based on Mallak's principles (1998) for resilience in organizations (Meneghel et al., 2016). For the present study, only items of the scale were used that measure team resilience directly based on the definition used in this study (Hartwig et al., 2020). The final scale consisted of five items, measured on a seven-point Likert scale from "strongly disagree" (0) to "strongly agree" (6). An example item is "In difficult times, my team gives support to each other" ($\alpha = .8$).

Psychological safety was assessed by using Harvey et al. (2019) modified version of Edmondson's scale (1999). This version consisted of four items that were scored on a seven-

point Likert scale from “strongly disagree” (1) to “strongly agree” (7). An example item is “In this team, it is easy to speak up about what is on your mind” ($\alpha = .75$).

Team potency was determined with a shorter version of Guzzo et al.’s scale (1993), derived from Gevers et al. (2020). The five items were answered on a five-point Likert scale from “strongly disagree” (1) to “strongly agree” (5). An example item is “This team has confidence in itself” ($\alpha = .92$).

Cognitive diversity was measured with four items proposed by van der Vegt and Janssen (2003). The items were answered on a five-point Likert scale from “strongly disagree” (1) to “strongly agree” (5). An example item is “Team members differ in their knowledge and skills” ($\alpha=.7$).

Control variables. The variables that might affect the team processes, such as average team tenure (Finkelstein & Hambrick, 2014), team size (Giannoccaro et al., 2018), average work experience, and the perceived impact of COVID-19 on the team’s functioning (Brammer et al., 2020) (further referred to as COVID-19) were controlled for.

Aggregation

Preceding aggregation, the within-group interrater reliability (RWG), and the interclass correlation 1 (ICC1) and 2 (ICC2) were calculated to test whether the data can be aggregated to the team level (James et al., 1984). An overview of the ICC1, ICC2, RWG, and reliability indices can be found in Table 2. The values for RWG can all be considered high based on a cut-off score of .7. The mean values for ICC1 and ICC2 are within the appropriate range as well (LeBreton et al., 2003).

Table 2

Within-group agreement (RWG), intraclass correlations (ICC1/ICC2), and Cronbach's alphas (α)

Variable	*ICC1*	*ICC2*	*RWG*	*α*
1 Psychological safety	.41	.69	.94	.75
2 Cognitive diversity	.36	.66	.91	.7
3 Team potency	.28	.55	.94	.92
4 Team resilience	.27	.53	.94	.8

Statistical analyses

Two power analyses using G*Power (Faul & Erdfelder, 1992) were conducted to get the required sample size for a *power (1-β)* > .8, with a medium effect size of *f2*=.15. One power analysis was conducted for the three-way interaction and resulted in a required sample size of *N*=75. The second power analysis was done for the two-way interactions and resulted in a sample size of *N*=69.

Data from Qualtrics was exported to the *Statistical Program of Social Sciences (SPSS)* to conduct the statistical analyses, using a three-way interaction moderation model (model 3) with PROCESS (Field, 2017). This is a bootstrapping method based on linear regression. Prior to the analyses, the data was checked for missing and invalid values, outliers, assumptions. Rather than using the common type 1 error rate (alpha) of 0.05, the alpha for the present study was set at .10 considering the small sample size (Fisher, 1950).

Results

Main analysis

Table 3 presents the means, standard deviations, and intercorrelations among the variables.

Table 3

Mean (M), Standard Deviation (SD), and aggregated level intercorrelations (N = 43)

Variable		M	SD	1	2	3	4	5	6	7	8
1.	Psychological safety	5.63	.69	-							
2.	Cognitive diversity	3.55	.5	-.34**	-						
3.	Team potency	3.94	.39	.5***	-.26*	-					
4.	Team resilience	5.56	.62	.36**	-.28	.38**	-				
5.	COVID-19	3.1	.79	.05	.1	.07	-.29	-			
6.	Team size	8.54	4.63	-.3*	.3*	-.3	-.07	-.02	-		
7.	Team tenure	43.44	73.68	-.43***	.37**	-.5***	-.34**	-.04	.03	-	
8.	Work experience	13.88	10.91	-.2	.36**	-.2	-.02	.03	.01	.45***	-

*Note: *p<.10 **p<.05 ***p<0.01*

To test the hypotheses, model 3 analyses through PROCESS were conducted. In the first phase, average team size, average team tenure, average work experience, and COVID-19 were controlled for. As only COVID-19 yielded significant results (b=-.27, 95% CI[-.44, -.1], t(34)=-3.23, p < .01), team size (b=-.01, 95% CI[-.06, .04], t(34)=-.47, p=.67), team tenure (b=0, 95% CI[0, 0], t(34)=-.4, p = .944), and work experience (b=0, 95% CI[0, 0], t(34)=-.1, p = .96) were excluded from the model to increase the power of the study. This revealed an overall model that was significant, $F(8,34) = 11.944$, $p < .001$, $R^2 = .46$, meaning that the proposed model explains 46% of the variance.

