

**Collective- Creative-Efficacy to Improve New-Product-Development Team Effectiveness  
in Virtual Collaboration during COVID-19**

Samuel T. Hofmann

s4813243

Department of Social Science, Radboud University

M.Sc. Behaviour Change

Master Thesis

University Supervisor: Dr. Ruddy M. P. Faure

Internship Coordinator: Dr. Martijn de Lange

July 15, 2021

### **Abstract**

The COVID-19 pandemic has detrimental effects on a variety of work-related outcomes, particularly on team effectiveness. However, it still remains unclear which psychological processes are responsible for these effects. By means of a newly developed psychological process model, two separate studies were used to identify critical constructs as well as testing an intervention to counteract reduced effectiveness. Using multiple linear regression analysis of questionnaire results of 32 participants, study 1 revealed collective creative efficacy to be the single relevant constant. Contrary to previous research, the other constructs in the model appeared to be non-significant. Study 2 subsequently conducted an online intervention in 79 participants who were recently involved in teamwork. The intervention stimulated one antecedent of collective creative efficacy: perceived cognitive proximity. All participants were instructed to recall a recent teamwork experience, after which they were randomly assigned into either a control or an intervention condition. In the latter one, memories were activated about homogeneity and cognitive diversity in team members, which was hypothesized to increase feelings of proximity. Results of study 2 were non-significant, however, an overall high level of team functioning could be observed. Results and implications are discussed and advice for further research is given.

*Keywords: COVID-19, new product development team, effectiveness, collective creative efficacy*

## **Collective- Creative-Efficacy to Improve New-Product-Development Team Effectiveness in Virtual Collaboration during COVID-19**

With the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) outbreak in late 2019, the world economy experienced a crisis of unprecedented proportions, unseen since WWII (Nicola et al., 2020). As a result, wherever possible, companies introduced home office as the new standard of working in early 2020 (Contreras et al., 2020). Especially business teams, whose workflows were traditionally characterised by face-to-face collaboration, were severely constrained by this workaround (Nicola et al., 2020). That is because the precipitate introduction of computer-mediated communication without an essential transition phase and an accompanied organisational change decisively restricts team effectiveness (e.g. Barrett, 2002; Rudolph et al., 2020; Vial, 2019). In particular, ensuring the effectiveness of innovation teams (referred to as New Product Development or NPD teams) is crucial because such teams are a critical driver of successful companies in fast-paced and highly competitive markets (Akgün et al., 2010; Brown et al., 1995). While a rushed introduction of home office and accompanied workflow adjustments have been linked to reduced team effectiveness, the impact of the COVID-19 pandemic on NPD team effectiveness remains unclear (Luzniak-Piecha & Bobrowska, 2021).

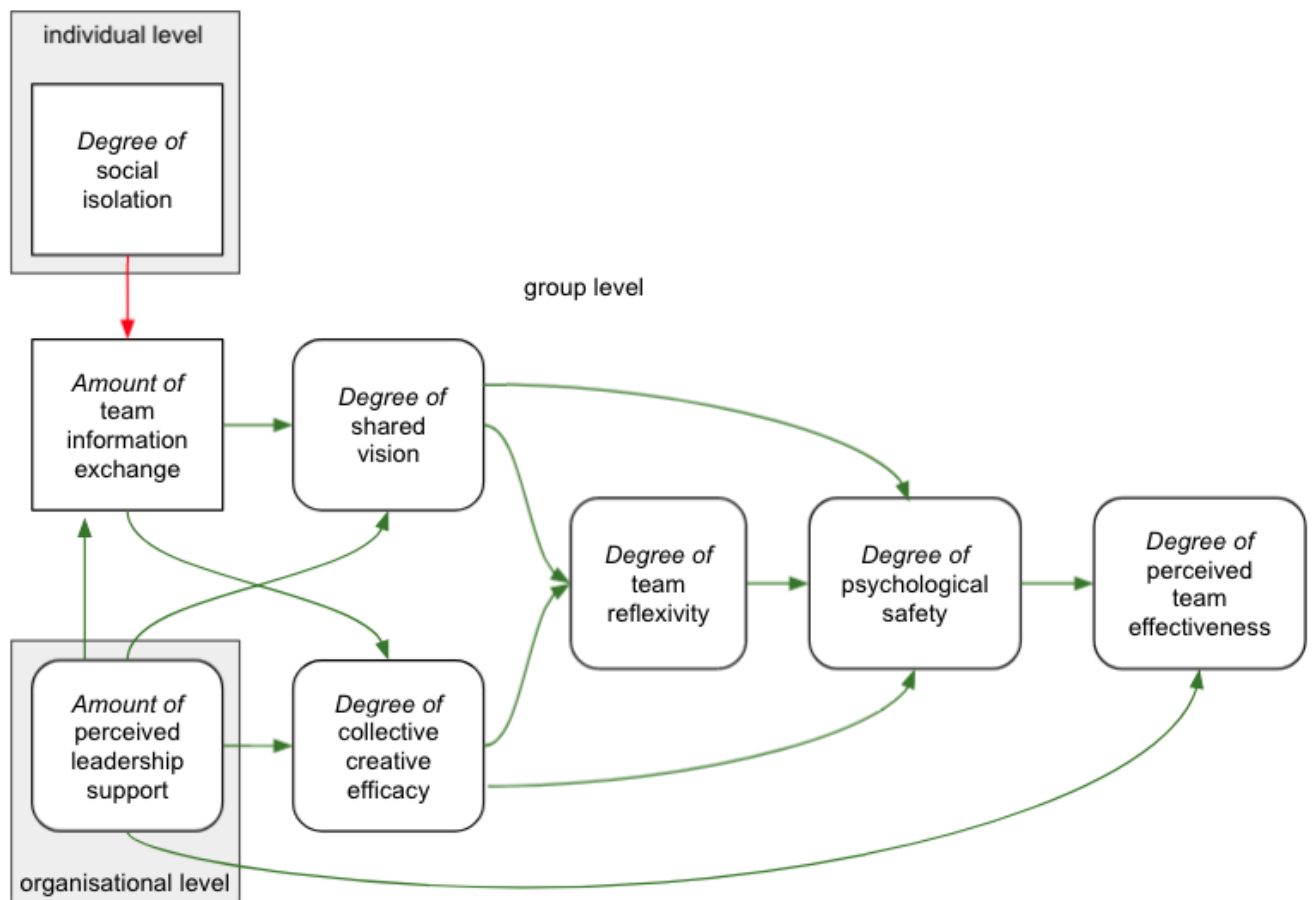
Particularly COVID-19 related digital transformation appears to be problematic, because a clear understanding of how to successfully implement a digital transformation in companies is still lacking (Vial, 2019). Digital transformation is defined as “a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies” (Vial, 2019, p.118). For the daily work of an NPD team, digital transformation essentially means a transformation of communication to be computer-mediated and the possibility to work remotely (Contreras et al., 2020). Spatial distribution hereby leads to drastic changes in

the nature and shape of team interaction (cf. Boos et al., 2017; Gilson et al., 2015), in a way that interlocutors lack situational cues (i.e. body language; Halbe, 2011), communication decelerates (Cramton & Orvis, 2003), and misunderstandings occur (van der Klij et al., 2009). Consequently, the entire workflow of an NPD team is constrained, resulting in reduced effectiveness (Handke & Kauffeld, 2019).

A variety of models have been developed to predict team effectiveness. One of the most recent and considerable contributions was conducted by Ficapal-Cusí et al. (2021). Their multilevel model forms the basis for the present process model, the *team effectiveness in virtual collaboration* (TEVIC) model. The TEVIC model elucidates critical factors for the effectiveness of NPD teams that underwent a digital transformation due to the COVID-19 pandemic.

### **TEVIC model**

The seven factors influencing team effectiveness in the TEVIC model are outlined according to their hierarchical structure and can be further subdivided into an individual, a team, and an organisational level (see Figure 1). In the literature, several ways of measuring NPD team effectiveness have been used (e.g. Breschi & Lenzi, 2016; Ter Wal & Boschma, 2009), one of which is the effectiveness from a team members' perspective (Ficapal-Cusí et al. (2021). The present paper adopts this approach, and hence refers to a team member's perceived team effectiveness (PTE).

**Figure 1***TEVIC model*

*Note.*

The two rectangular factors were added to the original model by Ficapal-Cusí et al. (2021).

Green arrows indicate a positive and red a negative relationship.

Primarily, it is the effects of social isolation that influence PTE at the individual level (McEwen, 2020). It is mainly the social support that helps humans deal with distress in adverse times (Anderzén & Arnetz, 1997). This opportunity for support from private relationships, colleagues and team leaders is lost when practising social isolation for protection against the SARS-CoV-2 virus (Golden et al., 2008). Hence, the body fails to maintain needed homeostasis and distress remains (Marks, 2018). This distress negatively

affects one's communicative skills and directly reduces the information exchange between members at the team level (Rasmussen & Jeppsen, 2006).

A reduction in team information exchange is particularly severe because it affects all those team processes that ultimately affect PTE. The degree of team information exchange describes the frequency, accuracy, and richness of information exchange within a team (Hambrick, 1994). Thus, team information exchange lies at the core of an innovative team's workflow (Thayer et al., 2018). A workflow, dependent on high-quality communication enables the team members to collaboratively develop ideas, to build on and refine concepts upon each other, and to adapt to changing situations (Liu et al., 2015). High-quality team information exchange as such enables the emergence of shared team vision and a shared sense of self-efficacy within the team members, at the next hierarchical level of the TEVIC model (Thayer et al., 2018).

Not only team information exchange, but also perceived leadership support positively influences the degree of shared vision and a shared sense of self-efficacy, from the organizational level onto the team level which describes the dynamics between the members). Furthermore, leadership directly positively influences team information exchange and PTE (cf. D'Innocenzo et al., 2016; Oah et al., 2018). Indirectly, leadership facilitates the development of shared cognitive states (Zaccaro et al., 2001), which helps the team feel connected and facilitate the emergence of shared mental models (Ayoko & Chua, 2014). These models are prerequisites for the team to communicate and share information effectively, as leadership support influences the degree of team information exchange (Mohammed et al., 2010). Moreover, leadership support facilitates the degree of a shared vision by creating and communicating a vision and hence a long-term perspective to the team (Bass, 1985). Further, leadership empowers team member's actions which increases a sense of self-efficacy (Lowe et al., 1996). By further highlighting the importance of cooperation, a

shared sense of self-efficacy is created (Bandura, 1997; Jung & Sosik, 2002). While these effects of leadership have been repeatedly demonstrated in traditional face-to-face workflows, it still remains unclear how such leadership behaviour affects teams in a virtual environment (Contreras et al., 2020).

Influenced by team information exchange and perceived leadership support, a shared team vision and a shared sense of self-efficacy in a creative team are crucial for developing the teams' ability to reflect (Widmer et al., 2009). A shared sense of self-efficacy in the creative context is referred to as collective creative efficacy (CCE). Initially mentioned by Bandura (social cognitive theory, 1997), CCE is the interplay of an individual's belief to possess the creative capabilities needed to succeed in a given task and the belief that individual contributions are coordinated so that the team as a whole reaches its goals (Bandura, 2007; Liu et al., 2015). A vision is "an idea of a valued outcome, a higher-order goal, which is a motivating force for a workgroup" (West, 1990, p. 310). A shared vision in this context increases the possibility that team members will collectively move closer to this goal (Hülshager et al., 2009) because a shared vision helps identify deviations and initiate reflection (DeShon et al., 2004). This recognition and initiation are reinforced by CCE (Bandura, 2007), as it strengthens team cohesion (Shamir et al., 1993) and trust (Schippers, 2003), which ultimately promotes team reflection (Widmer et al., 2009).

Turning toward the following hierarchical levels of the TEVIC model, West (2000) defines team reflexivity regarding team effectiveness as members collectively „reflect upon their objectives, strategies, processes, and wider environments, plan to adapt these aspects of their task functional worlds and make changes accordingly, [the] team will be more effective“ (West, 2000, p. 151). Team reflexivity is an essential antecedent for the ability to effectively resolve team conflicts (Widmer et al., 2009), to adapt to changing situations and tasks, for team innovation (Schippers et al., 2012), and effective teamwork (Salas et al., 2005). That is

because team reflection enables further reflection, which positively affects various team processes (Paulus & Yang, 2000). This reflection helps the team exchange ideas and suggestions, build on each other's concepts, and become clear about the current situation and the direction to take in the future (Schippers et al., 2012). Consequently, among others, a healthy team climate is created where members can open up and feel safe to take risks.

A safe team environment offers psychological safety, which is “a shared belief that the team’s members are safe for interpersonal risk-taking” (Edmondson, 1999, p. 354). This safety stimulates creativity and innovation and leads to higher team performance, making the team more effective (Sanner & Bunderson, 2015). That is because this safe environment promotes experiential learning. Learning which requires a non-judgmental environment where ideas and suggestions can be expressed, divergent views can be discussed, and mistakes are not a problem (Edmondson et al., 2007). Psychological safety is one of the essential concepts in the team performance literature (cf. Gladstein, 1984; Tushman, 1985) and has been particularly important for complex, creative, and innovative tasks (Vashdi et al., 2013). These tasks require a high level of social interactions and collective problem solving, such as in the context of an NPD team (Baer et al., 2003). Although there is a clear positive relationship between psychological safety and team effectiveness, the strength of the relationship varies widely (e.g. Schaubroeck et al., 2011; Stewart & Barrick, 2000). That is because possible moderators are primarily ignored (Sanner & Bunderson, 2015).

Upon elucidating on each construct of the TEVIC model, the objective of this paper was twofold. While study 1 aimed at identifying the most critical constructs in the model, based on these findings, study 2 developed and tested an intervention to increase PTE.

## **Study 1**

Study 1 examined which factors of the TEVIC model contribute most strongly to PTE in a sample of NPD teams during COVID-19 constrained teamwork. It was hypothesised that (1) the degree of social isolation correlates negatively with the amount of team information exchange, (2) team information exchange complements the model in such that it correlates positively with a shared vision and CCE, and (3) all TEVIC model factors together explain the largest proportion in the variance of PTE.

## **Method**

### **Participants**

A short YouTube video (Appendix B), entailing a link to study 1 in its description, was created to encourage participation. The video was distributed to employees of an automotive research innovation campus in Germany via intranet posts, email distribution lists, Whatsapp groups, direct messaging, and posters (Appendix C). As a reward, there was a raffle<sup>1</sup> to win one of three bars of fair-trade chocolate bars. Data collection occurred between April 21 and May 5, 2021<sup>2</sup>. A priori power analysis (G\*Power, version 3.1, Faul et al., 2007) with a medium effect size of .25 (according to Cohen, 1992), alpha .05, and a power of .8 indicated a minimum of 51 participants. Due to COVID-19-related restrictions and the small number of employees working at the innovation campus, only 32 of 41 participants who started the survey could be used for analyses. See Table 1 for participant characteristics.

---

<sup>1</sup> Email addresses for the raffle were collected in a separate survey guaranteeing no connection to previous answers given in the main survey.

<sup>2</sup> Prior to data collection a data management protocol was established and the study ensured to be in line with the General Data Protection Regulation of the European Union and the ethical principle of the UCLA Centre for Behaviour Change.

**Table 1***Subject Characteristics*

Age range (in years)	$M_{age}$	$SD_{age}$	Women	Men
21-25			0	7
26-30			5	5
31-40			3	7
41-50			0	3
51-60			0	2
Total	3.47 <sup>1</sup>	1.14 <sup>1</sup>	8	24

*Note.* <sup>1</sup> = numbers correspond to age range-scale (e.g. 2 = 21-25 years of age), see Appendix D.

**Materials**

An online survey conducted using Qualtrics (<https://www.qualtrics.com>)<sup>3</sup>. Next to a progress bar, six encouraging statements motivated further participation (Appendix D). The entire survey was pre-tested (Whittingham et al., 2008). See Appendix A for detailed scale description.

**Social isolation.** The short version (ULS-8) of the UCLA Loneliness Scale (ULS-20) (Hays & DiMatteo, 1987) was used ( $\alpha = .77$ ).

**Team information exchange.** The Teamwork Quality scale (TWQ; Hoegl et al., 2001) was used ( $\alpha = .75$ ).

**Perceived leadership support.** Three items by Ficapal-Cusí et al. (2021) were used ( $\alpha = .83$ ).

---

<sup>3</sup> For first insights, 23 semi-structured interviews were conducted and analyzed using MAXQDA (<https://www.maxqda.com>) (Smith, 2002). Results were used to develop the TEVIC model.

**Shared vision.** The German version (Brodbeck & Maier, 2001) of the validated short version (Strating & Nieboer, 2009) of the Team Climate Inventory (TCI; Anderson & West, 1998) were used ( $\alpha = .64$ ).

**Creative collective efficacy.** Five items from the German version (Brodbeck & Maier, 2001) of the TCI (Anderson & West, 1998) were used ( $\alpha = .82$ ).

**Social reflexivity.** The Team Reflexivity Inventory (TRI; Carter & West, 1998) was used ( $\alpha = .77$ ).

**Psychological safety.** Four items from the German version (Brodbeck & Maier, 2001) of the short version of the TCI (Anderson & West, 1998) were used ( $\alpha = .70$ ).

**Perceived team effectiveness.** Five items by Ficapal-Cusí et al. (2021) were used ( $\alpha = .80$ ).

**Work situation.** The number of times employees worked on-site at the campus before and after the SARS-CoV-2 pandemic outbreak was assessed by one question each.

## **Procedure**

Entering the survey, participants first saw a welcome page, privacy information, and were required to provide informed consent. Next, the questionnaire assessed each construct of the TEVIC model, followed by two questions about participants' working situation and demographics. Finally, participants were thanked, debriefed, given the possibility to contact the researchers and participate in the raffle (Appendix D). Participation took on average nine minutes.

## **Data Analysis**

Data of this exploratory quantitative cross-sectional survey design was collected anonymously and raw data cleaned and processed using SPSS Statistics (version 27)<sup>4</sup>. Thirty-two participants could be used for analyses. First, (partial) correlations were used to explore the relationship between the constructs of the TEVIC model, followed by a series of hierarchical multiple linear regression (MLR) models that tested the role of each predictor (and levels) of the TEVIC model in explaining PTE. In a first MLR model, only social isolation was entered as an independent variable. In a second model, team information exchange and perceived leadership support were added as independent variables. Shared vision and CCE were added in a third model, whereas in a fourth model, team reflexivity was added. Psychological safety was added as the independent variable in a fifth model. PTE remained the dependent variable.

