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# Foreign Language Use, Virtuality, and the Creative Performance of Dyadic Teams

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## Abstract

Firms rely on their employees' creativity to drive innovation and secure competitive advantages. In the modern workplace, team members often collaborate in a non-native language and interact virtually rather than face-to-face. Yet, the effects of foreign language use and virtuality on the creative performance of teams have not been fully explored. The present study addresses this issue using an experiment with 95 dyadic teams, which we randomly assigned to either a foreign or a native language condition. In line with our theoretical reasoning, we find that foreign language use is detrimental for team creative performance, an effect that can be alleviated by team members' foreign language proficiency. We further observe that, at least in the foreign language condition, interacting virtually rather than face-to-face can stimulate team creative performance. Virtuality may thus help alleviate some globalization-induced challenges to nurturing creative performance.

**Keywords** Team creativity · Foreign language use · Foreign language proficiency · Foreign language anxiety · Virtual interaction

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Listed in alphabetical order, Anja Loderer, Thorsten Semrau and Robert Wilken contributed equally to this work.

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## 1 Introduction

To foster innovation and competitiveness, organizations depend on their employees to be creative (i.e., to generate outcomes that are novel and useful; De Vasconcellos et al., 2019; Lua et al., 2023; Perry-Smith & Shalley, 2014; Zhou & Hoever, 2014). In contemporary organizations, the behaviors and activities that may produce creative outcomes are often embedded in teams (Lua et al., 2023; Mesmer-Magnus & DeChurch, 2009; Reiter-Palmon et al., 2012)—and these teams increasingly often utilize a non-native language and rely on virtual communication technology to interact. However, our understanding of how foreign language use, virtual interaction, and their interplay affect the creative performance of teams is still severely limited.

Due to the increasingly multilingual nature of organizations—ranging from multinational enterprises (MNEs) to domestic firms that employ skilled migrant and other non-native language workers (e.g., Angouri & Piekkari, 2018; Chen et al., 2006; Hokkinen & Barner-Rasmussen, 2023; Kassis-Henderson, 2005; Roberts, 2010; Tenzer et al., 2014; Tenzer et al., 2021)—team creativity in contemporary organizations often involves a fundamental decision regarding the language in which collaboration takes place. Specifically, employees often communicate in a language other than their mother tongue when jointly engaging in activities meant to produce creative outcomes (e.g., Tenzer et al., 2021). But how does foreign language use affect the creative performance of teams? Studies on individual creativity suggest that using a non-native language can affect creative processes and outcomes adversely (e.g., Geenen et al., *in press*; Haans & van Witteloostuijn, 2024; Hayakawa & Keysar, 2018; Nothelfer, 2020). However, given that simply assuming homology between how antecedents relate to creative performance at the individual and team levels may be premature (Zhou & Hoever, 2014), systematic research is needed to understand the impact of foreign language use on team creative performance.

When elaborating on the influence of (foreign) language (use) on the creative performance of teams, the type of work setting—physical or virtual—represents a complementary influence. Like foreign language use, its relevance has emerged from globalization. With increasing frequency, team creativity in contemporary organizations unfolds in virtual settings (e.g., Caligiuri et al., 2020; Charlier et al., 2016); that is, team members interact in a computer-mediated way rather than face-to-face (Hahn & Semrau, 2023; Johnson et al., 2009). However, despite the fundamental changes effectuated by virtual interaction (e.g., De Guinea et al., 2012; Eisenberg et al., 2021; Klitmøller & Luring, 2013; Klitmøller et al., 2015; Mesmer-Magnus et al., 2011), research on how virtuality affects the creative performance of teams is still relatively sparse (for exceptions, see Brucks & Levav, 2022; Giambatista & Bhappu, 2010; Kerr & Murthy, 2004). Most importantly, basically no studies have systematically addressed the question of how the creative performance of teams is shaped by the interplay of communicating in a foreign (rather than native) language and interacting virtually (rather than face-to-face).