Contradictory to hypothesis 1, psychological safety was not found to be a significant predictor for team resilience (b=.2, 95% CI[-.064, .455], t=1,53, p = .136), as can be seen in Table 4. Further, hypothesis 2 and 3 were not supported by the results of the present study. Hence, no significant interaction of psychological safety and cognitive diversity (b=-.16, 95%

CI[-.64, .32], t=-.68, p = .498) or psychological safety and team potency (b=-.03, 95% CI[-.63, .57], t=-.1, p = .136p = .922) on team resilience was detected.

Hypothesis 4 predicted that the relationship between team resilience and psychological safety is moderated by cognitive diversity and team potency in such a way that high cognitive diversity and team potency strengthen the relationship whereas low cognitive diversity and team potency weaken the relationship. In line with this hypothesis, Table 4 shows a significant three-way interaction of psychological safety, cognitive diversity and team potency on team resilience when COVID-19 is controlled for (b = -.86, 95% CI[-1.62, -.1], t(34) = -2.31, p < .05). Moreover, the significant R^2-change value of .04 suggests a change in the explained variance of 4%. Opposed to hypothesis 4, however, the results in Table 4 indicate a negative interaction of cognitive diversity, team potency, and psychological safety.

Table 4

Regression model for the predictor and interaction effects on team resilience

Predictor	*b*	*SE(b)*	ΔR^2	*t-value*	*p-value*
COVID-19	-2.58	.09		-3,02	.005
PS	.2	.13		1,53	-.136
TP	.01	.24		.06	-.954
CD	-.03	.15		-.17	-.865
PS x CD	-.16	.14	.01	-.68	-.498
PS x TP	-.03	.3	.04	-.1	.922
PS x CD x TP	-.86	.42	.04	-2.31	.027

Note. Significance at α=.1

Table 5 shows the details of this interaction. When cognitive diversity is low and team potency is high, psychological safety positively affects team resilience (b = .44, 95% CI[-.02, .9], t(34) = 1.93, p = .062). When team potency is low and cognitive diversity is high,

psychological safety also positively predicts team resilience (b = 35, 95% CI[-.01, .71], $t(34)$ = 1.96, p = .59). On the contrary, when team potency and cognitive diversity are both low or both high, psychological safety does not predict team resilience. Further, the slope differences (calculated according to Dawson & Richter, 2006) between (1) and (2) (t=-7.52, p<.001) as well as between (1) and (3) (t=-2.96, p<.01 are significant. (4) does not significantly differ from the rest of the slopes. The three-way interaction is plotted in Figure 4 following the method of Aiken & West (1991).