## Results and Discussion

After the outbreak of SARS-CoV-2, thirty-eight per cent of participants worked less than one day per week on-site at the innovation campus ( $M_{day} = 2.44$ ,  $SD_{day} = 1.52$ ), compared to 22% who did so before ( $M_{day} = 3.34$ ,  $SD_{day} = 1.87$ ). See Table 2 for detailed results.

Thus, even before the outbreak of the COVID-19 pandemic, it was not uncommon for employees to work remotely, at least part-time. The pandemic has further strengthened this trend. The ability to work remotely is generally observed in NPD teams (Pérea & Zedtwitz, 2018) and the trend of remote work to be amplified by the COVID-19 pandemic (e.g. Lopez-Leon et al., 2020).

---

<sup>4</sup> Data was cleaned based on missing cases (no outliers were detected) and prepared by re-coding, combining scales into total scores, and calculating the reliability.

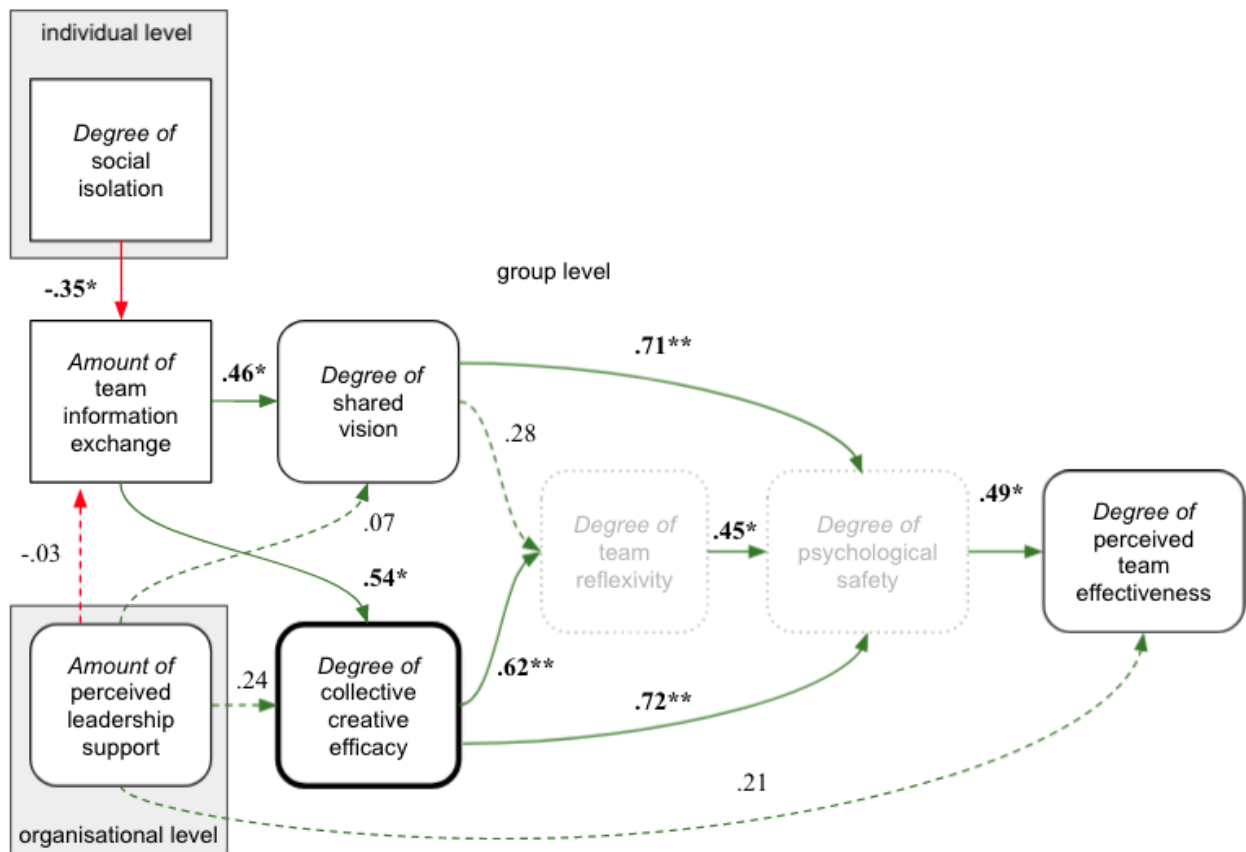
Correlating the constructs as elucidated in the TEVIC model, most correlations were significant. See Figure 2 for all correlations and Pearson Correlations between factors.

**Table 2**

*Onside Working Behaviour*

Frequency	before COVID-19 outbreak	after COVID-19 outbreak
>1 day	7	12
1 day	6	7
2 days	5	5
3 days	4	5
4 days	3	1
fulltime	7	2

Since social isolation significantly negatively influenced team information exchange and team information exchange significantly positively influenced shared vision and CCE, hypotheses one and two could be confirmed. Thus, the findings are consistent with previous research (McEwen, 2020; Thayer et al., 2018). However, the non-significant correlations between leadership support and PTE (Oah et al., 2018), shared vision (Bass, 1985), and CCE (Lowe et al., 1996) is contrary to previous research. Moreover, the negative relationship between leadership support and team information exchange contrasts with previous research demonstrating a clear positive correlation between these two constructs (Mohammed et al., 2010).

**Figure 2***Adjusted TEVIC model**Note.*

Numbers show Pearson Correlations with bold lettering indicating significance. Dashed arrows indicate non-significance. Green arrows indicate a positive and red a negative relationship. The bold framed variable is the only significant factor of the MLR of study one.

Gray framed variables are excluded in the adjusted model.

For statistical significant effects: \* for  $p < .05$ ; \*\* for  $p < .000$

Following, three standard multiple linear regression (MLR) analyses were performed to estimate the proportion of variance in PTE explained by social isolation, team information exchange, perceived leadership support, shared vision, CCE, team reflexivity, and psychological safety. Several assumptions were evaluated in advance. First, stem-and-leaf

plots and boxplots indicated each variable in the regression analyses was normally distributed and free of univariate outliers. Second, inspecting the normal probability plot of standardised residuals and the scatterplot of standardised residuals against standardised predicted values indicated that the assumptions of normality, linearity, and homoscedasticity of residuals were met. Finally, Mahalanobis distance did not exceed the critical  $\chi^2$  for  $df = 6$  (at  $\alpha = .001$ ) for any cases in the data file, indicating that multivariate outliers were not of concern.

Results indicated that model one explained a significant proportion of the variance in perceived team effectiveness. Model comparison also revealed that model two explained significantly more variance than model one and model three explained significantly more variance than model two. Model four, however, did not explain significantly more variance than model three, just as well as model five did not explain significantly more variance than model four (for model comparisons see Table 3). These results indicate model three explained the largest proportion of the explained variance of PTE in the present sample. In model three, CCE appeared to be the only significant factor. Table 4 reports the effects of each construct in model three.

**Table 3**

*Model Summary*

Model	R Square	Change Statistics			
		F Change	df1	df2	Sig. F Change
1 <sup>a</sup>	.148	5.195	1	30	.030
2 <sup>b</sup>	.393	5.668	2	28	.009
3 <sup>c</sup>	.632	8.459	2	26	.001
4 <sup>d</sup>	.672	2.997	1	25	.096
5 <sup>e</sup>	.688	1.271	1	24	.271

Note. <sup>a</sup> = Predictors: social isolation.

<sup>b</sup> = Predictors: social isolation, team information exchange, perceived leadership support.

<sup>c</sup> = Predictors: social isolation, team information exchange, perceived leadership support, shared vision, CCE.

<sup>d</sup> = Predictors: social isolation, team information exchange, perceived leadership support, shared vision, CCE, team reflexivity.

<sup>e</sup> = Predictors: social isolation, team information exchange, perceived leadership support, shared vision, CCE, team reflexivity, psychological safety.

Although model three explained the largest proportion of PTE, model five held the most comprehensive insights of the TEVIC model, because it controlled for the effect of each covariate on the effects on PTE. In model five, no significant effect of social isolation ( $p = .372$ ), team information exchange ( $p = .550$ ), perceived leadership support ( $p = .565$ ), shared vision ( $p = .452$ ), team reflexivity ( $p = .091$ ), and psychological safety ( $p = .271$ ) could be found. Controlling for all other factors, only CCE (Beta = 0.62,  $B = 0.53$ , SE = 0.17, 95% CI [0.18, 0.89],  $p < .005$ ) had a significant positive effect on PTE. Hence, higher CCE was significantly correlated with higher levels in PTE.

Further, two additional MLR analyses were conducted. One held psychological safety and one team reflexivity as a dependent variable. Covariates were again loaded hierarchically and results confirmed the first MLR by revealing CCE to be the only significant predictor of PTE.

**Table 4***Regression Table of Model Three*

Construct	<i>B</i>	$\beta$	<i>t</i>	<i>p</i>
Social Isolation	-.23	-.25	-1.76	.091
Team Information Exchange	.18	.15	.99	.333
Leadership Support	.05	.06	.48	.636
Shared Vision	-.05	-.04	-.28	.782
CCE	.54	.13	4.07	.000

*Note.* Dependent variable: PTE.

Concluding, results of study 1 reveal only one part of the TEVIC model (excluding team reflexivity and psychological safety) explain the largest proportion in PTE.

Consequently, hypothesis three must be rejected. These findings are inconsistent with previous research indicating both factors to be decisive for NPD team effectiveness (Gladstein, 1984; Widmer et al., 2009). Nevertheless, the goal of study 1 to identify critical factors to PTE was achieved. CCE appears to be vital for PTE in NPD teams and provides a reasonable basis for the focus of study 2.

## Study 2

Findings of study 1 indicate that collective creative efficacy explains a significant proportion in the variance in perceived team effectiveness. This aligns with previous research showing that CCE is decisive for PTE in NPD teams (Dampérat et al., 2016). However, most studies targeting CCE in the creative context focused only on self-efficacy as an antecedent of CCE. The second antecedent, perceived cognitive proximity (PCP), has largely been

ignored (Cheng & Yang, 2014). Based on findings from study 1 and a lack of research on perceived cognitive proximity as an antecedent of CCE in the context of virtual NPD teams effectiveness, study 2 aimed to stimulate PCP to increase CCE feelings and hence perceived team effectiveness.

As outlined in study 1, CCE evolves from the interplay of individual efficacy beliefs in a creative context and PCP stimulated by social interaction and feelings of connectedness (Bandura, 1977). PCP in the organisational context refers to feelings of psychological closeness (vs. distance) to other team members (Hubert, 2012). This feeling of closeness is rather cognitive than behavioural (Wilson et al., 2008). That is, two team members may feel close despite no physical contact with each other (e.g. virtual collaborating teams), while other members who regularly work together physically might feel distant from each other (e.g. due to a lack of communication). An intervention aiming to stimulate CCE may target creative efficacy, PCP, or both antecedents.

However, the COVID-19 pandemic required the present intervention to focus on PCP. These effects of the pandemic regarding restricted collaboration influence both antecedents of CCE, but PCP more severely. For self-efficacy, some studies indicate improvements during remote work (e.g., Grant et al., 2013, Madsen, 2011), while others highlight constraints (Contreras et al., 2020; Rudolph et al., 2020). However, the situation is different for PCP, however. Although team members may still feel close during physical isolation (Wilson et al., 2008), COVID-19-related distress and general distress is related to a reduction in communication skills, which are essential for developing feelings of proximity (Matias et al., 2020). PCP may consequently be severely restricted during the pandemic. Study 2 therefore, focused on stimulating PCP to target CCE.

PCP may be stimulated in two ways. Through homogeneity and through heterogeneity, both of which were targeted in the present intervention. Focusing first on

homogeneity, according to the homophily principle (McPherson et al., 2001) and Social Identity Theory (Tajfel, 1982), similarities foster proximity feelings and contact between people (Siebdrat et al., 2014; Van Dick et al., 2005). Particularly deep-level similarities (non-visible characteristics like values or attitudes) influence team functioning, innovation, and effectiveness (Tekleab & Quigley, 2014; van Emmerik & Brenninkmeijer, 2009). In this regard, sharing experiences (McPherson et al., 2001), educational background (Marsden, 1987), and work related values (Dose & Klimoski, 1999) have been associated with strengthening the relationships between members. In the organisational context, deep-level similarities incline team members to spend more time together, providing more opportunities to find even more similarities. These similarities connect people, facilitate collaboration, and eventually increase team effectiveness (Peeters et al., 2006). However, homogeneity is only one side of effective teamwork and PCP.

On the other side, there are inevitable differences and diversity in the characteristics of team members, referred to as heterogeneity (Chen et al., 2004). There is a great deal of inconsistency in the literature regarding deep-level heterogeneity (Mathieu et al., 2008). Studies found positive, negative, and no effects for the relationship between deep-level heterogeneity and team effectiveness (see Bell, 2007, for a meta-analysis). For instance, personality traits have been linked to decreased and increased team effectiveness (Mohammed & Angell, 2004). Despite this lack of understanding of the effects of deep-level heterogeneity, cognitively diverse team members (which differ in abilities, knowledge, and skills; forms of deep-level heterogeneity) have been consistently linked to team creativity (Bechtoldt et al., 2007) and effectiveness (Batenburg et al., 2013). This is in line with Belbin's (1993) conceptualisation of complementary group roles being crucial for effective teamwork, particularly in NPD teams (Salas et al., 2005). Hence, it can be assumed that cognitively diverse team members improve NPD team effectiveness (Bechtoldt et al., 2007).

From this follows hypothesis 1 which stated that stimulating perceived cognitive proximity increases feelings of collective creative efficacy and hypothesis 2 which stated homophily and cognitive diversity jointly foster the development of perceived cognitive proximity.

Moreover, team tenure and size are strong determinants of PCP, thus influencing hypothesis 2. The longer a team works together and the smaller a team is, the more opportunities arise to form a coherent unit to develop a shared mental model (Jackson et al., 1993). These shared models lead to more opportunities to experience homogeneity (van Emmerik & Brenninkmeijer, 2009) and cognitive diversity (Finkelstein & Hambrick, 1990). From this follows hypothesis 3 which stated that the effect of homogeneity and cognitive diversity is mediated (a) positively by team tenure and (b) negatively by team size.

Hence, the present intervention aimed at fostering CCE by targeting perceived cognitive proximity with a stimulation of deep level similarities and complementary differences in NPD teams. Due to COVID-19 restrictions, only a theoretical approach was feasible. While all participants were instructed to recall a recent teamwork experience, the experimental condition evoked deep-level memories of homogeneity and cognitive diversity of the participants' team members, additionally.

## **Methods**

### **Participants**

Using convenience sampling, a short YouTube video (Appendix E), entailing a link to study 2 in its description, was created to encourage participation. During the last two months, anyone who worked in a team was eligible to participate (knockout criteria). No compensation was given, instead, 1€ per participant was donated to a children's home in

central Germany. Data were collected between June 2 and June 20, 2021<sup>5</sup>. Of the 167 participants who started the study, only 79 had a teamwork experience in the last two months (Table 5). No missing data was detected. A priori power analysis (G\*Power, version 3.1, Faul et al., 2007) with a medium effect size of .25 (according to Cohen, 1992), alpha .05, and a power of .8 yielded a minimum of 128 participants.

**Table 5**

*Subject Characteristics per Condition*

Condition	<i>n</i>	<i>M<sub>age</sub></i>	<i>SD<sub>age</sub></i>	Women	Men	Preferred not to say
Experimental	32	25.47	5.19	18	14	0
Control	47	28.13	10.16	24	22	1
Total	79	27.05	8.56	42	36	1

**Materials**

A stimulation of recalling a recent teamwork experience was done by sentences like “*What does it look like around you? ... Now let this picture develop in your head. Give yourself a few minutes for this. Take your time.*” (Kiesler, 2002) (see Appendix F for details).

***Intervention***

---

<sup>5</sup> Prior to data collection a data management protocol was established and the study ensured to be in line with the General Data Protection Regulation of the European Union and the ethical principle of the UCLA Centre for Behaviour Change. Additionally, this study was pre-registered on the Open Science Framework (see <https://osf.io/swc5a>).

**Homogeneity.** Participants were instructed to recall deep-level similarities they share with their team regarding situations they had mastered together, shared personal backgrounds (education), and shared work-related values. To strengthen these memories (Craig, 1970) and to ensure compliance, participants had to think of two similarities and write them down. Generating a few, rather than many memories, has been associated to foster recall and memory (Winke et al., 1996).

**Cognitive diversity.** Participants were told that although some see differences among team members as weaknesses, complementary differences are essential for good teamwork. Consequently, participants had to identify two differences (Winke et al., 1996) between themselves and other team members and think about how these could be combined to strengthen the team (Bechtoldt et al., 2007). In turn, these two thoughts again had to be written down (Craig, 1970).

### ***Post measurements***

All post-measurement scales were assessed on a five-point Likert scale from "Do not agree at all" (1) to "fully agree" (5). The following sentence was added to each scale: "*Still having your team in mind, imagine you would have to work with them now. How would you answer the following questions?*" (Berscheid et al., 1989).

**Perceived cognitive proximity.** PCP cannot be measured as a construct itself, but is best quantified by the quality of *communication* and the level of *team identification* (Zamani & Pouloudi, 2021). For this purpose, the communication scale of study 1 was used and slightly adapted<sup>6</sup> ( $\alpha = .60$ ; see Appendix F). Team identification was assessed with four items by Doosje et al. (1995) adapted by Van Dick et al. (2005) ( $\alpha = .81$ ). An example item was "*I would identify with the other team members*".

---

<sup>6</sup> The tense was adjusted to the future.

**Collective creative efficacy and perceived team effectiveness.** See study 1 for a description of the scales of CCE ( $\alpha = .82$ ) and PTE ( $\alpha = .82$ ) (see Footnote 6).

**Covariates.** To control for team tenure, participants were asked: “*How often have you worked together with the team which you were thinking about?*”. Answers were given on a five-point Likert scale from “only one time” (1) to “very frequently” (5). Team size was assessed by asking: “*How many members does the team have you were thinking about, including yourself?*” Participants filled in a number.