The present study addresses this gap. To do so, we draw on the perspective of groups as (motivated) information processors (De Dreu et al., 2011; Hinsz et al., 1997) and conceptualize team creative performance as the extent to which teams can generate a variety of new and valuable ideas in response to an open problem (Baer,

2014; Paulus, 2000). The groups-as-(motivated)-information-processors perspective suggests that team creative performance results from a repeated cycling between individual and team information processing, in which ideas and resources contributed by individual members into a joint information-processing space are modified and refined (De Dreu et al., 2011). Taking this perspective as a point of departure and considering insights from prior research indicating that foreign language use is consequential for the cognitive resources individuals have at their disposal (Geenen et al., *in press*; Volk et al., 2014) and can influence the exchange of knowledge and information in teams (Du-Babcock, 1999; Kassis-Henderson, 2005; Lauring & Klit-møller, 2017), we first propose that using a foreign language rather than one's native language has a negative effect on the creative performance of teams (H1). Expanding on our arguments leading to H1 and building on previous research on foreign language use in MNEs (Geenen et al., *in press*; Hadjichristidis et al., 2017; Urbig et al., 2020; Volk et al., 2014), we also elaborate on how team members' foreign language proficiency (H2) and their foreign language anxiety (H3) qualify the link between foreign language use and the creative performance of teams. Recognizing information processing in teams as being context dependent (Hinsz et al., 1997; Nijstad & De Dreu, 2012) and virtual interaction as an important contextual input factor (Hahn & Semrau, 2023; Mathieu et al., 2008) that can shape team information processing (Hinsz et al., 1997), we further address how team creative performance is affected by virtuality and the interplay between virtuality and foreign language use. Specifically, we evaluate the consequences of the additive and reductive features of computer-mediated interaction (Carte & Chidambaram, 2004) from a groups-as-(motivated)-information-processors perspective to establish why we expect virtual interaction to have a positive main effect on team creative performance (H4), as well as a positive moderation effect on the link between foreign language use and the creative performance of teams (H5).

Following a growing stream of research on collective creativity that zooms in on dyadic teams (e.g., Bellis & Verganti, 2021; Bellis et al., 2024; Brucks & Levav, 2022; Koseoglu et al., 2022; Rouse, 2020; Skalicky et al., 2017), we test our hypotheses using an experimental study with dyads. This focus is particularly appropriate to address our research questions because dyads often constitute the nucleus of collective co-creation in organizations (Bellis & Verganti, 2021; Rouse, 2020), especially in virtual teams (e.g., Martins & Shalley, 2011). Moreover, focusing on dyadic teams allows us to minimize potentially confounding influences related to micropolitical maneuvering and inequality among team members (Rouse, 2020). In our experimental study, we randomly assigned 95 dyadic teams to perform creative tasks in either their native language (here: German) or English as the foreign language. When performing their creative tasks, teams interacted either virtually or face-to-face. To provide us with data on their foreign language anxiety and proficiency, participants completed a questionnaire that included a "fill-in-the-blanks" English test (see, e.g., C-Test, 2007). We analyzed our data using regression analyses.

With the insights generated, the present study contributes to expanding scholarly knowledge in several ways. We provide theoretical arguments and empirical evidence for the negative consequences of foreign language use on team creative performance. As such, our study complements prior research on foreign language use and

the creative performance of *individuals* (e.g., Geenen et al., [in press](#); Haans & van Witteloostuijn, [2024](#)) and adds to a stream of research in international management that addresses linguistic influences on team information and knowledge processing (e.g., Aichhorn & Puck, [2017](#); Klitmøller & Luring, [2013](#); Tenzer et al., [2021](#)) as well as to language-sensitive research in international business, more generally (e.g., Akkermans et al., [2010](#); Barner-Rasmussen et al., [2023](#); Karhunen et al., [2023](#); Tenzer et al., [2017](#)). Identifying foreign language use, and the interplay between foreign language use and, respectively, foreign language proficiency and virtual interaction as important determinants of the creative performance of teams, our study also helps to expand and refine groups-as-(motivated)-information-processors models of team creativity (e.g., De Dreu et al., [2011](#); Miron-Spektor et al., [2022](#)). Our study reveals that interacting virtually may have positive implications for the creative performance of teams, an effect that is primarily driven by the interplay between virtual interaction and foreign language use. These findings also contribute to the ongoing debate on the consequences of virtual interaction for the creative performance of teams (e.g., Brucks & Levav, [2022](#); Giambatista & Bhappu, [2010](#); Kerr & Murthy, [2004](#); Wang et al., [2024](#)) and suggest that instead of elaborating on a potential uniform effect of virtual interaction, future research may be well-advised to focus on contingencies that affect the consequences of virtuality. Given that in contemporary organizations, teams often collaborate in a non-native language (e.g., Tenzer et al., [2021](#)) and interact virtually (Hahn & Semrau, [2023](#)), our study also has important practical implications.