Table 5

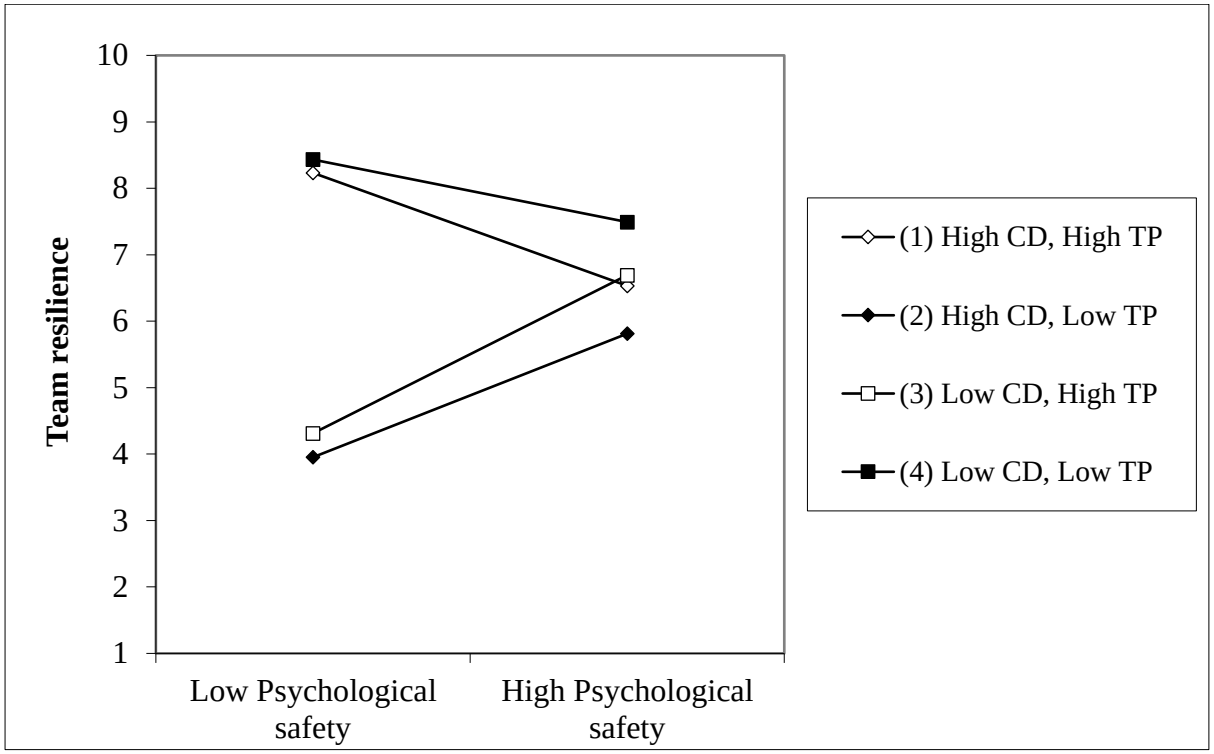
Conditional effects of PS at values of CD and TP

Pairs of comparison	*Team resilience*		
	b (slopes)	*t-value*	*p-value*
(1) High CD, high TP	-.09	-.26	.793
(2) High CD, low TP	.35	1.99	.059
(3) Low CD, high TP	.44	1.93	.062
(4) Low CD, low TP	.08	.5	.618
Slope differences			
1 and 2		-7.52	.000
1 and 3		-2.96	.006
1 and 4		-.39	.699
2 and 3		-.3	.768
2 and 4		1.58	.124
3 and 4		1.67	.103

Note. Pair numbers correspond to the numbers listed in Figure 2
Significance at α=.1

Figure 2

Plot of the three-way interaction



Additional analyses

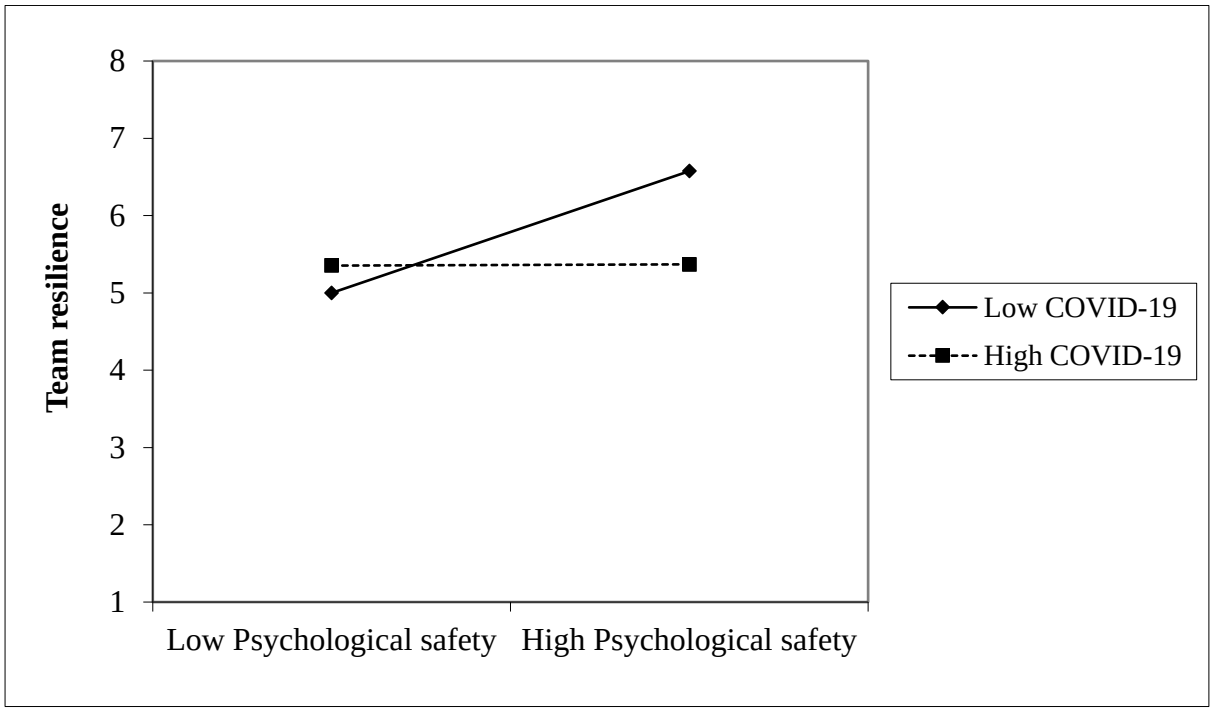
As COVID-19 became a significant variable in this study, it was further investigated. To examine whether the relationships of psychological safety, team potency, and cognitive diversity with team resilience differ when the impact of COVID-19 is experienced differently, a model 1 analysis using PROCESS was conducted.