## **Procedure**

The study was designed using Qualtrics (<https://www.qualtrics.com>) and pre-tested on five participants (Whittingham et al., 2008). Next to a progress bar, four encouraging statements motivated participation throughout the survey (Appendix F).

Entering the survey, all participants first faced a welcome page including the knockout question, were required to complete a consent form, and were guided to vividly imagine a recent teamwork experience. This was followed by a random assignment to either the control or the experimental condition. In the control condition, participants only had to write down two memories of what they just thought of about teamwork. In the experimental condition, participants were further instructed to recall two deep-level homogeneities of their team and complementary differences from their team. Participants also had to write down their thoughts. Moreover, these notes served as manipulation checks. Afterwards, all participants scored on PCP, CCE, PTE, indicated team tenure and size, age, and gender. Finally, participants were thanked, debriefed, and given the possibility to leave a comment and contact the researchers. Participation took approximately 12 minutes.

## **Data analysis**

Data of this post-test between-subjects design was collected anonymously and raw data cleaned and processed using SPSS Statistics (version 27)<sup>7</sup>. Seventy-nine participants could be used for analyses. For parametric testing, a multivariate analysis of covariates (MANCOVA) was conducted with PCP, CCE, and PTE as dependent variables (continuous, range: 1-5), group (categorical, control/experimental) as a fixed factor, and team size (continuous, range: 2-30) and team tenure (continuous, range: only once to very frequently) as covariates. For non-parametric testing moreover, three Wilcoxon-Mann-Whitney tests were performed.

### **Results and Discussion**

Before conducting the MANCOVA, assumptions were checked. Examination of the Shapiro-Wilk statistics and histograms for each dependent variable indicated that the MANCOVA assumption of normality was violated. Scatterplots showed that the relationship between the covariates and the dependent variables was linear. Finally, the assumptions of homogeneity of regression slopes and homogeneity of variance were supported by the absence of a significant condition-to-covariates interaction,  $F(6, 142) = 13.74, p = .147$ , and a non-significant Levene's test for PCP,  $F(1, 77) = .11, p = .741$ , for CCE,  $F(1, 77) = .04, p = .840$ , and for PTE,  $F(1, 77) = .11, p = .040$ , respectively. Because a MANCOVA is reasonably robust to violations of its assumptions, particularly of their normal distribution, it

---

<sup>7</sup> Data was cleaned based on missing cases, the knockout criteria, the manipulation check, and outliers. Preparing the data entailed re-coding, combining scales into total scores, and calculating the reliability.

was decided to continue conducting this parametric test, instead of a non-parametric test (Norman, 2010)<sup>8</sup>.

The MANCOVA showed no significant effects of group (Wilks'  $F(3, 73) = 1.23, p = .304$ ), and of the covariates team size (Wilks'  $F(3, 73) = .87, p = .462$ ), and team tenure (Wilks'  $F(3, 73) = 2.04, p = .116$ ). See Table 6 for descriptive statistics, Table 7 for univariate follow-up tests, and Table 8 for correlations between variables.

---

<sup>8</sup> Three non-parametric tests confirmed the results of the MANCOVA. See Appendix G for detailed statistics.

**Table 6***Descriptive Statistics*

variables	condition	<i>M</i>	<i>SD</i>	1	2	3
1 PCP <sup>1</sup>	contr.	3.69	.57			
	exp.	3.84	.50			
	total	3.76	.55			
2 CCE <sup>2</sup>	contr.	3.69	.76			
	exp.	3.78	.68			
	total	3.72	.73	.643*		
3 PTE <sup>3</sup>	contr.	3.52	.75			
	exp.	3.75	.56			
	total	3.61	.69	.465*	.648*	
team tenure		4.43 <sup>6</sup>	1.31 <sup>6</sup>	.169	.056	.167
team size		7.71	5.92	.015	.132	.034

*Note.* <sup>1</sup> = Perceived cognitive proximity; <sup>2</sup> = Collective creative efficacy; <sup>3</sup> = Perceived team effectiveness; <sup>4</sup> = number corresponds to scale (e.g. 4 = very frequently).

\* = correlation is significant at  $p < .001$ .

The MANVOCA results are in contrast to previous studies. The present manipulation was expected to work because it was based upon emphasising homogeneity (Tekleab & Quigley, 2014) and cognitive diversity (Bechtoldt et al., 2007), which have been shown to stimulate effective teamwork by increasing feelings of cognitive proximity. Moreover, the non-effects of team tenure and size are unexpected. Research suggests these two covariates to be essential to control for the effects of heterogeneity on PCP (van Emmerik & Brenninkmeijer, 2009) and team effectiveness (Jackson et al., 1993).

**Table 7***Univariate Results MANCOVA*

IV <sup>1</sup>	DV <sup>2</sup>	Mean Square	F	Sig.	partial $\eta^2$
team size	PCP <sup>3</sup>	.00	.03	.874	.00
	CCE <sup>4</sup>	.88	1.63	.205	.02
	PTE <sup>5</sup>	.78	.17	.681	.00
team tenure	PCP <sup>3</sup>	.72	2.46	.121	.03
	CCE <sup>4</sup>	.05	.10	.763	.00
	PTE <sup>5</sup>	1.1	2.37	.128	.03
group	PCP <sup>3</sup>	.53	1.80	.184	.02
	CCE <sup>4</sup>	.45	.84	.362	.01
	PTE <sup>5</sup>	1.30	2.84	.096	.04

*Note.* <sup>1</sup> = Independent variable; <sup>2</sup> = Dependent variable; <sup>3</sup> = Perceived cognitive proximity; <sup>4</sup> = Collective creative efficacy; <sup>5</sup> = Perceived team effectiveness.

**Table 8***Correlations*

covariates	statistics	PCP <sup>1</sup>	CCE <sup>2</sup>	PTE <sup>3</sup>
team tenure	$r^3$	.20	.06	.17
	$p^4$	.136	.624	.141
team size	$r^3$	.02	.13	.03
	$p^4$	.895	.245	.768

*Note.* <sup>1</sup> Perceived cognitive proximity; <sup>2</sup> Collective creative efficacy; <sup>3</sup> Perceived team effectiveness; <sup>4</sup> Pearson's Correlation with  $df = 77$ ; <sup>5</sup>  $p$ -value.

## General discussion

Two studies were conducted in the present paper. Study 1 developed the TEVIC model to identify decisive factors in NPD team effectiveness during the SARS-CoV-2 pandemic. Consistent with previous research, collective creative efficacy was significant. While all other factors were non-significant, team reflexivity and psychological safety yielded no statistical significance and had to be excluded in the final model. Based on CCE, study 2 tested an intervention to stimulate team effectiveness - due to pandemic related restrictions, hypothetically online. Perceived cognitive proximity (as an antecedent of CCE) was stimulated by increasing team members' homogeneity and cognitive diversity memories. In contrast to previous research, results revealed no significant effects.

In study 1, CCE appears to be a constant significant factor in explaining the variance of PTE. This is in line with literature demonstrating that CCE is a key variable in predicting team creativity (Lui et al., 2015) and team effectiveness in various teamwork domains (Stajkovic et al., 2009). According to Social Learning Theory, self-efficacy, or believing in oneself, is crucial for team members' performance and emotional reactions (Bandura, 1997; Pajares, 1997). When an individual's performance can contribute to a group and lead to success in cooperation with others, CCE emerges, positively influencing PTE. This effect was demonstrated in study 1 in a positive correlation between CCE and PTE.

In contrast to previous research, no other factor in the TEVIC model was significant (Ficapal-Cusí et al., 2021). Accordingly, social isolation was included in the model as the most critical effect of the COVID-19 pandemic on team effectiveness. Social isolation hinders social support, essential for coping with distress during adverse times like a pandemic (Anderzén & Arnetz, 1997). Distress reduces communication capabilities (Rasmussen & Jeppsen, 2006), reducing team information exchange and knowledge transfer (Eppler, 2007). This effect could not be demonstrated in the present study.

It could be that although social isolation causes reduced information exchange, the pandemic restrictions may also have had positive effects on team effectiveness. That is because social isolation during COVID-19 in NPD teams means working remotely. Remote work has been associated with various effects on team effectiveness. Team distribution, for example, can lead to coordination difficulties (Painter et al., 2016), resulting in communication deficiencies (Espinosa et al., 2017), and deficiencies in shared vision (Gray et al., 2015) and CCE (Verburg et al., 2013). This is especially critical when teams work creatively, which requires extensive team information exchange (Gassmann & von Zedtwitz, 2003). However, a team can also benefit from the advantages of remote work, supported by effective leadership (Grant et al., 2013). With remote work also comes higher job flexibility, lower stress levels to coordinate job and personal life (Madsen, 2011), and hence higher job satisfaction (Wheatley, 12), involvement (Kossek et al., 2006) and productivity (Noonan & Glass, 2012). This leads to increased communication (Sullivan & Lewis, 2001). Thus, it could be that the positive effects of remote work offset the adverse effects of social isolation on team information exchange (Baruch, 2000).

The non-significance of the other factors could also be attributed to the COVID-19 pandemic. It is difficult to grasp the multifactorial impact of the lockdown means for employees' lives and for NPD team effectiveness. For example, despite leadership plays a critical role in times of crisis (Lesener et al., 2019), there is little research on leadership during the pandemic (Koekemoer et al., 2021). In crisis management, leadership can reduce stress, for example, through technical adaptation of a workflow (Prewitt & Weil 2014). However, the literature suggests that these adaptations might be good for the short term, but no long term solutions (Prewitt & Weil 2014). Accordingly, the job demand resource model (Bakker & Demerouti, 2017) states that work engagement and the achievement of team goals (Schaufeli, 2017) only occur when job resources are available in the work environment

(Lesener et al., 2019). Thus, leadership can maintain team effectiveness during the pandemic by introducing e.g. video conferencing - in the short term. More comprehensive long term solutions are needed to sustain team effectiveness over the prolonged course of the pandemic. Therefore, companies must introduce remote working and focus on the provision of job resources and long-term solutions during the pandemic (Beauregard et al., 2019).

In line, one study shows that not only leadership behaviour but also technological flexibility is a crucial factor of team effectiveness during COVID-19 (Koekemoer et al., 2021). This makes sense because the extent to which organisations enable flexible working strongly influences how employees and teams deal with the changes necessary to remain effective in the pandemic. This construct of technological flexibility was not considered in the present model. It may be that this factor or other unknown constructs have such tremendous influences on the processes of team effectiveness during the pandemic that they significantly affect all constructs of the TEVIC model, resulting in the other factors no longer be significant.

Study 2 found no significant differences in PCP, CCE, and PTE when controlling for team size and tenure between the two conditions. This is contrary to previous research demonstrating deep-level similarities of work-related values (Dose & Klimoski, 1999), shared experiences (McPherson et al., 2001), and a shared educational background (Marsden, 1987) to foster likability (Tekleab & Quigley, 2014) and social relationships (Granovetter, 1973). This is accompanied by an increase in communication and feelings of proximity (Peeters et al., 2006), allowing the group to create resources needed for the emergence of CCE (van Emmerik & Brenninkmeijer, 2009).

Moreover, the cognitive diversity in team members has been demonstrated to influence team effectiveness, because individual strengths foster collaborative problem solving (Batenburg et al., 2013). Different strengths complement each other to holistically

address a problem from different perspectives (Belbin, 1997). As a result, members become more engaged, which increases communication and the feeling of closeness (Peeters et al., 2006). This effect could not be replicated in this paper. Explanations for this will be elaborated upon below.

Despite the lack of effects of the intervention, interesting observations can be made. Home office and virtual teamwork in NPD teams are thought to decrease effectiveness (Contreras et al., 2020). In line, computer-mediated communication slows down the communication flow and the transfer of resources and knowledge among team members. This prevents the development of a shared feeling of efficacy (Granovetter, 1973). In the present study, an overall high level<sup>9</sup> of PCP ( $M = 3.76$ ), CCE ( $M = 3.72$ ), and PTE ( $M = 3.61$ ) was found in the current sample. It appears that despite the pandemic, the sample archives reasonably high levels of team performance and manages the situation well. In fact, teams are most sensitive to external factors in their early formation phase (Dose & Klimoski, 1999). Once the team has reached the norming and performance phase, external influences cannot change much; the team is committed to performance (Tuckman, 1965). Thus, if a team was established and performed well before the pandemic, the new external force did not significantly influence the team performance.

The non-significant effects of study 2 could be explained by the hypothetical nature of the intervention. Due to the pandemic-related restrictions, it might have been problematic that the focus of the intervention was on PCP, being only one antecedent of CCE. In fact, it is primarily feelings of self-efficacy that are crucial for the emergence of CCE (Dampérat et al., 2016). This feeling of empowerment in a creative situation can become CCE through the presence of others and resulting feelings of proximity. However, if there are no feelings of efficacy to begin with, strong feelings of proximity may never lead to *collective* creative

---

<sup>9</sup> on a scale from 1-5, with 5 being the highest rating

efficacy (Dampérat et al., 2016). In this respect, it may not be PCP but individual efficacy that might be decisive for the emergence of CCE. In this respect, even the most effective intervention could have problems fostering CCE through PCP, but must moreover focus on stimulating efficacy feelings. Hence, it may be that the current study could not stimulate CCE and thus could not increase PTE.

Nevertheless, the intervention was not able to stimulate PCP after all. Due to COVID-19 related restrictions and the limited timeframe of this research project, the power of 0.80 was not reached. The small sample size could hence explain the non-significant effects. The effects of study 1 could also be attributed to this limitation. According to Cohen (1992), a small sample size leads to a low power, which increases the risks of type I and type II errors. Therefore, the results must be interpreted with caution and further research with a larger sample is necessary to replicate the results.

Another limitation of this study is the theoretical approach chosen for the present manipulation. Due to COVID-19 restrictions, only PCP (and not creative efficacy) could be stimulated in the present intervention. CCE however arises from an interplay of PCP *and* creative efficacy. Further research is advised to target both antecedents of CCE, thereby focussing on *knowledge gained through experience*, which is the primary antecedent of creative efficacy (Bandura, 2007; Dampérat et al., 2016). Being confident to possess the knowledge and skills required for a given task, one has an advantageous mindset (based upon successful experiences) to succeed. Stimulating this knowledge, gained through experience of one's capabilities, which helps to feel empowered to tackle similar tasks in the future, too (Lui et al., 2015), combined with feelings of cognitive proximity, will likely increase CCE.

Moreover, due to COVID-19, study 2 could only indirectly study NPD teams by assuming team processes are generally the same for all teams. Employing convenience sampling, any participant who recently experienced teamwork could participate. This was a

feasible solution for study 2, however NPD teams are unique as they integrate classical team functions with creativity and innovation. Further research is advised to focus on NDP teams solely.

The pandemic has brought many unknown factors onto the scientific agenda. It is yet to be seen what consequences the pandemic will have on people and team functioning. This paper provides initial insights into understanding the impact of the COVID-19 pandemic on team effectiveness and thus takes a first step to being well prepared for future pandemic-restricted workflows.

### **Acknowledgements**

I would like to express my gratitude to Ruddy Faure for his supervision and guidance throughout the entire project. His thoughtful comments, recommendations and our discussions were very stimulating.

Moreover, I would like to thank Brigitte Schoeneberger, Lisa Kurz, and Georg Nawrot for their encouragement to think outside the box and support in putting my ideas into practice.

## References

Akgün, A. E., Keskin, H., & Byrne, J. C. (2010). Procedural justice climate in new product development teams: Antecedents and consequences. *Journal of Product Innovation Management*, 27(7), 1096-1111. <https://doi.org/10.1111/j.1540-5885.2010.00773.x>

Anderson, N. R., & West, M. A. (1998). Measuring climate for work group innovation: Development and validation of the team climate inventory. *Journal of Organizational Behavior*, 19(3), 235-258.  
[https://doi.org/10.1002/\(sici\)1099-1379\(199805\)19:3<235::aid-job837>3.0.co;2-c](https://doi.org/10.1002/(sici)1099-1379(199805)19:3<235::aid-job837>3.0.co;2-c)

Anderzén, I., & Arnetz, B. B. (1997). Psychophysiological reactions during the first year of a foreign assignment: Results of a controlled longitudinal study. *Work & Stress*, 11(4), 304-318. <https://doi.org/10.1080/02678379708252994>

Ayoko, O. B., & Chua, E. L. (2014). The importance of transformational leadership behaviors in team mental model similarity, team efficacy, and intra-team conflict. *Group & Organization Management*, 39(5), 504-531. <https://doi.org/10.1177/1059601114550080>

Baer, M., Oldham, G. R., & Cummings, A. (2003). Rewarding creativity: When does it really matter? *The Leadership Quarterly*, 14(4-5), 569-586.  
[https://doi.org/10.1016/s1048-9843\(03\)00052-3](https://doi.org/10.1016/s1048-9843(03)00052-3)

Bakker, A. B., & Demerouti, E. (2017). Job demands–resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology*, 22(3), 273-285.  
<https://doi.org/10.1037/ocp0000056>

Bandura, A. (2007). *Auto-efficacité. Le sentiment d'efficacité personnelle*. Paris: De Boeck Université.

Bandura, A. (1997). *Self-efficacy: the exercise of control. Self-efficacy: the Exercise of Control*. Times Books.

Barrett, D. J. (2002). Change communication: Using strategic employee communication to facilitate major change. *Corporate Communications: An International Journal*, 7(4), 219-231. <https://doi.org/10.1108/13563280210449804>

Baruch, Y. (2000). Teleworking: Benefits and pitfalls as perceived by professionals and managers. *New Technology, Work and Employment*, 15(1), 34-49. <https://doi.org/10.1111/1468-005x.00063>

Bass, B. M. (1985). *Leadership and performance beyond expectations*.

Batenburg, R., Van Walbeek, W., & In der Maur, W. (2013). Belbin role diversity and team performance: Is there a relationship? *Journal of Management Development*, 32(8), 901-913. <https://doi.org/10.1108/jmd-08-2011-0098>

Beauregard, T. A., Basile, K. A., & Canonico, E. (2019). Telework. *The Cambridge Handbook of Technology and Employee Behavior*, 511-543. <https://doi.org/10.1017/9781108649636.020>

Bechtoldt, M. N., Welk, C., Zapf, D., & Hartig, J. (2007). Main and moderating effects of self-control, organizational justice, and emotional labour on counterproductive behaviour at work. *European Journal of Work and Organizational Psychology*, 16(4), 479-500. <https://doi.org/10.1080/13594320701662618>

Belbin, R. M. (1996). *Managementteams: Erfolg und Misserfolg*.