COVID-19 was found to be a significant moderator for the relationship of psychological safety and team resilience (b=-.39, 95% CI[-.72, -.06], t(39)=-2.4, $p < .05$). As depicted in Figure 3 (can be found in the appendix), the relationship between psychological safety and team resilience strengthens when COVID-19 is perceived as having a weak impact on the team's functioning. Conversely, there is no relationship between psychological safety and team resilience when COVID-19 is high. The value of R^2-change = .077, F(1,39) = 5.78, $p < .05$ suggests a change in the explained variance of 7.7%.

Further, there is no significant interaction of COVID-19 and team potency (*b*=-.12, 95% CI[-1, .76], *t*=-.28, *p*=.781) or cognitive diversity (*b*=.09, 95% CI[-.42, .59], *t*=.34, , *p*=.732).

Figure 3

Interaction of COVID-19 and psychological safety.



Discussion

In summary, this team-level data study fulfilled its aim of contributing to the empirical literature on team resilience. Specifically, the conditions under which psychological safety is related to team resilience were examined and some interesting results were found. Even though there was no main relationship between psychological safety and team resilience in this study, the findings confirm the hypothesis that there is a positive relationship under certain circumstances. There was no interaction effect between psychological safety and cognitive diversity or psychological safety and team potency. However, there was a significant three-way interaction effect of all three predictor variables. These results demonstrate the importance of different factors that impact team resilience.

Theoretical implications

The present study has not confirmed the hypothesis that psychological safety is significantly related to team resilience. Further, when COVID-19 was examined as a moderator of this relationship, psychological safety was only found to be positively related to team resilience when COVID-19 was perceived as having a low impact on the team's functioning. On the contrary, when COVID-19 was high, no relationship between the two was found. This implies that a team benefits from psychological safety when an adverse event is not perceived as having a strong impact on the team. For instance, when an adverse event is not perceived as severe, there might be more capacity within a team to feel psychologically safe and to voice differing perspectives. Even though the results found by Carmeli & Friedman (2013) showing a positive relationship between psychological safety and team resilience were not affirmed, the findings of COVID-19 as a moderator for this relationship imply that psychological safety is associated with team resilience under certain conditions.

This study also examined team potency and cognitive diversity moderators for the relationship between psychological safety and team resilience. The results did not indicate a moderating role of either of them, which is not in line with the hypotheses. Considering that team potency has been positively associated with team outcomes through empirical findings (Stajkovic et al., 2009) and theoretical frameworks (Hobfoll, 2010; Stoverink et al., 2020), these results are surprising. Looking at the empirical findings regarding cognitive diversity, mixed results for the impact of cognitive diversity on team outcomes have been found. On the one hand, it was negatively related to team satisfaction (Kurtzberg, 2005) and positively related to interpersonal conflicts (Jehn et al., 1999). On the other hand, cognitive diversity can also be associated with increased creativity (Woodman et al., 1993) and problem-solving (i.e., van Knippenberg & Schippers, 2007). Moreover, previous studies show that cognitive diversity and psychological safety positively interact in their relationship with team performance (Olson

et al., 2007; Martins et al., 2013; Diegmann & Rosenkranz, 2017). A reason for the insignificant findings could be the low number of teams in this study in combination with a heterogeneous group of sectors and countries that the teams are working in. Heterogeneity causes more statistical noise (Field, 2017). In this study, the statistical noise cannot be compensated by the sample size as the sample size is too small. Therefore, future research studies should work towards a sample size that is more homogeneous and larger.

Additionally, as hypothesized, the results of this study revealed a three-way interaction of psychological safety, cognitive diversity, and team potency. Opposed to the hypothesis, the interaction shows that low (high) cognitive diversity and high (low) team potency strengthen the relationship between psychological safety and team resilience. On the contrary, when cognitive diversity and team potency are both high or both low, there is no significant relationship between psychological safety and team resilience. As the slope differences reveal, the pair with high levels of both moderators differs significantly from the pairs with levels of high (low) team potency and low (high) cognitive diversity. Compared to that, low levels of both moderators do not significantly differ from the rest of the pairs. Furthermore, the graph and coefficients show that the relationship between psychological safety and team resilience is stronger when cognitive diveristy is low and team potency is high compared to high cognitive diversity and low team potency. Therefore, it is recommended for future studies to further investigate this interaction with a larger sample size.

Practical implications for leaders

To the knowledge of the author, this study is the first to analyze the impact of a three-way interaction on team resilience. Therefore, the results of this study can be helpful for organizations and their teams to become aware of the team characteristics and circumstances that (do not) support their resilience in adverse times. This is especially relevant at times like

these as organizations will have to stand up against the long-term effects of the COVID-19 pandemic.

The findings of this study showed negative bivariate correlations between cognitive diversity and psychological safety as well as cognitive diversity and team potency. Furthermore, the results of the analyses revealed a significant negative interaction between cognitive diversity and team potency that was not hypothesized for the present study. However, taking the three-way interaction the significant two-way interaction, and their negative bivariate correlation together, one can assume that less cognitively diverse teams with high potency might be more beneficial for a team. In that regard, it is advised for team leaders to focus more on a team with high potency and low cognitive diversity rather than the other way around to increase the influence of psychological safety on team resilience. For instance, team-building training that emphasizes psychological safety in confident teams might strengthen their resilience.

On the other hand, if a team is cognitively diverse but not confident in their abilities, psychological safety might lead to resilience by encouraging team members to use their diverse knowledge and skills effectively. In that case, it is advised for teams to engage in team-building training that creates an environment for a less confident team in which team members can share their differential perspectives might help teams to be resilient in adverse times.

Limitations and future directions

One of the strengths of this study is the team-level data, which is more representative of the team as a whole than individual data. Furthermore, since this study is the first to conduct a three-way interaction to investigate the joint impact of psychological safety, cognitive diversity, and team potency on team resilience, it contributes to the literature in a meaningful way. With the findings of this study, interesting implications could be made for empirical, theoretical, and practical purposes.

However, this study also has some limitations that will be discussed in the following. First, the design of this study is cross-sectional. For this reason, there cannot be any causal inferences made based on these results. A longitudinal study will be beneficial for those purposes. Second, as mentioned before, the heterogeneity of the sample can create statistical noise. The participating teams came from different countries (Germany, the Netherlands, the UK, and Italy). According to the GLOBE cluster (Dastmalchian et al., 2020), Germany and the Netherlands belong to one cultural and societal cluster. Consequently, distortions from those data points are less likely. However, the UK and Italy are considered to be part of other clusters, resulting in a heterogeneous group. Since the number of teams from the UK was high enough and the team from Italy was thought of as matching with the characteristics of the UK teams, severe distortions were not expected. Nonetheless, it should be noted that such heterogeneity can affect the results. Furthermore, the small sample size might have lowered the power of this study (Field, 2017). One reason for the small sample size and the rather heterogeneous groups is the impact of the COVID-19 pandemic on the data collection. First, reaching out to teams was more difficult as many teams and their leaders worked from home. Second, because of the impact of COVID-19 on the day-to-day work life of teams, they often did not want to participate as a result of having other priorities.

The following paragraphs introduce suggestions for future research. First, the results of the present study confirm the COR theory that factors contributing to team resilience most likely interact with each other (Hobfoll, 2010), resulting in a complex system that works according to different conditions. The interaction of cognitive diversity and team potency in relation to psychological safety as well as regardless of psychological safety should be considered in future research as it revealed interesting results in the present study that need further examination. For instance, how do cognitive diversity and team potency interact in their

relationship with team resilience? And does psychological safety have a positive or negative relationship with team resilience when cognitive diversity and team potency are both low/high?