Bell, S. T. (2007). Deep-level composition variables as predictors of team performance: A meta-analysis. *Journal of Applied Psychology*, 92(3), 595-615. <https://doi.org/10.1037/0021-9010.92.3.595>

Berscheid, E., & Christensen, H. H. (1983). *Close Relationships*. New York: Freeman.

Boos, M., Hardwig, T., & Riethmüller, M. (2017). Führung und Zusammenarbeit in verteilten teams. <https://doi.org/10.1026/02628-000>

Brown, S. L., & Eisenhardt, K. M. (1995). Product development: Past research, present findings, and future directions. *The Academy of Management Review*, 20(2), 343. <https://doi.org/10.2307/258850>

Breschi, S., & Lenzi, C. (2016). Co-invention networks and inventive productivity in US cities. *Journal of Urban Economics*, 92, 66-75. <https://doi.org/10.1016/j.jue.2015.12.003>

Brodbeck, F. C., & Maier, G. W. (2001). Das teamklima-inventar (TKI) für innovation in Gruppen. *Zeitschrift für Arbeits- und Organisationspsychologie A&O*, 45(2), 59-73. <https://doi.org/10.1026//0932-4089.45.2.59>

Carter, S. M., & West, M. A. (1998). Reflexivity, effectiveness, and mental health in BBC-TV production teams. *Small Group Research*, 29(5), 583-601. <https://doi.org/10.1177/1046496498295003>

Cheng, H., & Yang, H. (2014). The antecedents of collective creative efficacy for information system development teams. *Journal of Engineering and Technology Management*, 33, 1-17. <https://doi.org/10.1016/j.jengtecman.2013.12.001>

Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112(1), 155-159. <https://doi.org/10.1037/0033-2909.112.1.155>

Contreras, F., Baykal, E., & Abid, G. (2020). E-leadership and teleworking in times of COVID-19 and beyond: what we know and where do we go. *Frontiers in Psychology*, 11. <https://doi.org/10.3389/fpsyg.2020.590271>

Craig, M. C., Fletcher, P. C., Daly, E. M., Picchioni, M. M., Brammer, M., Giampietro, V., Rymer, J., McGuire, P. K., Maki, P. M., & Murphy, D. G. (1970). A study of visuospatial working memory. *Issues regarding Behavior*, 54(1), 47-59. <https://doi.org/10.1016/j.yhbeh.2008.01.012>

Cramton, C. D., & Orvis, K. L. (2003). *Overcoming barriers to information sharing in virtual teams*. Jossey-Bass, San Francisco.

Dampérat, M., Jeannot, F., Jongmans, E., & Jolibert, A. (2016). Team creativity: Creative self-efficacy, creative collective efficacy and their determinants. *Recherche et Applications en Marketing (English Edition)*, 31(3), 6-25.

<https://doi.org/10.1177/2051570716650164>

DeShon, R. P., Kozlowski, S. W., Schmidt, A. M., Milner, K. R., & Wiechmann, D. (2004). A multiple-goal, multilevel model of feedback effects on the regulation of individual and team performance. *Journal of Applied Psychology*, 89(6), 1035-1056.

<https://doi.org/10.1037/0021-9010.89.6.1035>

D’Innocenzo, L., Mathieu, J. E., & Kukenberger, M. R. (2016). A meta-analysis of different forms of shared leadership–team performance relations. *Journal of Management*, 42(7), 1964-1991. <https://doi.org/10.1177/0149206314525205>

Doosje, B., Ellemers, N., & Spears, R. (1995). Perceived Intragroup variability as a function of group status and identification. *Journal of Experimental Social Psychology*, 31(5), 410-436. <https://doi.org/10.1006/jesp.1995.1018>

Dose, J. J., & Klimoski, R. J. (1999). The diversity of diversity: Work values effects on formative team processes. *Human Resource Management Review*, 9(1), 83-108.

[https://doi.org/10.1016/s1053-4822\(99\)00012-1](https://doi.org/10.1016/s1053-4822(99)00012-1)

Edmondson, A. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, 44(2), 350. <https://doi.org/10.2307/2666999>

Edmondson, A. C., Dillon, J. R., & Roloff, K. S. (2007). 6 Three perspectives on team learning. *Academy of Management Annals*, 1(1), 269-314.

<https://doi.org/10.5465/078559811>

Eppler, M. (2007). Knowledge communication problems between experts and decision makers: An overview and classification. *Electronic Journal of Knowledge Management*, 5(3), 291-300. <https://doi.org/10.4018/978-1-59140-573-3.ch042>

Espinosa, J. A., Slaughter, S. A., Kraut, R. E., & Herbsleb, J. D. (2007). Familiarity, complexity, and team performance in geographically distributed software development.

*Organization Science*, 18(4), 613-630. <https://doi.org/10.1287/orsc.1070.0297>

Faul, F., Erdfelder, E., Lang, A., & Buchner, A. (2007). G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences.

*Behavior Research Methods*, 39(2), 175-191. <https://doi.org/10.3758/bf03193146>

Ficapal-Cusí, P., Enache-Zegheru, M., & Torrent-Sellens, J. (2021). Enhancing team performance: A multilevel model. *Journal of Cleaner Production*, 289, 125158.

<https://doi.org/10.1016/j.jclepro.2020.125158>

Finkelstein, S., & Hambrick, D. C. (1990). Top-management-Team tenure and organizational outcomes: The moderating role of managerial discretion. *Administrative Science Quarterly*, 35(3), 484. <https://doi.org/10.2307/2393314>

Gassmann, O., & Zedtwitz, M. (2003). Trends and determinants of managing virtual R&D teams. *R and D Management*, 33(3), 243-262.

<https://doi.org/10.1111/1467-9310.00296>

Gilson, L. L., Maynard, M. T., Jones Young, N. C., Vartiainen, M., & Hakonen, M. (2015). Virtual teams research. *Journal of Management*, 41(5), 1313-1337.

<https://doi.org/10.1177/0149206314559946>

Gladstein, D. L. (1984). Groups in context: A model of task group effectiveness. *Administrative Science Quarterly*, 29(4), 499. <https://doi.org/10.2307/2392936>

Golden, T. D., Veiga, J. F., & Dino, R. N. (2008). undefined. *Journal of Applied Psychology*, 93(6), 1412-1421. <https://doi.org/10.1037/a0012722>

Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, 78(6), 1360-1380. <https://doi.org/10.1086/225469>

Grant, C. A., Wallace, L. M., & Spurgeon, P. C. (2013). An exploration of the psychological factors affecting remote E-worker's job effectiveness, well-being and work-life balance. *Employee Relations*, 35(5), 527-546.

<https://doi.org/10.1108/er-08-2012-0059>

Gray, P., Butler, B. S., & Sharma, N. (2015). The interacting effects of distributed work arrangements and individual dispositions on willingness to engage in sensemaking behaviors. *Journal of the Association for Information Science and Technology*, 66(10), 2085-2097.

<https://doi.org/10.1002/asi.23306>

Halbe, D. (2011). "Who's there?": Differences in the features of telephone and face-to-face conferences. *Journal of Business Communication*, 49(1), 48-73.

<https://doi.org/10.1177/0021943611425238>

Hambrick, D. C. (1994). Top management groups: A conceptual integration and reconsideration of the team label. *Research in organizational behavior*, 16, 171-214.

<https://doi.org/10.4324/9780203066430-25>

Handke, L., & Kauffeld, S. (2019). A matter of time? Mastering challenges of virtual team collaboration. *Gruppe. Interaktion. Organisation. Zeitschrift für Angewandte Organisationspsychologie*, 50(1), 33-41. <https://doi.org/10.1007/s11612-019-00445-5>

Hays, R., & DiMatteo, M. R. (1987). A short-form measure of loneliness. *Journal of Personality Assessment*, 51(1), 69-81. [https://doi.org/10.1207/s15327752jpa5101\\_6](https://doi.org/10.1207/s15327752jpa5101_6)

Hoegl, M., & Gemuenden, H. G. (2001). Teamwork quality and the success of innovative projects: A theoretical concept and empirical evidence. *Organization Science*, 12(4), 435-449. <https://doi.org/10.1287/orsc.12.4.435.10635>

Hsu, J. S., Shih, S., Chiang, J. C., & Liu, J. Y. (2012). The impact of transactive memory systems on IS development teams' coordination, communication, and performance.

*International Journal of Project Management*, 30(3), 329-340.

<https://doi.org/10.1016/j.ijproman.2011.08.003>

Hubert, F. (2012). On the role and interrelationship of spatial, social and cognitive proximity: Personal knowledge relationships of R&D workers in the Cambridge information technology cluster. *Regional Studies*, 46(9), 1169-1182.

<https://doi.org/10.1080/00343404.2011.569539>

Hülshager, U. R., Anderson, N., & Salgado, J. F. (2009). Team-level predictors of innovation at work: A comprehensive meta-analysis spanning three decades of research. *Journal of Applied Psychology*, 94(5), 1128-1145. <https://doi.org/10.1037/a0015978>

Jackson, S. E., & Joshi, A. (2004). Diversity in social context: A multi-attribute, multilevel analysis of team diversity and sales performance. *Journal of Organizational Behavior*, 25(6), 675-702. <https://doi.org/10.1002/job.265>

Jackson, S. E., Stone, V. K., & Alvarez, E. B. (1993). Socialization amidst diversity: Impact of demographics on work team oldtimers and newcomers. *Research in organizational behavior*, 15, 45-109. <https://doi.org/10.1002/job.4030150211>

Jung, D. I., & Sosik, J. J. (2002). Transformational leadership in work groups. *Small Group Research*, 33(3), 313-336. <https://doi.org/10.1177/10496402033003002>

Kiesler, S., & Cummings, J. N. (2002). What do we know about proximity and distance in work groups? *Distributed Work*. <https://doi.org/10.7551/mitpress/2464.003.0007>

Koekemoer, L., De Beer, L. T., Govender, K., & Brouwers, M. (2021). Leadership behaviour, team effectiveness, technological flexibility, work engagement and performance during COVID-19 lockdown: An exploratory study. *SA Journal of Industrial Psychology*, 47. <https://doi.org/10.4102/sajip.v47i0.1829>

Kossek, E. E., Lautsch, B. A., & Eaton, S. C. (2006). Telecommuting, control, and boundary management: Correlates of policy use and practice, job control, and work-family

effectiveness. *Journal of Vocational Behavior*, 68(2), 347-367.

<https://doi.org/10.1016/j.jvb.2005.07.002>

Lesener, T., Gusy, B., Jochmann, A., & Wolter, C. (2019). The drivers of work engagement: A meta-analytic review of longitudinal evidence. *Work & Stress*, 34(3), 259-278. <https://doi.org/10.1080/02678373.2019.1686440>

Lippke, S., Fischer, M. A., & Ratz, T. (2021). Physical activity, loneliness, and meaning of friendship in young individuals – A mixed-methods investigation prior to and during the COVID-19 pandemic with three cross-sectional studies. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.617267>

Lisitsa, E., Benjamin, K. S., Chun, S. K., Skalisky, J., Hammond, L. E., & Mezulis, A. H. (2020). Loneliness among young adults during COVID-19 pandemic: The mediational roles of social media use and social support seeking. *Journal of Social and Clinical Psychology*, 39(8), 708-726. <https://doi.org/10.1521/jscp.2020.39.8.708>

Liu, J., Chen, J., & Tao, Y. (2015). Innovation performance in new product development teams in China's technology ventures: The role of behavioral integration dimensions and collective efficacy. *Journal of Product Innovation Management*, 32(1), 29-44. <https://doi.org/10.1111/jpim.12177>

Lowe, K. B., Kroeck, K., & Sivasubramaniam, N. (1996). Effectiveness correlates of transformational and transactional leadership: A meta-analytic review of the mlq literature. *The Leadership Quarterly*, 7(3), 385-425. [https://doi.org/10.1016/s1048-9843\(96\)90027-2](https://doi.org/10.1016/s1048-9843(96)90027-2)

Luźniak-Piecha, M., & Bobrowska, J. (2020). Effective management of employee innovation in the Covid-19 era, i.e. how to strengthen the innovation potential of members of the organization during a crisis. *Journal of Management*, 87(5), 55-63.

<https://doi.org/10.15219/em87.1493>

Madsen, S. R. (2011). The benefits, challenges, and implication of teleworking: a literature review. *Journal of Culture and Religion*, *1*(1), 148-158.

<https://doi.org/10.1108/09555340410699613>

Marsden, P. V. (1987). Core discussion networks of Americans. *American Sociological Review*, *52*(1), 122. <https://doi.org/10.2307/2095397>

Marks, D. (2018). A general theory of behaviour. Psychology Press, London. <https://doi.org/10.4135/9781529714616>

Mathieu, J., Maynard, M. T., Rapp, T., & Gilson, L. (2008). Team effectiveness 1997-2007: A review of recent advancements and a glimpse into the future. *Journal of Management*, *34*(3), 410-476. <https://doi.org/10.1177/0149206308316061>

Matias, T., Dominski, F. H., & Marks, D. F. (2020). Human needs in COVID-19 isolation. *Journal of Health Psychology*, *25*(7), 871-882.

<https://doi.org/10.1177/1359105320925149>

McEwen, B. S., & Akil, H. (2020). Revisiting the stress concept: Implications for affective disorders. *The Journal of Neuroscience*, *40*(1), 12-21.

<https://doi.org/10.1523/jneurosci.0733-19.2019>

McPherson, J. D., Marra, J. D., Hillier, M., Waterston, L. D., Chinawalla, R. H., & Wallis, W. (2001). A physical map of the human genome. *Nature*, *409*(6822), 934-941.

<https://doi.org/10.1038/35057157>

Medina-Enríquez, M. M., Carlos-Escalante, J. A., Aponte-Torres, Z., Cuapio, A., Lopez-Leon, S., & Wegman-Ostrosky, T. (2020). Ace2: The doorway to SARS-Cov-2.

<https://doi.org/10.31226/osf.io/bhpx8>

Mohammed, S., & Angell, L. C. (2004). Surface- and deep-level diversity in workgroups: Examining the moderating effects of team orientation and team process on

relationship conflict. *Journal of Organizational Behavior*, 25(8), 1015-1039.

<https://doi.org/10.1002/job.293>

Mohammed, S., Ferzandi, L., & Hamilton, K. (2010). Metaphor no more: A 15-Year review of the team mental model construct. *Journal of Management*, 36(4), 876-910.

<https://doi.org/10.1177/0149206309356804>

Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., Agha, M., & Agha, R. (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery*, 78, 185-193.

<https://doi.org/10.1016/j.ijssu.2020.04.018>

Noonan, M. C., & Glass, J. (2012). The hard truth about telecommuting. *Monthly Labor Review*, 135(6), 38-35. <https://doi.org/10.1111/j.1540-5885.2010.00773.x>

Norman, G. (2010). Likert scales, levels of measurement and the “laws” of statistics. *Advances in Health Sciences Education*, 15(5), 625-632.

<https://doi.org/10.1007/s10459-010-9222-y>

Oah, S., Na, R., & Moon, K. (2018). The influence of safety climate, safety leadership, workload, and accident experiences on risk perception: A study of Korean manufacturing workers. *Safety and Health at Work*, 9(4), 427-433.

<https://doi.org/10.1016/j.shaw.2018.01.008>

Painter, G., Posey, P., Austrom, D., Tenkasi, R., Barrett, B., & Merck, B. (2016). Sociotechnical systems design: Coordination of virtual teamwork in innovation. *Team Performance Management*, 22(7/8), 354-369. <https://doi.org/10.1108/tpm-12-2015-0060>

Paulus, P. B., & Yang, H. (2000). Idea generation in groups: A basis for creativity in organizations. *Organizational Behavior and Human Decision Processes*, 82(1), 76-87.

<https://doi.org/10.1006/obhd.2000.2888>

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research*, 66(4), 543-578. <https://doi.org/10.3102/00346543066004543>

Peeters, M. A., Rutte, C. G., Van Tuijl, H. F., & Reymen, I. M. (2006). The Big Five personality traits and individual satisfaction with the team. *Small Group Research*, 37(2), 187-211. <https://doi.org/10.1177/1046496405285458>

Pérea, C., & Von Zedtwitz, M. (2018). Organic vs. mechanistic coordination in distributed new product development (NPD) teams. *Journal of Engineering and Technology Management*, 49, 4-21. <https://doi.org/10.1016/j.jengtecman.2018.04.005>

Prewitt, J. E., & Weil, R. (2014). Organizational opportunities endemic in crisis leadership. *Journal of Management Policy and Practice*, 15(2), 72-87. <https://doi.org/10.1111/peps.12183>

Rasmussen, T. H., & Jeppesen, H. J. (2006). Teamwork and associated psychological factors: A review. *Work & Stress*, 20(2), 105-128. <https://doi.org/10.1080/02678370600920262>

Rousseau, V., Aubé, C., & Savoie, A. (2006). Teamwork behaviors. *Small Group Research*, 37(5), 540-570. <https://doi.org/10.1177/1046496406293125>

Rudolph, C., Allan, B., Clark, M., Hertel, G., Hirschi, A., Kunze, F., Shockley, K., Shoss, M., Sonnentag, S., & Zacher, H. (2020). Pandemics: Implications for research and practice in industrial and organizational psychology. <https://doi.org/10.31234/osf.io/k8us2>

Salas, E., Sims, D. E., & Burke, C. S. (2005). Is there a “Big Five” in teamwork? *Small Group Research*, 36(5), 555-599. <https://doi.org/10.1177/1046496405277134>

Salas, E., Wildmann, J. L., & Piccolo, R. F. (2005). Using simulation-based training to enhance management education. *Academy of Management Learning & Education*, 8(4), 559-573. <https://doi.org/10.5465/amle.2009.47785474>

- Sanner, B., & Bunderson, J. S. (2015). When feeling safe isn't enough. *Organizational Psychology Review*, 5(3), 224-243.  
<https://doi.org/10.1177/2041386614565145>
- Schaubroeck, J., Lam, S. S., & Peng, A. C. (2011). Cognition-based and affect-based trust as mediators of leader behavior influences on team performance. *Journal of Applied Psychology*, 96(4), 863-871. <https://doi.org/10.1037/a0022625>
- Schaufeli, W. B. (2017). Applying the job demands-resources model. *Organizational Dynamics*, 46(2), 120-132. <https://doi.org/10.1016/j.orgdyn.2017.04.008>
- Schippers, M. C., Den Hartog, D. N., Koopman, P. L., & Wienk, J. A. (2003). Diversity and team outcomes: The moderating effects of outcome interdependence and group longevity and the mediating effect of reflexivity. *Journal of Organizational Behavior*, 24(6), 779-802. <https://doi.org/10.1002/job.220>
- Schippers, M. C., West, M. A., & Dawson, J. F. (2012). Team reflexivity and innovation. *Journal of Management*, 41(3), 769-788.  
<https://doi.org/10.1177/0149206312441210>
- Shamir, B., House, R. J., & Arthur, M. B. (1993). The motivational effects of charismatic leadership: A self-concept based theory. *Organization Science*, 4(4), 577-594.  
<https://doi.org/10.1287/orsc.4.4.577>
- Siebdrat, F., Hoegl, M., & Ernst, H. (2014). Subjective distance and team collaboration in distributed teams. *Journal of Product Innovation Management*, 31(4), 765-779. <https://doi.org/10.1111/jpim.12122>
- Smith, F. (2002). *Research Methods in Pharmacy Practice*. Pharmaceutical Press, London.