Second, this study revealed a positive bivariate correlation between psychological safety and team potency. Further, psychological safety and team potency positively correlated with team resilience. This triangle of significant correlations calls for further investigation of their relations. A mediation analysis to examine whether psychological safety functions as a mediator of the relationship between team potency and team resilience might reveal important insights into that matter. A team that is confident in their abilities might give team members a safer feeling to take interpersonal risks, which might further influence team resilience.

Third, COVID-19 is forcing changes upon organizations such as introducing remote work and requiring more flexibility. As a result, there has been more focus on the need for safety and resilience, possibly at the cost of innovation and creativity (Spicer, 2020). This opens doors for researchers to explore the role of team characteristics in team resilience amid a crisis. It raises the question of how an adverse event influences the interactions among those team characteristics related to team resilience.

Conclusion

In summary, team resilience has gained significance in the past year given the impact of COVID-19 on organizations and their teams. The current study contributes to theoretical and empirical evidence to foster a better understanding of the conditions under which a team can be resilient. The two most important aspects that need to be taken from this study are (1) that cognitive diversity and team potency seem to compensate for each other and (2) that adversity (or possibly any adverse event occurring) plays an important role in team resilience. Finally, this study hopefully encourages researchers to further investigate the conditions under which psychological safety is positively related to the resilience of teams.

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Appendices

Appendix A – Leaflet

Research On Team Behaviour

Dear Sir / Madam,

Our research group of master students at Utrecht University, led by dr. S.M. Ceri-Booms, is investigating various factors that might influence team behaviour during adverse times. Think of challenging times such as during COVID-19. The target group of this research are employees nested in teams and their respective supervisors.

What does this mean for you:

The questionnaire for the employee will take up 5-7 minutes to complete.

The supervisor will fill in a different questionnaire which takes up to 1-2 minutes to complete.

The questionnaire is digitally available.

The data will be anonymous and will be treated confidentially.

Your participation is what will make our research meaningful!
Your team has the chance to win a 25€ voucher for a team building activity of your choice!

Contact email: teamwork202106@gmail.com

Appendix B – E-mail template

Dear [insert name],

We are a research group of master students at Utrecht University, led by dr. S.M. Ceri-Booms and we are investigating the various factors that might influence team behaviour during adverse times, such as the COVID-19 pandemic that we are in currently. The target group of this research are employees nested in teams and their respective supervisors. Therefore, it is important for all team members to participate in this survey.

What is the purpose of this research?

Team resilience refers to a team's capacity to bounce back after an adverse event. This study aims to investigate the antecedents and consequences of team resilience.

What is in it for you?

- You can contribute to scientific theories and findings concerning the functioning of teams and their performance.
- You will be provided with a report presenting our findings.
- Your team will have the chance to win a €25 Euro Amazon voucher.

How will the research be done and what will I have to do?

You will be asked to complete a short online questionnaire on Qualtrics which will take 5-7 minutes to complete for team members and 1-2 minutes for team supervisors. You may take the survey in English, Dutrch or German, which can be chosen on the top right side of the first page.

Data Processing

Data will be treated with the highest degree of anonymity and confidentiality. In addition, your data will be used for scientific purposes only and will never be shared with any third parties. Demographic data will be stored separately from the research data.

Why have I been asked to take part? What about the right to withdraw?

You have been invited to take part because you are currently an employee in or a leader of a team. Your participation in this study is completely voluntary. If you decide to take part, you will still be free to withdraw within 15 days after participation. This is essential to minimise the possible impact of the removal of your data on the ongoing data analysis and write-up of the project. You do not have to give a reason for your withdrawal. If you wish to participate or withdraw from the study, please contact the following email address: teamwork202106@gmail.com.

Thank you in advance for your time!

Appendix C - Questionnaire

Dear participant,

You are about to participate in a survey constructed by 5 collaborating students from the Social, Health and Organizational Psychology masters program at Utrecht University under the supervision of Dr. Meltem Ceri-Booms.

Goal of this survey

We are collecting data for our master theses on the factors and processes that are needed to achieve positive team outcomes during the COVID-19 period. The survey consists of 5 pages and takes about 6 minutes to complete.