Stajkovic, A. D., Lee, D., & Nyberg, A. J. (2009). Collective efficacy, group potency, and group performance: Meta-analyses of their relationships, and test of a mediation model. *Journal of Applied Psychology, 94*(3), 814-828. <https://doi.org/10.1037/a0015659>

Stewart, G. L., & Barrick, M. R. (2000). Team structure and performance: Assessing the mediating role of Intrateam process and the moderating role of task type. *Academy of Management Journal, 43*(2), 135-148. <https://doi.org/10.5465/1556372>

Strating, M. M., & Nieboer, A. P. (2009). Psychometric test of the team climate inventory-short version investigated in Dutch quality improvement teams. *BMC Health Services Research, 9*(1). <https://doi.org/10.1186/1472-6963-9-126>

Sullivan, C., & Lewis, S. (2001). Home-based telework, gender, and the synchronization of work and family: Perspectives of teleworkers and their Co-residents. *Gender, Work & Organization, 8*(2), 123-145. <https://doi.org/10.1111/1468-0432.00125>

Tajfel, H. (1982). Social psychology of intergroup relations. *Annual Review of Psychology, 33*(1), 1-39. <https://doi.org/10.1146/annurev.ps.33.020182.000245>

Tekleab, A. G., & Quigley, N. R. (2014). Team deep-level diversity, relationship conflict, and team members' affective reactions: A cross-level investigation. *Journal of Business Research, 67*(3), 394-402. <https://doi.org/10.1016/j.jbusres.2012.12.022>

Ter Wal, A. L., & Boschma, R. A. (2009). Applying social network analysis in economic geography: Framing some key analytic issues. *The Annals of Regional Science, 43*(3), 739-756. <https://doi.org/10.1007/s00168-008-0258-3>

Thayer, A. L., Petruzzelli, A., & McClurg, C. E. (2018). Addressing the paradox of the team innovation process: A review and practical considerations. *American Psychologist, 73*(4), 363-375. <https://doi.org/10.1037/amp0000310>

Tjosvold, D., Tang, M. M., & West, M. (2004). Reflexivity for team innovation in China. *Group & Organization Management*, 29(5), 540-559.

<https://doi.org/10.1177/1059601103254911>

Tuckman, B. W. (1965). Developmental sequence in small groups. *Psychological Bulletin*, 63(6), 384-399. <https://doi.org/10.1037/h0022100>

Tushman, M. L. (1978). Technical communication in R & D laboratories: The impact of project work characteristics. *Academy of Management Journal*, 21(4), 624-645.

<https://doi.org/10.5465/255704>

Van der Kleij, R., Maarten Schraagen, J., Werkhoven, P., & De Dreu, C. K. (2009). How conversations change over time in face-to-face and video-mediated communication. *Small Group Research*, 40(4), 355-381. <https://doi.org/10.1177/1046496409333724>

Van Dick, R., Wagner, U., Stellmacher, J., Christ, O., & Tissington, P. A. (2005). To Be(long) or not to Be(long): Social identification in organizational contexts. *Genetic, Social, and General Psychology Monographs*, 131(3), 189-218.

<https://doi.org/10.3200/mono.131.3.189-218>

Van Emmerik, I. H., & Brenninkmeijer, V. (2009). Deep-level similarity and group social capital: Associations with team functioning. *Small Group Research*, 40(6), 650-669.

<https://doi.org/10.1177/1046496409346550>

Vashdi, D. R., Bamberger, P. A., & Erez, M. (2013). Can surgical teams ever learn? The role of coordination, complexity, and transitivity in action team learning. *Academy of Management Journal*, 56(4), 945-971. <https://doi.org/10.5465/amj.2010.0501>

Verburg, R. M., Bosch-Sijtsema, P., & Vartiainen, M. (2013). Getting it done: Critical success factors for project managers in virtual work settings. *International Journal of Project Management*, 31(1), 68-79. <https://doi.org/10.1016/j.ijproman.2012.04.005>

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, 28(2), 118-144.

<https://doi.org/10.1016/j.jsis.2019.01.003>

West, M. A. (2000). *Reflexivity, revolution and innovation in work teams*. Product Development Teams Press.

West, M. A., & Farr, J. L. (1990). *Innovation at work*. Innovation and creativity at work.

Wheatley, D. (2012). Good to be home? time-use and satisfaction levels among home-based teleworkers. *New Technology, Work and Employment*, 27(3), 224-241.

<https://doi.org/10.1111/j.1468-005x.2012.00289.x>

Whittingham, J. R., Ruiter, R. A., Castermans, D., Huiberts, A., & Kok, G. (2008). Designing effective health education materials: Experimental pre-testing of a theory-based brochure to increase knowledge. *Health Education Research*, 23(3), 414-426.

<https://doi.org/10.1093/her/cym018>

Widmer, P., Schippers, M., & West, M. (2009). Recent developments in reflexivity research. *Psychology Everyday*, 2(2), 11-29. <https://doi.org/10.3109/9781420080063-3>

Wilson, J. M., Boyer O'Leary, M., Metiu, A., & Jett, Q. R. (2008). Perceived proximity in virtual work: Explaining the paradox of far-but-Close. *Organization Studies*, 29(7), 979-1002. <https://doi.org/10.1177/0170840607083105>

Winke, M., Bless, H., & Biller, B. (1996). Subjective experience versus content of information in the construction of attitude judgments. *Personality and Social Psychology Bulletin*, 22(11), 1105-1113. <https://doi.org/10.1177/01461672962211002>

Zaccaro, S. J., Rittman, A. L., & Marks, M. A. (2001). Team leadership. *The Leadership Quarterly*, 12(4), 451-483. [https://doi.org/10.1016/s1048-9843\(01\)00093-5](https://doi.org/10.1016/s1048-9843(01)00093-5)

Zamani, E. D., & Pouloudi, N. (2020). Generative mechanisms of workarounds, discontinuance and reframing: A study of negative disconfirmation with consumerised IT. *Information Systems Journal*, 31(3), 384-428. <https://doi.org/10.1111/isj.12315>

## Appendix A

### Materials section of study one

#### Materials

All scores except psychological safety scored on a five-point Likert scale from "Do not agree at all" (1) to "fully agree" (5). When necessary, scales were translated into German<sup>10</sup>.

**Social isolation.** The scale has been validated in COVID-19-related social isolation in the U.S. (Lisitsa et al., 2020) and in Germany (Lippke et al., 2021). An example item was "*I feel isolated from others*". One item was reverse coded.

**Team information exchange.** The Teamwork Quality scale (TWQ; Hoegl et al., 2001) is a validated and reliable inventory (Hsu et al., 2012) for measuring communication in business teams is the . An example item was "*There was frequent communication within the team*". Three items were reverse coded.

**Perceived leadership support.** For continuity the scale by Ficapal-Cusí et al. (2021), a five-point scale was used instead of the initially proposed seven-point Lickert scale. An example item was "*Leadership tended to be a source of motivation for the team*".

**Shared vision.** An example item was "*How far are you in agreement with the team objectives?*".

**Creative collective efficacy.** Items assessed effectiveness in developing and generating new ideas, the efficacy team members cooperate in implementing new ideas, and

---

<sup>10</sup> The author's translation was discussed and improved in several rounds of discussion and feedback with researchers from the University of Stuttgart, the Fraunhofer IAO, and ARENA2036.

their perceptions on the team's creative efficacy (Ficapal-Cusí et al., 2021). An example item was "*People in the team cooperate to help develop and apply new ideas*".

**Social reflexivity.** The valid and reliable (Ficapal-Cusí et al., 2021; Tjosvold et al., 2014) TRI held eight items on team reflexivity. An example item was "*Team members provide each other with support when times are difficult*". Four items were reverse coded.

**Psychological safety.** Items were scored on a five-point Likert scale from "never true" (1) to "always true" (5). An example item was "*We have a "we are together" attitude.*"

**Perceived team effectiveness.** While four items assessed the team's evaluation and learning reflexivity, one item assessed result-oriented outcomes: "*We've been an effective team*".

**Work situation.** Answer possibilities ranged from (1) "< 1 day" to (6) "fulltime".

## **Appendix B**

### **Link to YouTube video introducing study one**

This video was created, shot and edited by the author with Adobe Premiere Pro (CS6) for a creative call for participation in study one.

<https://www.youtube.com/watch?v=H77BnPoa97E>

## Appendix C

### Poster call for participation study one

*Translation:*

Dear ARENAer:inside,

We have already received great feedback from you. Now it continues, we would also like your input! So... Feel like a short distraction? Then watch this short video (1:30min)!

Best regards,

Samuel

<p><b>Kein Bock mehr auf die momentane Arbeitssituation?</b></p> <p>Lieber ARENAer:innen, Wir haben schon super Rückmeldungen von Euch bekommen. Nun geht es weiter, wir möchten auch noch <b>DEIN Input!</b></p> <p>Also... <b>Lust auf ne kurze Ablenkung?</b></p> <p>Dann zieh Dir doch dieses kleine Video (1:30min) rein!</p> <p>Liebe Grüße, Samuel</p> 	<p><b>Nutzt Eure Chance den ARENA2036-Innovationsraum mitzugestalten!</b></p> <p>Liebe ARENA2036-Kolleginnen und Kollegen, für Euch soll in der ARENA2036 ein <b>Innovationsraum</b> aufgebaut werden, in dem ihr euch zukünftig richtig austoben könnt. Ihr habt nun die <b>einmalige Chance eure Anregungen und Wünsche</b> an die Ausgestaltung des Raumes zu definieren.</p> <p>Info: Bearbeitungsdauer: ca. 5-10 min</p> <p>Beste Grüße Modisray</p> 
 <p>Universität Stuttgart Institut für Arbeitswissenschaft und Technologemanagement IAT</p>	 <p>BWT Abteilung Berufswirtschafts- und Technologipädagogik</p>
<p>InnoHub</p>	

## Appendix D

### Online survey study one

Please first find the German version and then the English translation for every page of the survey. The survey was made and distributed with Qualtrics.com (<https://www.qualtrics.com>).

*[Umfrage Seite 1; German, original]*

#### Informationsschreiben

zur Onlineumfrage des Agilen InnovationsHubs  
“Die momentane Arbeitssituation im Homeoffice“.

**Danke, dass Du schon bis hierhergekommen bist!**

Um dein ganz persönliches Empfinden in der momentanen Situation des Arbeitens im Homeoffice zu erheben, bitten wir Dich um acht Minuten Deiner Zeit.

Die Ergebnisse dieser Umfrage können von **erheblicher Bedeutung für das Verbessern von online/hybride Zusammenarbeitsformen in der ARENA2036** sein und zu einem besseren wissenschaftlichen Verständnis von den Bedürfnissen der Mitarbeitenden führen.

Als Dankeschön für Deine Zeit verlosen wir unter allen Teilnehmenden eine der drei leckeren Tafeln Tony’s Choclonely.

Zum Gewinnspiel kommst Du sobald Du alle Fragen beantwortet hast.

Der Fragebogen ist wie folgt aufgebaut:

Zunächst gibst Du bitte Dein Einverständnis zur Teilnahme an dieser Studie. Anschließend bitten wir Dich, diese kurze Umfrage zu den verschiedenen Aspekten deiner momentanen Arbeitssituation auszufüllen.

Während der Studie kannst du deine **Teilnahme jederzeit beenden**. Dein Ausstieg hat keinerlei Konsequenzen.

**Alle Informationen, die wir sammeln, werden anonym verarbeitet.**

Das bedeutet, dass die Ergebnisse später nicht auf Dich zurückgeführt werden können. Nach Beendigung der Studie können wir dich daher nicht über Deine persönlichen Ergebnisse informieren, allerdings könnten wir Dir die Gesamtergebnisse der Studie mitteilen. Falls Du daran Interesse hast, sende bitte eine E-Mail an: [hofmann@bwt.uni-stuttgart.de](mailto:hofmann@bwt.uni-stuttgart.de).

Falls Du nach der Umfrage **Anmerkungen** zu unserer Studie haben solltest, kannst Du dich jederzeit an den Betreuer dieser Online-Umfrage wenden: Georg Nawroth ([georg.nawroth@iat.uni-stuttgart.de](mailto:georg.nawroth@iat.uni-stuttgart.de)).

Möchtest Du nach diesen Informationen nicht mehr an der Studie teilnehmen, schließe einfach das Fenster und wir danken Dir für Deine Zeit.

Zur Umfrage gelangst Du, indem Du zur nächsten Seite klickst.

Mit herzlichen Grüßen,  
Samuel T. Hofmann

---

Agiler InnovationHub  
**ARENA**2036 e.V.  
Pfaffenwaldring 19  
70569 Stuttgart, Germany

*[survey page 1; English]*

### **Information letter**

to the online survey of the Agile InnovationsHub.

"The current work situation in the home office".

**Thank you for getting this far already!**

In order to collect your very personal feeling about the current situation of working in a home office, we ask you for eight minutes of your time.

The results of this survey can be of **significant importance for improving online/hybrid forms of collaboration in ARENA2036** and lead to a better scientific understanding of the needs of employees.

As a thank you for your time, we are giving away one of three delicious bars of Tony's Chocolonely to all participants.

You can enter the competition as soon as you have answered all the questions.

The questionnaire is structured as follows:

First, please give your consent to participate in this study. Then we ask you to fill out this short survey about the different aspects of your current work situation.

**You can end your participation at any time** during the study. There are no consequences to your withdrawal.

**All the information we collect is processed anonymously.**

This means that the results cannot be traced back to you later. After the end of the study, we cannot inform you about your personal results, but we could inform you about the overall results of the study. If you are interested, please send an e-mail to:

[hofmann@bwt.uni-stuttgart.de](mailto:hofmann@bwt.uni-stuttgart.de).

If you have any comments about our study after the survey, you can always contact the supervisor of this online survey: Georg Nawroth ([georg.nawroth@iat.uni-stuttgart.de](mailto:georg.nawroth@iat.uni-stuttgart.de)).

If you no longer wish to participate in the study after receiving this information, simply close the window and we will thank you for your time.

You can access the survey by clicking on the next page.

With best regards,  
Samuel T. Hofmann

---

Agile InnovationHub  
**ARENA**2036 e.V.  
Pfaffenwaldring 19  
70569 Stuttgart, Germany

[Umfrage Seite 2; German, original]

## **Datenschutzinformation**

### **Onlineumfrage im Rahmen des Agilen InnovationsHub**

Im Rahmen der Teilnahme an dieser Onlineumfrage des Forschungsprojekts ARENA2036 – Agiler InnovationsHub werden personenbezogene Daten von uns als den für die Datenverarbeitung Verantwortlichen verarbeitet und für die Dauer gespeichert, die zur Erfüllung der festgelegten Zwecke und gesetzlicher Verpflichtungen erforderlich ist. Im Folgenden informieren wir Sie darüber, um welche Daten es sich dabei handelt, auf welche Weise sie verarbeitet werden und welche Rechte Ihnen diesbezüglich zustehen. Personenbezogene Daten sind gemäß Art. 4 Nr. 1 Datenschutzgrundverordnung (DSGVO) alle Informationen, die sich auf eine identifizierte oder identifizierbare natürliche Person beziehen.

#### **1. Name und Kontaktdaten des für die Verarbeitung Verantwortlichen sowie des betrieblichen Datenschutzbeauftragten**

Verantwortlicher für die Datenverarbeitung ist:

Radboud University  
Houtlaan 4  
6525 XZ Nijmegen, the Netherlands  
(024) 361 61 61

Die datenverarbeitende Unterorganisation ist:

Faculty of Social Sciences  
Thomas van Aquinostraat 4  
P.O. Box 9104  
6500 HE Nijmegen, the Netherlands  
Dr. Martijn de Lange ([m.delange@psych.ru.nl](mailto:m.delange@psych.ru.nl)).

#### **2. Verarbeitung personenbezogener Daten und Zwecke der Verarbeitung**

##### **a) Freiwilligkeit**

Die Teilnahme an den Workshops und Umfragen des Forschungsprojekts ARENA2036 – Agiler InnovationsHub erfolgt freiwillig. Ihnen steht es frei, einzelne Fragen nicht zu

beantworten. Alle Angaben werden vertraulich behandelt. Aus der Nichtteilnahme oder dem Überspringen einzelner Fragen entstehen Ihnen keine Nachteile.

**b) Rechtsgrundlage**

Die personenbezogenen Daten (durch Umfragen) verarbeiten wir auf Grundlage Ihrer ausdrücklich erteilten Einwilligung gemäß Art. 6 Abs. 1 S. 1 lit. a DSGVO.

**c) Erhebungszweck**

Ziel des Forschungsprojekts ist es, wissenschaftliche Erkenntnisse zu Innovations- und Wissensmanagement in der ARENA2036 zu generieren und Ihnen auf dieser Basis Best Practices verfügbar zu machen. Dazu werden Umfragen durchgeführt. Eine Veröffentlichung der Ergebnisse in wissenschaftlichen Fachzeitschriften wird angestrebt.

**d) Dokumentation und Veröffentlichung**

Um die wissenschaftliche Dokumentation und Auswertung der Umfragen bzw. der Workshops zu ermöglichen, werden Umfragen durchgeführt und Beobachtungen notiert, anschließend werden diese durch unsere Projektmitarbeiter\*innen verschriftlicht und ausgewertet.