What is in it for you?

Your cooperation in our research will help us expand scientific theory concerning the functioning of teams and their performance. Through this collaboration, we also would like to benefit your company and teams. For this purpose, if you are interested, we will provide you with a presentation of our findings, with the aim of explaining the practical relevance for your team. Furthermore, we will give away two €25 Amazon vouchers.

Confidentiality and anonymity

Data will be treated with an highest degree of anonymity and confidentiality. Qualtrics offers strong guarantees for the security of your data. In addition, your data will be used for scientific purposes only and will never be shared with any third parties.

Contact information

If you are unsure about the characteristics of this research or would like further clarification, you can contact the researchers at the following email addresses:

Carmen Natalie van de Kuilen/ c.n.vandekuilen@students.uu.nl

Bernadette Paschertz/ b.paschertz@students.uu.nl

Hui (Zoe) Zhu/ h.zhu1@students.uu.nl

Oliver Molenschot/ o.j.molenschot@students.uu.nl

Ruben Martin/ r.martin@students.uu.nl

Your Permission statement

I declare that I have been clearly informed about the purpose of the research. I know that the data and results of the investigation will be treated anonymously and confidentially. I also know that no

confidential information is passed on to third parties. I hereby grant permission to researchers at Utrecht University to use the information that I will provide in the questionnaire for research. I reserve the right to terminate my participation in this study at any time during the survey and within 15 days after participation without giving reasons.

- ○ I understand the information given above and give my consent to take part in the survey (1)
- ○ I do not give my consent to take part in this survey. (2)

Skip To: End of Survey If Info = I do not give my consent to take part in this survey.

End of Block: Intro page

Start of Block: Page 1 - Demo

teamname
Fill in the name of your organization followed by the name of your team below.

This information is necessary to be able to correctly combine the responses of the team members from the same team. After aggregation, this information will be destroyed and the data presented in the end study will be totally anonymous.

Example: Utrecht University-Research and development

_____

age What is your age?

_____

gender What is your gender?

- ○ Male (1)
- ○ Female (2)
- ○ Other (3)
- ○ Prefer not to say (10)

teamsize How many members are there in your team?

_____

teamtenure For how many months have you been working in this team?

_____

education What is the highest degree or level of education you have completed?

▼ A-levels / IB / Higher national diploma (13) ... Other (16)

workexperience How many years of work experience do you have?

_____

industry What industry does your company operate in?

▼ Information and communication (1) ... Other (7)

End of Block: Page 1 - Demo

Start of Block: Page 2

Instr. **Please think about the last 10 months (COVID-19 period) while evaluating the following items.**

perceivediff Our team functioning was strongly affected by COVID-19.

- ○ Strongly Disgree (1)
- ○ Disagree (3)
- ○ Neither disagree nor agree (4)
- ○ Agree (5)
- ○ Strongly Agree (6)

---

performance Please rate the following items:

	Poor (1)	Fair (2)	Good (3)	Very good (4)	Excellent (5)
Team members' general performance. (1)	○	○	○	○	○
Team members' punctual task completion. (6)	○	○	○	○	○
Team members' ability to achieve organizational objectives. (7)	○	○	○	○	○
Team members' level of performance quality. (8)	○	○	○	○	○

---

reflexivity Please indicate your views on the following statements:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (6)	Strongly agree (4)
The team often reviews its objectives. (1)	○	○	○	○	○
The methods used by the team to get the job done are often discussed. (2)	○	○	○	○	○
We regularly discuss whether the team is working effectively together. (3)	○	○	○	○	○
The team rarely reviews whether it's getting the job done. (4)	○	○	○	○	○

innovation Please indicate your views on the following statements:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
Team members often implement new ideas to improve the quality of our products and services. (1)	○	○	○	○	○
This team gives little consideration to new and alternative methods and procedures for doing their work. (2)	○	○	○	○	○
Team members often produce new services, methods, or procedures. (3)	○	○	○	○	○
This is an innovative team. (4)	○	○	○	○	○

End of Block: Page 2

Start of Block: Page 3

Instruction

Please think about the last 10 months (COVID-19 period) and evaluate the following items.

support Please indicate your views on the following statements:

	Strongly disagree (6)	Disagree (7)	Neither agree nor disagree (8)	Agree (9)	Strongly agree (10)
Team members provide practical support for new ideas and their application. (6)	○	○	○	○	○
Help with the development of new ideas is readily available. (10)	○	○	○	○	○
Team members work together to develop and apply new ideas. (11)	○	○	○	○	○
Team members deliver and share resources to apply new ideas. (12)	○	○	○	○	○

resilience In difficult situations, my team...