Die Dokumentation und Veröffentlichung der Untersuchungsergebnisse erfolgt ausschließlich in anonymisierter Form, ohne Ihre namentliche Nennung und ohne Angabe von Informationen, die einen Rückschluss auf Ihre Person zulassen. Ergebnisse werden stets nur in aufbereiteter, aggregierter Form dargestellt. Vereinzelt werden wörtliche Zitate aus den Workshops genutzt, um die dargestellten Sachverhalte zu veranschaulichen. Diese Aussagen werden ebenfalls anonymisiert.

**3. Speicherdauer**

Die ausgefüllten Umfragen werden nach Beendigung des Forschungsprojekts oder spätestens am 1. Oktober 2021 gelöscht. Zu diesem Zeitpunkt wird der Teil, welche die persönlichen Daten enthält von dem Datenset gelöscht. Die Untersuchungsergebnisse, die keine personenbezogenen Daten beinhalten, werden dauerhaft archiviert und wissenschaftlichen Nachnutzungen, auch durch Dritte, zugänglich gemacht. Die Speicherung erfolgt zu wissenschaftlichen Zwecken und um unseren Dokumentationspflichten ggf. nachkommen zu können.

#### **4. Weitergabe von personenbezogenen Daten**

Die, aus den Umfragen und Beobachtungen, abgeleiteten Untersuchungsergebnisse werden bei Bedarf an alle Projektpartner der ARENA2036 – Agilger InnovationsHub (namentlich Fraunhofer-Institut für Arbeitswirtschaft und Organisation, Daimler AG und Siemens AG) zugänglich gemacht.

Eine Übermittlung von personenbezogenen Daten an andere Dritte findet grundsätzlich nicht statt. Eine Weitergabe kommt allenfalls in Betracht, wenn für die Weitergabe nach Art. 6 Abs. 1 S. 1 lit. c DSGVO eine gesetzliche Verpflichtung besteht oder wenn Sie gem. Art. 6 Abs. 1 S. 1 lit a DSGVO ausdrücklich Ihre Einwilligung dazu erteilt haben.

Eine Übermittlung von personenbezogenen Daten an ein Drittland oder eine internationale Organisation ist ausgeschlossen.

#### **5. Betroffenenrechte**

Sie haben das Recht:

- gemäß Art. 7 Abs. 3 DSGVO Ihre einmal erteilte Einwilligung jederzeit gegenüber uns zu widerrufen. Dies hat zur Folge, dass wir die Datenverarbeitung, die auf dieser Einwilligung beruhte, für die Zukunft nicht mehr fortführen dürfen;
- gemäß Art. 15 DSGVO Auskunft über Ihre von uns verarbeiteten personenbezogenen Daten zu verlangen. Insbesondere können Sie Auskunft über die Verarbeitungszwecke, die Kategorie der personenbezogenen Daten, die Kategorien von Empfängern, gegenüber denen Ihre Daten offengelegt wurden oder werden, die geplante Speicherdauer, das Bestehen eines Rechts auf Berichtigung, Löschung, Einschränkung der Verarbeitung oder Widerspruch, das Bestehen eines Beschwerderechts, die Herkunft ihrer Daten, sofern diese nicht bei uns erhoben wurden, sowie über das Bestehen einer automatisierten Entscheidungsfindung einschließlich Profiling und ggf. aussagekräftigen Informationen zu deren Einzelheiten verlangen;
- gemäß Art. 16 DSGVO unverzüglich die Berichtigung unrichtiger oder Vervollständigung Ihrer bei uns gespeicherten personenbezogenen Daten zu verlangen;
- gemäß Art. 17 DSGVO die Löschung Ihrer bei uns gespeicherten personenbezogenen Daten zu verlangen, soweit nicht die Verarbeitung zur Ausübung des Rechts auf freie Meinungsäußerung und Information, zur Erfüllung einer rechtlichen Verpflichtung, aus Gründen des öffentlichen Interesses oder zur Geltendmachung, Ausübung oder Verteidigung von Rechtsansprüchen erforderlich ist;

- gemäß Art. 18 DSGVO die Einschränkung der Verarbeitung Ihrer personenbezogenen Daten zu verlangen, soweit die Richtigkeit der Daten von Ihnen bestritten wird, die Verarbeitung unrechtmäßig ist, Sie aber deren Löschung ablehnen und wir die Daten nicht mehr benötigen, Sie jedoch diese zur Geltendmachung, Ausübung oder Verteidigung von Rechtsansprüchen benötigen oder Sie gemäß Art. 21 DSGVO Widerspruch gegen die Verarbeitung eingelegt haben;
- gemäß Art. 20 DSGVO Ihre personenbezogenen Daten, die Sie uns bereitgestellt haben, in einem strukturierten, gängigen und maschinenlesebaren Format zu erhalten oder die Übermittlung an einen anderen Verantwortlichen zu verlangen und
- gemäß Art. 77 DSGVO sich bei einer Aufsichtsbehörde zu beschweren. In der Regel können Sie sich hierfür an die Aufsichtsbehörde ihres üblichen Aufenthaltsortes oder Arbeitsplatzes oder unseres Unternehmenssitzes wenden.
- Gemäß Art. 89 DSGVO i.V.m. § 27 Absatz 2 BDSG sind die vorgenannten Rechte der Artikel 15, 16, 18 und 21 DSGVO insoweit beschränkt, als diese Rechte voraussichtlich die Verwirklichung der Forschungs- oder Statistikzwecke unmöglich machen oder ernsthaft beeinträchtigen und die Beschränkung für die Erfüllung der Forschungs- oder Statistikzwecke notwendig ist. Das Recht auf Auskunft gemäß Artikel 15 DSGVO besteht darüber hinaus nicht, wenn die Daten für Zwecke der wissenschaftlichen Forschung erforderlich sind und die Auskunftserteilung einen unverhältnismäßigen Aufwand erfordern würde. Über eine Anwendung des Artikels wird im Einzelfall entschieden.

## **6. Datensicherheit**

Wir bedienen uns geeigneter technischer und organisatorischer Sicherheitsmaßnahmen, um Ihre Daten gegen zufällige oder vorsätzliche Manipulationen, teilweisen oder vollständigen Verlust, Zerstörung oder gegen den unbefugten Zugriff Dritter zu schützen. Unsere Sicherheitsmaßnahmen werden entsprechend der technologischen Entwicklung fortlaufend verbessert.

*[survey page 2; English]*

## **Privacy information**

### **Online survey in the context of the Agile InnovationsHub.**

In the context of participation in this online survey of the research project ARENA2036 - Agile InnovationsHub, personal data will be processed by us as the data controllers and stored for the duration necessary to fulfill the specified purposes and legal obligations. In the following, we inform you about what data is involved, how it is processed and what rights you have in this regard.

According to Art. 4 No. 1 of the General Data Protection Regulation (GDPR), personal data is any information relating to an identified or identifiable natural person.

#### **1. name and contact details of the data controller and the company data protection officer.**

The data controller is:

Radboud University  
Houtlaan 4  
6525 XZ Nijmegen, the Netherlands  
(024) 361 61 61

The data processing sub-organization is:

Faculty of Social Sciences  
Thomas van Aquinostraat 4  
P.O. Box 9104  
6500 HE Nijmegen, the Netherlands  
Dr. Martijn de Lange ([m.delange@psych.ru.nl](mailto:m.delange@psych.ru.nl)).

#### **2. processing of personal data and purposes of processing**

##### **a) Voluntariness**

Participation in the workshops and surveys of the research project ARENA2036 - Agile InnovationsHub is voluntary. You are free not to answer individual questions. All information

will be treated confidentially. You will not suffer any disadvantages from not participating or skipping individual questions.

#### **b) Legal basis**

We process the personal data (through surveys) on the basis of your expressly given consent pursuant to Art. 6 (1) p. 1 lit. a DSGVO.

#### **c) Purpose of the survey**

The aim of the research project is to generate scientific findings on innovation and knowledge management in ARENA2036 and to make best practices available to you on this basis.

Surveys will be conducted for this purpose. A publication of the results in scientific journals is aimed at.

#### **d) Documentation and publication**

In order to enable the scientific documentation and evaluation of the surveys and the workshops, surveys will be conducted and observations will be noted, then these will be written down and evaluated by our project staff.

The documentation and publication of the results of the survey is done exclusively in anonymous form, without naming you and without providing any information that could be used to draw conclusions about you. Results are always presented only in edited, aggregated form. Occasionally, verbatim quotes from the workshops are used to illustrate the facts presented. These statements are also anonymized.

### **3. storage period**

The completed surveys will be deleted after the end of the research project or on October 1, 2021 at the latest. At that time, the part containing the personal data will be deleted from the dataset. The survey results, which do not contain personal data, will be permanently archived and made available for subsequent scientific use, including by third parties. The storage takes place for scientific purposes and in order to be able to fulfill our documentation obligations if necessary.

### **4. passing on of personal data**

The research results derived from the surveys and observations will be made available to all project partners of ARENA2036 - Agilger InnovationsHub (namely Fraunhofer Institute for Industrial Engineering, Daimler AG and Siemens AG), if required.

A transfer of personal data to other third parties does not take place in principle. A transfer is only possible if there is a legal obligation for the transfer according to Art. 6 para. 1 p. 1 lit. c DSGVO or if you have given your explicit consent according to Art. 6 para. 1 p. 1 lit a DSGVO.

A transfer of personal data to a third country or an international organization is excluded.

## **5. data subject rights**

You have the right

- in accordance with Art. 7 (3) DSGVO to revoke your consent once given to us at any time.

This has the consequence that we may no longer continue the data processing based on this consent for the future;

- to request information about your personal data processed by us in accordance with Art. 15 DSGVO. In particular, you may request information about the processing purposes, the category of personal data, the categories of recipients to whom your data have been or will be disclosed, the planned storage period, the existence of a right to rectification, erasure, restriction of processing or objection, the existence of a right of complaint, the origin of your data if it has not been collected by us, and the existence of automated decision-making, including profiling, and, if applicable, meaningful information about its details;

- pursuant to Art. 16 DSGVO, to request the correction of incorrect or incomplete personal data stored by us without undue delay;

- pursuant to Art. 17 DSGVO, to request the erasure of your personal data stored by us, unless the processing is necessary for the exercise of the right to freedom of expression and information, for compliance with a legal obligation, for reasons of public interest or for the establishment, exercise or defense of legal claims;

- pursuant to Art. 18 DSGVO, to request the restriction of the processing of your personal data, insofar as the accuracy of the data is disputed by you, the processing is unlawful, but you object to its erasure and we no longer require the data, but you need it for the assertion, exercise or defense of legal claims or you have objected to the processing pursuant to Art. 21 DSGVO;

- pursuant to Art. 20 DSGVO, to receive your personal data that you have provided to us in a structured, common and machine-readable format or to request the transfer to another controller; and

- complain to a supervisory authority in accordance with Art. 77 DSGVO. As a rule, you can contact the supervisory authority of your usual place of residence or workplace or our company headquarters for this purpose.

- According to Art. 89 DSGVO in conjunction with § Section 27(2) of the BDSG, the aforementioned rights under Articles 15, 16, 18 and 21 of the DSGVO are restricted to the extent that these rights are likely to make it impossible or seriously impair the achievement of the research or statistical purposes and the restriction is necessary for the fulfillment of the research or statistical purposes. Furthermore, the right of access pursuant to Article 15 of the GDPR does not apply if the data are necessary for scientific research purposes and providing the information would require a disproportionate effort. A decision on the application of this article will be made on a case-by-case basis.

## **6. Data security**

We use appropriate technical and organizational security measures to protect your data against accidental or intentional manipulation, partial or complete loss, destruction or against unauthorized access by third parties. Our security measures are continuously improved in line with technological developments.

[Umfrage Seite 3; German, original]

### **Einwilligungserklärung**

Hiermit erteilen ich der Radboud Universität Nijmegen, Niederlanden die Einwilligung zur Verarbeitung meiner personenbezogenen Daten, die von mir im Rahmen dieser Onlineumfrage erhoben werden. Den Umfang, die Speicherdauer und die genauen Zwecke der Datenverarbeitung, kann ich der Datenschutzzinformation entnehmen.

- Ich habe die Datenschutzzinformation zur Verarbeitung meiner personenbezogenen Daten im Rahmen der Teilnahme in dieser Onlineumfrage einer Master Thesis an der Radboud University erhalten.
- Ich willige ein, dass das mit mir im Rahmen des Forschungsprojekts erhobene Daten zu den in der Datenschutzzinformation näher erläuterten wissenschaftlichen Zwecken gespeichert werden. Die Daten werden anonym erhoben und sind später nicht auf meine Person zurück zu führen.
- Ich stimme zu, dass ich die Möglichkeit hatte, Fragen zu dieser Studie zu stellen und meine Fragen zufriedenstellend beantwortet wurden.
- Ich stimme zu, dass mir ausreichend Zeit eingeräumt wurde, um zu überlegen, ob ich meine Einwilligung geben möchte.
- Mir ist bekannt, dass ich diese Einwilligung jederzeit widerrufen kann. Die Rechtmäßigkeit der Verarbeitung meiner personenbezogenen Daten bis zum Widerruf bleibt davon unberührt.

(Check Box) **Hiermit bestätige ich**, dass ich älter als 18 Jahre bin, ausreichend über diese Studie informiert wurde und willige freiwillig dazu ein, an dieser Studie teilzunehmen.

(Check Box) **Ich willige nicht ein** und möchte diese Studie stoppen.

*[survey page 3; English]*

### **Declaration of consent**

I hereby give my consent to Radboud University Nijmegen, Netherlands to process my personal data collected from me in the context of this online survey. The scope, storage period and exact purposes of the data processing, I can find in the privacy information.

- I have received the data protection information on the processing of my personal data in the context of participation in this online survey of a Master Thesis at Radboud University.
- I agree that the data collected with me in the context of the research project will be stored for the scientific purposes explained in more detail in the data protection information. The data will be collected anonymously and cannot later be traced back to my person.
- I agree that I have had the opportunity to ask questions about this study and that my questions have been answered satisfactorily.
- I agree that I have been given sufficient time to consider whether to give my consent.
- I understand that I may withdraw this consent at any time. The lawfulness of the processing of my personal data until revocation remains unaffected.

(Check Box) **I hereby confirm** that I am over 18 years of age, have been adequately informed about this study and voluntarily consent to participate in this study.

(Check Box) **I do not consent** and would like to stop this study.

*[Umfrage Seite 4; German, original]*

**Willkommen!**

**Wir freuen uns, dass du dich dazu entschieden hast, an unserer Studie teilzunehmen.**

Danke!

Du wirst nun einige Fragen zu **deiner ganz persönlichen Wahrnehmung** der momentanen Arbeitssituation während der Covid-19 Pandemie zu sehen bekommen.

Es gibt keine "richtigen" oder "falschen" Antworten,  
viel wichtiger ist es, daß du möglichst genaue und ehrliche Antworten auf jede einzelne Frage gibst.

Jetzt gehts auch schon los ... und im Anschluss gibt's das Gewinnspiel.

*[survey page 4; English]*

**Welcome!**

**We are pleased that you have decided to participate in our study.**

Thank you!

You will now see some questions **about your very personal perception** of the current work situation during the Covid-19 pandemic.

There are no "right" or "wrong" answers,  
It is much more important that you answer each question as accurately and honestly as possible.

Here we go ... and after that there's the raffle.

[survey page 5; Social Isolation]

Während der Corona Pandemie...

*During the Corona pandemic...*

<i>number</i>	<i>item</i>
1	... fehlt mir Gemeinschaft. ... <i>I lack companionship.</i>
2	... gibt es niemanden, an den ich mich wenden kann. ... <i>there is no one I can turn to.</i>
3	... bin ich gesellig. (R) ... <i>I am an outgoing person. (R)</i>
4	... fühle ich mich außen vorgelassen. ... <i>I feel left out.</i>
5	... fühle ich mich von anderen Menschen isoliert. ... <i>I feel isolated from others.</i>
6	... kann ich Gemeinschaft finden, wenn ich sie möchte. (R) ... <i>I can find companionship when I want it. (R)</i>
7	... bin ich unglücklich, weil ich so zurückgezogen bin. ... <i>I am unhappy being so withdrawn.</i>
8	... sind Menschen um mich herum, aber nicht bei mir. ... <i>people are around me but not with me.</i>

Answer possibilities on a five-point Likert scale:

- Stimme überhaupt nicht zu (*Do not agree at all*)
- Stimme nicht zu (*Do not agree*)
- Stimme weder zu noch lehne ab (*Neither agree nor disagree*)
- Stimme zu (*Agree*)
- Stimme voll und ganz zu (*Fully agree*)

[survey page 6; team information exchange]

Wenn ich an mein Team in der ARENA2036 denke:

Während der Corona Pandemie...

*Thinking of my team at ARENA2036:*

*During the Corona pandemic...*

<i>number</i>	<i>item</i>
1	...wurde innerhalb des Teams häufig kommuniziert. <i>...there was frequent communication within the team.</i>
2	...kommunizieren die Teammitglieder oft in spontanen Meetings, Telefongesprächen usw. <i>... The team members communicated often in spontaneous meetings, phone conversations, etc.</i>
3	... kommunizieren die Teammitglieder meist direkt und persönlich miteinander. <i>... The team members communicated mostly directly and personally with each other.</i>
4	... gibt es Mediator*innen, durch die viel Kommunikation stattfindet. (R) <i>... There were mediators through whom much communication was conducted. (R)</i>
5	... werden projektrelevante Informationen von allen Mitgliedern offen geteilt. <i>... Project-relevant information was shared openly by all team members.</i>
6	... werden wichtige Informationen in bestimmten Situationen von anderen Teammitgliedern zurückgehalten. (R) <i>... Important information was kept away from other team members in certain situations. (R)</i>
7	... gibt es in unserem Team Konflikte bezüglich der offenen Informationsweitergabe. (R) <i>... In our team there were conflicts regarding the openness of the information flow. (R)</i>

8	<p>... sind die Teammitglieder zufrieden mit der rechtzeitigen Bereitstellung von Informationen durch andere Teammitglieder.</p> <p><i>... The team members were happy with the timeliness in which they received information from other team members.</i></p>
9	<p>... sind die Teammitglieder zufrieden mit der Genauigkeit der Informationen, die sie von anderen Teammitgliedern erhielten.</p> <p><i>... The team members were happy with the precision of the information received from other team members.</i></p>
10	<p>... sind die Teammitglieder zufrieden mit der Nützlichkeit der Informationen, die sie von anderen Teammitgliedern erhielten.</p> <p><i>... The team members were happy with the usefulness of the information received from other team members.</i></p>

Answer possibilities on a five-point likert scale:

- Stimme überhaupt nicht zu (*Do not agree at all*)
- Stimme nicht zu (*Do not agree*)
- Stimme weder zu noch lehne ab (*Neither agree nor disagree*)
- Stimme zu (*Agree*)
- Stimme voll und ganz zu (*Fully agree*)

*[survey page 7; shared vision]*

Wenn ich an mein Team in der ARENA2036 denke:

Während der Corona Pandemie...

*Thinking of my team at ARENA2036:*

*During the Corona pandemic...*

<i>number</i>	<i>item</i>
1	... wie genau bist du dir im Klaren über die Ziele deines Teams? <i>...How far are you in agreement with the team objectives?</i>
2	... was denkst du, inwieweit sind die Ziele deines Teams den anderen Teammitgliedern klar und deutlich gegenwärtig? <i>...To what extent do you think your team's objectives are clearly understood by other members of the team?</i>
3	... was denkst du, inwieweit können die Ziele deines Teams auch tatsächlich erreicht werden? <i>...To what extent do you think your team's objectives can actually be achieved?</i>
4	... was denkst du, inwieweit sind diese Ziele für dein Unternehmen von Bedeutung? <i>...How worthwhile do you think these objectives are to the organisation?</i>

Answer possibilities on a five-point likert scale:

- Stimme überhaupt nicht zu (*Do not agree at all*)
- Stimme nicht zu (*Do not agree*)
- Stimme weder zu noch lehne ab (*Neither agree nor disagree*)
- Stimme zu (*Agree*)
- Stimme voll und ganz zu (*Fully agree*)

*[survey page 8; creative collective efficacy]*

**Super, du hast schon mehr als die Hälfte der Fragen beantwortet!**

Wenn ich nun an mein Team in der ARENA2036 denke:

Inwieweit trifft diese Aussage zu?

Während der Corona Pandemie...

*Great, you have already answered more than half of the questions!*

*If I now think of my team in the ARENA2036:*

*To what extent is this statement true?*

*During the Corona Pandemic...*

<i>number</i>	<i>item</i>
1	<p>... ist das Team bereit, potentielle Schwachstellen seiner Arbeit kritisch zu bewerten, um das bestmögliche Endergebnis zu erzielen?</p> <p><i>...does the team critically appraise potential weaknesses in what it is doing in order to achieve the best possible outcome?</i></p>
2	<p>... bauen die Teammitglieder gegenseitig auf Ihren Ideen auf, um das bestmögliche Ergebnis zu erhalten?</p> <p><i>...do members of the team build on each other's ideas in order to achieve the best possible outcome?</i></p>
3	<p>... suchen die Personen im Team ständig nach neuen Wegen, Probleme zu betrachten.</p> <p><i>...people in this team are always searching for fresh, new ways of looking at problems.</i></p>
4	<p>... nehmen wir uns in unserem Team die Zeit, die wir brauchen, um neue Ideen zu entwickeln.</p>

	<i>... in this team we take the time needed to develop new ideas.</i>
5	<p>... arbeiten Personen im Team zusammen, um neue Ideen zu entwickeln und zu verwirklichen.</p> <p><i>...people in the team cooperate in order to help develop and apply new ideas.</i></p>

Answer possibilities on a five-point likert scale:

- Trifft gar nicht zu (*Never true*)
- Trifft wenig zu (*Rarely true*)
- Trifft mittelmässig zu (*Sometimes true*)
- Trifft überwiegend zu (*Very Often true*)
- Trifft völlig zu (*Always true*)

[survey page 9; social reflexivity]

Wenn ich an mein Team in der ARENA2036 denke:

Während der Corona Pandemie...

*Thinking of my team at ARENA2036:*

*During the Corona pandemic...*

<i>number</i>	<i>item</i>
1	... unterstützen sich Teammitglieder gegenseitig in schwierigen Zeiten. <i>... team members provide each other with support when times are difficult.</i>
	... ist das Team nicht sehr hilfsbereit, wenn es bei der Arbeit stressig wird. (R) <i>... is the team not very supportive, when things at work are stressful. (R)</i>
3	... dauern in diesem Team Konflikte tendenziell an. (R) <i>... Conflicts tend to linger in this team. (R)</i>
4	... bringen sich in diesem Team die Mitarbeitenden oft gegenseitig neue Fähigkeiten/Kompetenzen bei. <i>... People in this team often teach each other new skills.</i>
5	... wird mit Konflikten in diesem Team konstruktiv umgegangen. <i>... Conflicts are constructively dealt with in this team.</i>
6	... halten wir als Team zusammen, wenn es bei der Arbeit stressig wird. <i>... When things at work are stressful, we pull together as a team.</i>
7	... sind die Teammitglieder oft unfreundlich. (R) <i>... Team member are often unfriendly. (R)</i>
8	... sind die Teammitglieder langsam bei der Konfliktlösung. (R) <i>... People in this team are slow to resolve arguments. (R)</i>

Answer possibilities on a five-point likert scale:

- Stimme überhaupt nicht zu (*Do not agree at all*)
- Stimme nicht zu (*Do not agree*)
- Stimme weder zu noch lehne ab (*Neither agree nor disagree*)
- Stimme zu (*Agree*)

- Stimme voll und ganz zu (*Fully agree*)

[survey page 10; psychological safety]

Wenn ich an mein Team in der ARENA2036 denke:

Während der Corona Pandemie...

*Thinking of my team at ARENA2036:*

*During the Corona pandemic...*

<i>number</i>	<i>item</i>
1	... haben wir eine "wir sitzen in einem Boot"- Einstellung. ... <i>we have a "we are together" attitude.</i>
2	... halten wir uns über arbeitsrelevante Themen gegenseitig auf dem Laufenden. ... <i>people keep each other informed about work-related issues in the team.</i>
3	... fühlen sich die Teammitglieder gegenseitig akzeptiert und verstanden. ... <i>people feel understood and accepted by each other.</i>
4	... gibt es im Team echtes Bemühen, Informationen innerhalb der ganzen Arbeitsgruppe zu teilen. ... <i>there are real attempts to share information throughout the team.</i>

Answer possibilities on a five-point likert scale:

- Trifft gar nicht zu (*Never true*)
- Trifft wenig zu (*Rarely true*)
- Trifft mittelmässig zu (*Sometimes true*)
- Trifft überwiegend zu (*Very Often true*)
- Trifft völlig zu (*Always true*)

*[survey page 11; team effectiveness]*

### Fast geschafft!

Wenn ich an mein Team in der ARENA2036 denke:

Während der Corona Pandemie...

### Almost there!

Thinking of my team at ARENA2036:

During the Corona pandemic...

<i>number</i>	<i>item</i>
1	... prüfen wir, ob unsere Arbeit die erwarteten Ergebnisse erbracht hat. ... <i>we check whether our activities produced the expected results.</i>
2	... werden in diesem Team die Ergebnisse von Vorgehensweisen ausgewertet. ... <i>in this team the results of actions are evaluated.</i>
3	... bewerten wir die Abläufe, nachdem bestimmte Arbeiten abgeschlossen sind. ... <i>after certain activities are completed, we evaluate matters.</i>
4	... besprechen wir regelmäßig, ob das Team effektiv arbeitet. ... <i>we regularly discuss whether the team is working effectively.</i>
5	... sind wir ein effektives Team. ... <i>we are an effective team.</i>

Answer possibilities on a five-point likert scale:

- Stimme überhaupt nicht zu (*Do not agree at all*)
- Stimme nicht zu (*Do not agree*)
- Stimme weder zu noch lehne ab (*Neither agree nor disagree*)
- Stimme zu (*Agree*)
- Stimme voll und ganz zu (*Fully agree*)

*[survey page 12; leadership support]*

Denke an deine\*n Teamleiter\*in.

Während der Corona Pandemie, mein\*e Teamleiter\*in...

*Think of your team leader.*

*During the Corona Pandemic, my team leader...*

<i>number</i>	<i>item</i>
1	<p>... berücksichtigt meine persönlichen Gefühle bei der Umsetzung von durchzuführenden Aktionen, die mich betreffen.</p> <p><i>...Considers my personal feelings when implementing actions that will affect me.</i></p>
2	<p>... Berücksichtigt meine persönlichen Bedürfnisse.</p> <p><i>... takes into account my personal needs.</i></p>
3	<p>... stellt sicher, dass die Interessen der Mitarbeitende bei der Entscheidungsfindung berücksichtigt werden.</p> <p><i>...Ensures the interests of employees are considered when making decisions.</i></p>

Answer possibilities on a five-point likert scale:

- Stimme überhaupt nicht zu (*Do not agree at all*)
- Stimme nicht zu (*Do not agree*)
- Stimme weder zu noch lehne ab (*Neither agree nor disagree*)
- Stimme zu (*Agree*)
- Stimme voll und ganz zu (*Fully agree*)

*[survey page 13; demographics]*

(1)

*zum Abschluss noch 4 kleine letzte Fragen.*

... gleich gibt's das Gewinnspiel.

VOR Covid-19 Ausbruch - wie viele Arbeitstage, pro Woche, warst du durchschnittlich vor Ort in der ARENA2036?

*to finish, 4 small final questions.*

... we're about to start the raffle.

*BEFORE Covid-19 outbreak - how many working days, per week, were you on site at ARENA2036 on average?*

(Answer possibilities)

- <1 day
- 1 day
- 2 days
- 3 days
- 4 days
- Fulltime

(2)

NACH Covid-19 Ausbruch - wie viele Arbeitstage, pro Woche, warst du durchschnittlich vor Ort in der ARENA2036?

*AFTER Covid-19 outbreak- how many working days, per week, were you on site at ARENA2036 on average?*

(Answer possibilities)

- <1 day
- 1 day
- 2 days
- 3 days
- 4 days

- Fulltime

(3)

Dein Geschlecht

*Your gender*

(Answer possibilities)

- Male
- Female
- Other/divers
- No statement

(4)

Und zum Abschluss...

Noch dein Alter

*Last but not least...*

*Your age*

(Answer possibilities)

- 18-20
- 21-25
- 26-30
- 31-40
- 41-50
- 51-60

... und geschafft!

Auf der nächsten Seite geht's zum Debriefing.

*... and done!*

*On the next page you will find the debriefing.*

*[survey page 14; debriefing; German, original]*

### --- Debriefing & Gewinnspiel ---

#### Liebe\*r Teilnehmende\*r,

Du hast an einer **Onlineumfrage zur momentanen Arbeitssituation im Homeoffice** teilgenommen.

Da eine explizite Information über unsere spezifische Versuchshypothese vor Beginn des Experiments die Ergebnisse verfälscht hätte, geben wir erst hier die vollständigen Details der Untersuchung bekannt.

**Durch das momentane Arbeiten im Homeoffice und die damit einhergehende soziale Isolation, gehen wir davon aus, dass dadurch die Effektivität von Teams in der ARENA2036 beeinflusst wird.**

Mit einer vorherigen Erwähnung des Ziels geht oft eine Beeinflussung des Antwortverhaltens einher bzw. ist häufig eine Antworttendenz in Richtung der erwartenden Ergebnisse zu beobachten. **Daher wurde hier eine Einfachblindstudie durchgeführt**, d.h. der Teilnehmende weiß zum Zeitpunkt des Experiments nichts über die wahre Natur der Studie Bescheid. Dies ist ein Goldstandard in diesem Forschungsbereich.

Die Ergebnisse können von **erheblicher Bedeutung für das Verbessern von online/hybriden Zusammenarbeitsformen in der ARENA2036** sein und zu einem besseren wissenschaftlichen Verständnis von den Bedürfnissen der Mitarbeitenden in einer solchen Situation führen.

Wenn Du weitere **Fragen oder Kommentare** zu dieser Studie hast, wenn Du dich durch den Fragebogen körperlich oder seelisch geschädigt fühlst oder wenn du deine Daten zurückziehen möchtest, nachdem du nun den grundlegenden Zweck der Forschung erfahren hast, sende bitte eine E-Mail an: [hofmann@bwt.uni-stuttgart.de](mailto:hofmann@bwt.uni-stuttgart.de). Falls Du Anmerkungen bezüglich der Studie hast und/oder diese mit einer unabhängigen Partei teilen möchtest,

wende dich an den Forschungskordinator dieser Studie: Dr. Martijn de Lange  
([m.delange@psych.ru.nl](mailto:m.delange@psych.ru.nl)).

Vielen Dank für Deine Teilnahme!

Mit freundlichen Grüßen,  
Samuel T. Hofmann

**PS: Zur Verlosung der drei leckeren Tafeln Tony's Choclonely, geht es HIER.**

Du wirst auf eine neue Seite geleitet.

So gewährleisten wir, dass deine persönliche E-Mail-Adresse nur für das Gewinnspiel genutzt und nicht mit deinen Antworten in Verbindung gebracht wird.

(du kannst die Umfrage nun schließen)

*[survey page 14; debriefing; English]*

**--- Debriefing & Raffle ---**

**Dear participant,**

You have participated in an **online survey about your current work situation** in the home office.

Since explicit information about our specific experimental hypothesis before the start of the experiment would have falsified the results, we are only disclosing the full details of the survey here.

**By currently working in a home office and the accompanying social isolation, we hypothesize that this will influence the effectiveness of teams in ARENA2036.**

A prior mention of the goal is often accompanied by an influence on the response behavior, or a response tendency in the direction of the expected results can often be observed. Therefore, a single-blind study was conducted here, meaning that the participant is unaware of the true nature of the study at the time of the experiment. This is a gold standard in this area of research.

The results may be of **significant importance for improving online/hybrid collaboration in ARENA2036** and may lead to a better scientific understanding of the needs of employees in such a situation.

If you have further **questions or comments** about this study, if you feel physically or emotionally harmed by the questionnaire, or if you wish to withdraw your data now that you have learned the basic purpose of the research, please send an email to: [hofmann@bwt.uni-stuttgart.de](mailto:hofmann@bwt.uni-stuttgart.de). If you have comments regarding the study and/or would like to share them with an independent party, please contact the research coordinator of this study: Dr. Martijn de Lange ([m.delange@psych.ru.nl](mailto:m.delange@psych.ru.nl)).

Thank you for your participation!

Sincerely,  
Samuel T. Hofmann

PS: To enter the drawing for three delicious bars of Tony's Choclonely, go [HERE](#).

You will be redirected to a new page.

This way we ensure that your personal email address will only be used for the raffle and will not be associated with your answers.

(you can close the survey now)

*[second, external survey: raffle]*

Trage bitte hier deine E-Mail-Adresse ein, wenn du eine der drei leckeren Tafeln Tony's Chocolonely gewinnen möchtest.

Für diese Verlosung ist der Rechtsweg leider ausgeschlossen.

Meine E-Mail-Adresse: \_\_\_\_\_

*Please enter your e-mail address here if you would like to win one of the three delicious bars of Tony's Chocolonely.*

*Unfortunately, there is no legal recourse for this giveaway.*

*My email address: \_\_\_\_\_*

## Appendix E

### **Link to YouTube video introducing study two**

This video was created, shot and edited by the author with Adobe Premiere Pro (CS6) for a creative call for participation in study two.

[https://youtu.be/jEd\\_6Ns7eJg](https://youtu.be/jEd_6Ns7eJg)

## Appendix F

### Online survey study two

This second study was distributed only in English. The survey was made and distributed with Qualtrics.com (<https://www.qualtrics.com>).

*[survey page 1: welcome + knockout]*

Welcome!

This study is about teamwork.

Teamwork is defined as the cooperation of a group of people to achieve a clearly defined goal together.

Before we start a quick question:

Have you worked in a team **in the last 2 months**? That is, working together with others in a team to achieve a clearly defined goal?

You might have worked in a team in your studies or at work.

For example:

- general working groups at work (part-time job, full-time)
- joint project work (assignment, research project, ... ) during your studies,

[yes -> continue survey]

[no -> end survey]

*[survey end page: knockout]*

Unfortunately, you have not experienced teamwork in the last two months.

This means you can't participate in this survey.

This is because we are studying how people behave and collaborate in teams. As you have not experienced such work in the past two month, you are not permitted to participate in this study.

Thank you nevertheless for your interest in this research!

The survey is now finished. You can close this window now.

[survey page 2: welcome + information letter]

### **Information letter**

about the online study on the topic  
"Working in a team".

You have worked in a team with others in the last 2 months. This means that you can participate in this study.

This study is about working together in a team.

We are interested in the different mental processes that underlie teamwork and successful coordination of such. Therefore, we would like to ask you for 5 minutes of your time.

The results of this survey can be of **considerable importance for improving online/hybrid forms of collaboration** and lead to a better scientific understanding of the needs of employees.

\*\*\*DONATION\*\*\*

As a thank you for your time and effort we are going to **donate 1€ per participant to the children's home *Kinder & Jugendheim Funk*** close to Limburg an der Lahn in Mid-Germany.

This children's home is a particular matter of the heart for us, because it cares for children who have experienced **domestic violence during the Corona pandemic** and are no longer safe at home.

In a family-like atmosphere, there are 11 beds for children starting from elementary school age.

The stay is supported among other things by animal-assisted riding therapy and by therapeutically trained dogs.

Here you can find out more about the children's home: <https://kinderheim360.de/>

This online study is now structured as follows:

First, please give your consent to participate.

After that you will get a quick input from us and afterwards a short survey.

During the study you can **end your participation at any time**. Your exit will not have any consequences.

**All information we collect is processed anonymously.**

This means that the results cannot be traced back to you later. After the end of the study, we cannot inform you about your personal results, but we could inform you about the overall results of the study. If you are interested, please send an email to:

[hofmann@bwt.uni-stuttgart.de](mailto:hofmann@bwt.uni-stuttgart.de). Also, if you have any **comments** about our study afterwards, you can always contact us.

If you no longer wish to participate in the study after receiving this information, simply close this window and we will thank you for your time.

You can start the survey by clicking onto the next page.