	Strongly disagree (1)	Disagree (2)	More or less disagree (3)	Neither agree nor disagree (4)	More or less agree (5)	Agree (6)	Strongly agree (7)
tries to look on the positive side. (1)	○	○	○	○	○	○	○
adapts to changes in a positive way, and becomes stronger when overcome them. (2)	○	○	○	○	○	○	○
gives support to each other. (3)	○	○	○	○	○	○	○
has no fear of uncertainty, we can deal with it well and become strengthened. (4)	○	○	○	○	○	○	○
can work well even in absence of any group member. (5)	○	○	○	○	○	○	○

potency Please indicate your views on the following statements:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (6)	Agree (3)	Strongly agree (4)
This team has confidence in itself. (1)	○	○	○	○	○
This team believes it can become unusually good at producing high-quality work. (2)	○	○	○	○	○
This team expects to be known as a high-performing team. (3)	○	○	○	○	○
This team feels it can solve any problem it encounters. (4)	○	○	○	○	○
This team believes it can be very productive. (5)	○	○	○	○	○

End of Block: Page 3

Start of Block: Page 4

Instruction **Please think about the last 10 months (COVID-19 period) while evaluating the following items:**

orientation Please indicate your views on the following statements:

	Strongly Disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly Agree (5)
We look for opportunities to develop new skills and knowledge. (1)	○	○	○	○	○
We like challenging and difficult assignments that teach new things. (2)	○	○	○	○	○
We are willing to take risks on new ideas in order to find out what works. (3)	○	○	○	○	○
We like to work on things that require a lot of skill and ability. (4)	○	○	○	○	○
We see learning and developing skills as very important. (5)	○	○	○	○	○

outcome In our team...

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
attainment for one team member facilitates goal attainment for others. (1)	○	○	○	○	○
success for one team member implies success for others. (2)	○	○	○	○	○
benefits for one team member do not necessarily involve benefits for others. (3)	○	○	○	○	○
gain for one team member means gain for others. (4)	○	○	○	○	○

participative Please indicate your views on the following statements:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
My manager encourages work group members to express ideas/suggestions. (1)	○	○	○	○	○
My manager listens to my work group's ideas and suggestions. (2)	○	○	○	○	○
My manager uses my work group's suggestions to make decisions that affect us. (3)	○	○	○	○	○
My manager considers my work group's ideas even when he/she disagrees with them. (4)	○	○	○	○	○
My manager makes decisions based only on his/her own ideas. (7)	○	○	○	○	○
My manager gives all work group members a chance to voice their opinions. (8)	○	○	○	○	○

End of Block: Page 4

Start of Block: Page 5

Instruction Please think about the last 10 months (COVID-19 period) while evaluating the items.

goal Please indicate your views on the following statements:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
Team members have clear performance norms, in line with the team objectives. (1)	○	○	○	○	○
Our team formulates clear objectives. (2)	○	○	○	○	○
In our team, team members know what is expected from them. (3)	○	○	○	○	○

diveristy Team members differ in...

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
their way of thinking. (1)	○	○	○	○	○
their knowledge and skills. (2)	○	○	○	○	○
how they view the world. (3)	○	○	○	○	○
their beliefs about what is right or wrong. (4)	○	○	○	○	○

learning Please indicate your views on the following statements:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
Team members learn a lot from each other. (1)	○	○	○	○	○
My team learns from mistakes and errors. (2)	○	○	○	○	○
Team members ask and give each other feedback. (3)	○	○	○	○	○

safety Please indicate your views on the following statements:

	Strongly disagree (1)	Disagree (2)	More or less disagree (3)	Neither agree nor disagree (4)	More or less agree (5)	Agree (6)	Strongly agree (7)
In this team, it is easy to speak up about what is on your mind. (1)	○	○	○	○	○	○	○
If you make a mistake in this team, it is often held against you. (2)	○	○	○	○	○	○	○
People in this team are usually comfortable at talking about problems and disagreements. (3)	○	○	○	○	○	○	○
People in this team are eager to share information about what does and doesn't work. (9)	○	○	○	○	○	○	○

End of Block: Page 5