With best regards,  
Samuel T. Hofmann

---

Agile InnovationHub  
**ARENA**2036 e.V.  
Pfaffenwaldring 19  
70569 Stuttgart, Germany

*[survey page 3: informed consent]*

[Privacy information has been uploaded as a pdf document in Qualtrics and should be opened by clicking]

\_\_\_\_\_ [pdf starts here] \_\_\_\_\_

## **Privacy information**

### **Online survey within the Agile InnovationsHub project**

In the context of participation in this online survey of the research project ARENA2036 - Agile InnovationsHub, personal data will be processed by us as the data controllers and stored for the duration necessary to fulfill the specified purposes and legal obligations. In the following, we inform you about what data is involved, how it is processed and what rights you have in this regard.

According to Art. 4 No. 1 of the General Data Protection Regulation (GDPR), personal data is any information relating to an identified or identifiable natural person.

#### **1. name and contact details of the data controller and the company's data protection officer.**

The data controller is:  
 Radboud University  
 Houtlaan 4  
 6525 XZ Nijmegen, the Netherlands  
 (024) 361 61 61

The data processing sub-organization is:

Faculty of Social Sciences  
 Thomas van Aquinostraat 4  
 P.O. Box 9104  
 6500 HE Nijmegen, the Netherlands  
 Dr. Martijn de Lange (m.delange@psych.ru.nl).

#### **2. processing of personal data and purposes of processing**

##### **a) Voluntariness**

Participation in the online study of the research project ARENA2036 - Agile InnovationsHub is voluntary. You are free not to answer individual questions. All information will be treated confidentially. You will not suffer any disadvantages from not participating or skipping individual questions.

#### **b) Legal basis**

We process the personal data (through surveys) on the basis of your expressly given consent pursuant to Art. 6 (1) p. 1 lit. a DSGVO.

#### **c) Purpose of the survey**

The aim of the research project is to generate scientific findings on innovation and knowledge management in ARENA2036 and to make best practices available to you on this basis. For this purpose, surveys and online studies will be conducted. A publication of the results in scientific journals is aimed at.

#### **d) Documentation and publication**

In order to enable the scientific documentation and evaluation of this online study, surveys will be conducted and subsequently evaluated by our project staff.

The documentation and publication of the results of the study will be carried out exclusively in anonymous form, without naming you and without providing any information that would allow us to draw conclusions about you. Results are always presented only in processed, aggregated form.

### **3. storage period**

The completed surveys will be deleted after the end of the research project or on October 1, 2021 at the latest. At that time, the part containing personal data will be deleted from the dataset. The survey results, which do not contain personal data, will be permanently archived and made available for subsequent scientific use, including by third parties. The storage takes place for scientific purposes and in order to be able to fulfill our documentation obligations if necessary.

### **4. passing on of personal data**

The research results derived from the surveys and observations will be made available to all project partners of ARENA2036 - Agilger InnovationsHub (namely Fraunhofer Institute for Industrial Engineering, Daimler AG and Siemens AG), if required.

A transfer of personal data to other third parties does not take place in principle. A transfer is only possible if there is a legal obligation for the transfer according to Art. 6 para. 1 p. 1 lit. c DSGVO or if you have given your explicit consent according to Art. 6 para. 1 p. 1 lit. a DSGVO.

## **5. data subject rights**

You have the right

- Pursuant to Art. 7 (3) DSGVO, to revoke your consent once given to us at any time. This has the consequence that we may no longer continue the data processing based on this consent for the future;
- to request information about your personal data processed by us in accordance with Art. 15 DSGVO. In particular, you may request information about the processing purposes, the category of personal data, the categories of recipients to whom your data have been or will be disclosed, the planned storage period, the existence of a right to rectification, erasure, restriction of processing or objection, the existence of a right of complaint, the origin of your data if it has not been collected by us, as well as the existence of automated decision-making, including profiling, and, if applicable, meaningful information about its details;
- in accordance with Art. 16 DSGVO, to demand the immediate correction of incorrect or completion of your personal data stored by us;
- pursuant to Art. 17 DSGVO, to request the erasure of your personal data stored by us, unless the processing is necessary for the exercise of the right to freedom of expression and information, for compliance with a legal obligation, for reasons of public interest or for the establishment, exercise or defense of legal claims;
- pursuant to Art. 18 DSGVO, to request the restriction of the processing of your personal data, insofar as the accuracy of the data is disputed by you, the processing is unlawful, but you object to its erasure and we no longer require the data, but you need it for the assertion, exercise or defense of legal claims or you have objected to the processing pursuant to Art. 21 DSGVO;

- pursuant to Art. 20 DSGVO, to receive your personal data that you have provided to us in a structured, common and machine-readable format or to request the transfer to another controller; and
- complain to a supervisory authority in accordance with Art. 77 DSGVO. As a rule, you can contact the supervisory authority of your usual place of residence or workplace or our company headquarters for this purpose.
- According to Art. 89 DSGVO in conjunction with. § Section 27(2) of the BDSG, the aforementioned rights under Articles 15, 16, 18 and 21 of the DSGVO are restricted to the extent that these rights are likely to make it impossible or seriously impair the achievement of the research or statistical purposes and the restriction is necessary for the fulfillment of the research or statistical purposes. Furthermore, the right of access pursuant to Article 15 of the GDPR does not apply if the data are necessary for scientific research purposes and providing the information would require a disproportionate effort. A decision on the application of this article will be made on a case-by-case basis.

## **6. data security**

We use appropriate technical and organizational security measures to protect your data against accidental or intentional manipulation, partial or complete loss, destruction or against unauthorized access by third parties. Our security measures are continuously improved in line with technological developments.

\_\_\_\_\_ [pdf ends here] \_\_\_\_\_

## **Declaration of consent**

I hereby give active consent to Radboud University Nijmegen, Netherlands to process my personal data collected from me in the context of this online survey. The scope, storage period and exact purposes of the data processing, I can find in the privacy information.

I hereby agree that

- I have received the data protection information on the processing of my personal data.

- my data will be stored for scientific purposes. The data will be collected anonymously and cannot later be traced back to my person.
- I have had the opportunity to ask questions about this study and my questions have been answered satisfactorily.
- I have been given sufficient time to consider whether I wish to give my consent.
- I am aware that I can revoke this consent at any time. The lawfulness of the processing of my personal data until revocation remains unaffected.

[yes -> continue]

(Check Box) **I hereby voluntarily confirm** that I am over 18 years of age, have been adequately informed about this study and wish to continue participation. Moreover, I know that I am only allowed to participate in this research ones.

[no -> end survey]

(check box) **I hereby object** to the above statements and wish to terminate this study immediately. This means that you cannot participate in this study.

[-> end page]

*[RANDOMISATION into either control or intervention condition]*

*[survey EXPERIMENTAL page 1]*

**Welcome!**

**We are pleased that you have decided to participate in our study.**

Thank you!

You will now receive a little input from us and afterwards we will ask you to fill in a few questions.

Earlier we asked you if you have worked in a team in the last two months.  
This is the team we are going to focus on now.

We assume that your team and you have not been able to work together as usual for a year now due to the pandemic.

**Please imagine your team now.** Imagine it exactly as you remember it.

(e.g. imagine the last time you had a physical meeting together, or a web-conference you recently had)

- **Who is sitting where?** (... in the conference room? Or where is the team member sitting you observe on your screen? Is she sitting in her kitchen? Or on the balcony?)
- **What does it look like around you?** (... are you sitting in the same room as the other team members? Or are you sitting in your living room with your laptop?)
- **What is the weather like?** (...when you imagine to look outside)
- **What are you all wearing?** (...have you perhaps only dressed up on your upper body and still wearing your pajamas below? How do other people look like you observe? Are you perhaps all casually dressed meeting outside for a walk?)
- **What does it smell like?**

*Now let this picture develop in your head.  
Give yourself a few minutes for this. Take your time.*

After that click on the next page.

*[survey EXPERIMENTAL page 2]*

Now imagine that you look around and take a good look at each of your team members.  
*Please do that now.*

Then think about what connects you with your team.

- What do you all have in common?
- What makes you special as a team?
- What makes you a good team?

*[survey EXPERIMENTAL page 3]*

Now think about deeply rooted commonalities with your team (things you share deep inside you).

That is, don't think e.g. about you both wearing glasses, but rather about experiences and values you share.

- So, please think about **situations** that you have mastered and experienced together as a team,
- think about the **values** that all (or most) of you share about teamwork.
- think about what **background** you all have, that connects you. Like where you are from, and what educational background you all have.

*Please think about two similarities now.*

Afterwards, write down the two deeply rooted similarities you thought of and explain in a few words what these similarities are.

1. \_\_\_\_\_
2. \_\_\_\_\_

*[survey EXPERIMENTAL page 4]*

Additionally, a good team is not only about similarities, but also about differences.

For very good teamwork, it is important that team members in your team have different opinions, values, and ideas.

Some people see these differences as costs, but they can also be seen as strengths, as **unique knowledge and skills of team members to complement one another** so that eventually your team can perform at its best.

We would like you now to think about this:

- First **identify two differences** between yourself and your team members.  
*Please do this now.*
- Afterwards, think about how these differences of every team member can be combined and **used as a strength**. What is the **added value of every single team member**? What can you add and what can the others add to the team? How can the specialties of every single team member be combined so that it complements your team to **perform better as a whole**.

*Please do this now.*

*Give yourself a few minutes to think about this deeply. Take time for this.*

Afterwards, please write down the two differences in skills, knowledge and values that you can complement your team members with.

Please also explain in a few words why you have chosen those.

1. \_\_\_\_\_

2. \_\_\_\_\_

Great, you are already half through the study!

*[survey EXPERIMENTAL page 5: measurements - see below]*

*[survey EXPERIMENTAL page 6: debriefing]*

--- Debriefing ---

Dear Participant,

You have participated in an **online study about working together in a team.**

With the completion of the study, we can now provide you with the full details of the research.

In this study, we investigate the direct **link between the activation of thoughts about similarities and complementing differences of team members and feelings of cognitive proximity. Studying this relationship we moreover investigate whether these thoughts may be able to increase collective creative efficacy** (the feeling of being able to get creative together) **and consequently perceived team effectiveness.**

We hypothesized that activating thoughts about shared similarities and complementing differences will make team members feel more connected and close to their members. Moreover, we hypothesized that this will lead to higher levels of collective creative efficacy and a higher level of perceived team effectiveness.

All participants were randomly assigned to one of two groups. While one half simply imagined their team, the other half were guided to use thoughts about similarities and complementing differences.

You were in the intervention-group.

The results of this study can be of **significant importance for improving online/hybrid collaboration in innovation teams but also for understanding team dynamics in general.**

If you have further questions or comments about this study, if you feel harmed in any way by the study, or if you would like to withdraw your data now that you have learned about the basic purpose of the research, please send an email to: [hofmann@bwt.uni-stuttgart.de](mailto:hofmann@bwt.uni-stuttgart.de).

If you have comments regarding the study and/or would like to share them with an independent party, please contact the research coordinator of this study: Dr. Martijn de Lange ([m.delange@psych.ru.nl](mailto:m.delange@psych.ru.nl)).

Thank you for your participation!

Sincerely,

Samuel T. Hofmann

This is the end of this study.

If you have any questions, remarks or comments, please let us know here:

[ text field ]

Please click on the next page to finish this study.

*[survey end page]*

Thank you for your participation in this study. You helped us a lot!

Your answers have been saved.

You can now close this window.

*[survey CONTROL page 1]*

**Welcome!**

**We are pleased that you have decided to participate in our study.**

**Thank you!**

You will now receive a little input from us and afterwards we will ask you to fill in a few questions.

Earlier we asked you if you have worked in a team in the last two months.

This is the team we are going to focus on now.

We assume that your team and you have not been able to work together as usual for a year now due to the pandemic.

**Please imagine your team now.** Imagine it exactly as you remember it.

(e.g. imagine the last time you had a physical meeting together, or a web-conference you recently had)

- **Who is sitting where?** (... in the conference room? Or where is the team member sitting you observe on your screen? Is she sitting in her kitchen? Or on the balcony?)
- **What does it look like around you?** (... are you sitting in the same room as the other team members? Or are you sitting in your living room with your laptop?)
- **What is the weather like?** (...when you imagine to look outside)
- **What are you all wearing?** (...have you perhaps only dressed up on your upper body and still wearing your pyjama below? How do the other people look like you observe? Are you perhaps all casually dressed meeting outside for a walk?)
- **What does it smell like?**

*Now let this picture develop in your head.*

*Give yourself a few minutes for this. Take your time.*

After that click on the next page.

*[survey CONTROL page 2]*

Now imagine that you look around and take a good look at each of your team members.

*Please do that now.*

If you now think about teamwork in your team, what are you thinking of?

Please write down 2 things you thought of.

(Your answer is completely anonymous!)

1. \_\_\_\_\_

2. \_\_\_\_\_

Great, you are already half through the study!

*[survey CONTROL page 3: measurements - see below]*

*[survey CONTROL page 4: debriefing]*

--- Debriefing ---

Dear Participant,

You have participated in an **online study about working together in a team.**

With the completion of the study, we can now provide you with the full details of the research.

In this study, we investigate the direct **link between the activation of thoughts about similarities and complementing differences of team members and feelings of cognitive proximity. Studying this relationship we moreover investigate whether these thoughts may be able to increase collective creative efficacy** (the feeling of being able to get creative together) **and consequently perceived team effectiveness.**

We hypothesized that activating thoughts about shared similarities and complementing differences will make team members feel more connected and close to their members. Moreover, we hypothesized that this will lead to higher levels of collective creative efficacy and a higher level of perceived team effectiveness.

All participants were randomly assigned to one of two groups. While one half simply imagined their team, the other half were guided to use thoughts about similarities and complementing differences.

You were in the control-group.

The results of this study can be of **significant importance for improving online/hybrid collaboration in innovation teams but also for understanding team dynamics in general.**

If you have further questions or comments about this study, if you feel harmed in any way by the study, or if you would like to withdraw your data now that you have learned about the basic purpose of the research, please send an email to: [hofmann@bwt.uni-stuttgart.de](mailto:hofmann@bwt.uni-stuttgart.de).

If you have comments regarding the study and/or would like to share them with an independent party, please contact the research coordinator of this study: Dr. Martijn de Lange ([m.delange@psych.ru.nl](mailto:m.delange@psych.ru.nl)).

Thank you for your participation!

Sincerely,

Samuel T. Hofmann

This is the end of this study.

If you have any questions, remarks or comments, please let us know here:

[ text field ]

Please click on the next page to finish this study.

*[survey end page]*

[Please, see above.]

*[survey MEASUREMENTS: team information exchange]*

*Still having your team in mind, imagine you would have to work with them now.*

*How would you answer the following questions?*

<i>number</i>	<i>item</i>
1	...There would be frequent communication within the team.
2	...The team members would communicate often in spontaneous meetings, phone conversations, etc.
3	... The team members would communicate mostly directly and personally with each other.
4	... There would be mediators through whom much communication would happen. (R)
5	... Project-relevant information would be shared openly by all team members.
6	... Important information would be kept away from other team members in certain situations. (R)
7	... In our team there would be conflicts regarding the openness of the information flow. (R)
8	... The team members would be happy with the timeliness in which they would receive information from other team members.
9	... The team members would be happy with the precision of the information they would receive from other team members.
10	... The team members would be happy with the usefulness of the information they would receive from other team members.

Answer possibilities on a five-point likert scale:

- Do not agree at all
- Do not agree
- Neither agree nor disagree
- Agree

- Fully agree

*[survey MEASUREMENTS: team identification]*

*Still having your team in mind, imagine you would have to work with them now.*

*How would you answer the following questions?*

<i>numer</i>	<i>item</i>
1	... I would identify with the other team members.
2	... I would define myself as a member of my team.
3	... I would be pleased to be a member of my team.
4	... I would feel strong ties with other members of my team.

Answer possibilities on a five-point likert scale:

- Do not agree at all
- Do not agree
- Neither agree nor disagree
- Agree
- Fully agree

*[survey MEASUREMENTS: CCE]*

*Still having your team in mind, imagine you would have to work with them now.*

*How would you answer the following questions?*

<i>number</i>	<i>item</i>
1	... The team would critically appraise potential weaknesses in what it would be doing, in order to achieve the best possible outcome.
2	... Members of the team would build on each other's ideas in order to achieve the best possible outcome
3	... People in this team would always be searching for fresh, new ways of looking at problems.
4	... In this team we would take the time needed to develop new ideas.
5	... People in the team would cooperate in order to help develop and apply new ideas.

Answer possibilities on a five-point likert scale:

- Do not agree at all
- Do not agree
- Neither agree nor disagree
- Agree
- Fully agree

*[survey MEASUREMENTS: perceived team effectiveness]*

*Still having your team in mind, imagine you would have to work with them now.*

*How would you answer the following questions?*

<i>number</i>	<i>item</i>
1	... We would check whether our activities would produce the expected results.
2	... In this team the results of actions would be evaluated.
3	... After certain activities would be completed, we would evaluate matters.
4	... We would regularly discuss whether the team is working effectively.
5	... We would be an effective team.

Answer possibilities on a five-point likert scale:

- Do not agree at all
- Do not agree
- Neither agree nor disagree
- Agree
- Fully agree

*[survey MEASUREMENTS: covariates]*

**1. How often have you worked together with the team which you were thinking about?**

- only one time
- Rarely
- occasionally
- frequently
- very frequently

**2. How many members does the team have you were thinking about, including yourself?**

\_\_\_\_\_ (only numbers allowed to enter)

*[survey MEASUREMENTS: demographics]*

**3. Your gender**

- Male
- Female
- Non-binary / third gender
- Prefer not to say

**4. Your age**

\_\_\_\_\_ (only numbers allowed to enter)

## Appendix G

### Subsequent analysis of study two

**Non-parametric testing.** A first Wilcoxon-Mann-Whitney test has shown that there was no significant effect of the group (control, experimental) on PCP ( $U = 657.50$ ,  $z = -.94$ ,  $p = .345$ ).

A second Wilcoxon-Mann-Whitney test has shown that there was no significant effect of the group (control, experimental) on CCE ( $U = 710$ ,  $z = -.42$ ,  $p = .673$ ).

A third Wilcoxon-Mann-Whitney test has shown that there was no significant effect of the group (control, experimental) on PTE ( $U = 604.50$ ,  $z = -1.48$ ,  $p = .138$ ). As such, all the tests confirm the non-significant results of the MANCOVA.