## 2 Conceptual Background and Hypotheses

In the field of organizational behavior, creativity refers to the generation of outcomes that are novel and useful (Amabile, [1988](#); Runco & Jaeger, [2012](#); Zhou & Hoever, [2014](#)).<sup>1</sup> Generating such outcomes requires breaking with norms, or ‘thinking outside the box’ (Goncalo & Staw, [2006](#)), and they may be exhibited by individual employees as well as teams (Seong & Choi, [2023](#); Zhou & Hoever, [2014](#)).

Team creative performance is based on team members interacting to jointly generate novel and useful ideas (Baer, [2014](#); Gilson & Shalley, [2004](#); Paulus, [2000](#); Shin & Zhou, [2007](#)). From a groups-as-(motivated)-information-processors perspective (De Dreu et al., [2008](#); Hinsz et al., [1997](#)), such ideas are generated through a repeated “cycling between individual-level and group-level information processing” (De Dreu et al., [2011](#), p. 82). By means of sharing ideas, providing insights and tentative solu-

<sup>1</sup> Following (Guilford, [1957](#)), the production of creative ideas is usually associated with two types of thinking processes. Divergent thinking—which broadly refers to the generation of multiple different solutions—is typically considered one of the most important elements of creative performance (e.g., Geenen et al., [in press](#); Silvia et al., [2008](#)). Convergent thinking as the second element relates to the process of narrowing down the resulting set of options toward choosing a focal solution. By conceptualizing team creative performance as the extent to which teams are able to generate a variety of new and valuable ideas, this study focuses, in particular, on the divergent thinking element. This focus ties in literature on both team creativity (e.g., Paulus, [2000](#); Baer, [2014](#)) and creativity through a language lens (e.g., Geenen et al., [in press](#); Skalicky et al., [2017](#)), including applied and sociolinguistic studies (e.g., Swann & Deumert, [2018](#)).

tions, and revealing preferences, individual team members contribute resources to a joint group information-processing space (De Dreu et al., 2008; Hinsz et al., 1997). Once contributed, these informational resources are available to others within the team, who may process and integrate them into their own knowledge base (Hinsz et al., 1997; Huang & Liu, 2022). Such integration may lead to new insights, ideas, or solutions that, again, can be shared and thus contributed to the joint information-processing space (De Dreu et al., 2008). Through repeated cycling between individual and team information processing, the resource contributions of different team members may thus be combined, modified, and refined to ultimately result in the generation of ideas that are novel and useful (De Dreu et al., 2011).

When trying to predict the creative performance of teams in line with a perspective of groups as (motivated) information processors, prior research has identified several aspects of team composition (e.g., the configuration of team members' openness for experience and their need for cognition) as well as contextual characteristics (e.g., time pressures) as crucial antecedents (De Dreu et al., 2011). The influences emanating from these contextual and compositional features can be explained when considering them as motivational antecedents of team members' "tendency to engage in systematic and effortful information processing" (De Dreu et al., 2011, p. 83). This tendency determines the depth and degree of deliberation with which information is processed, communicated, and integrated in individual and team information processing (e.g., De Dreu et al., 2008; De Dreu et al., 2011; Miron-Spektor et al., 2022). Beyond stimulating information processing at the individual level, it also appears to enable teams to achieve deeper processing of diverging perspectives and to better bridge representational gaps within the group (De Dreu et al., 2008, 2011; Miron-Spektor et al., 2022). Against this backdrop, we follow earlier research on team creativity (Li et al., 2018; Huang & Liu, 2022; Miron-Spektor et al., 2022) and draw on a perspective of "groups as (motivated) information processors" (De Dreu et al., 2008, p. 24) to subsequently develop our hypotheses, which are illustrated in Fig. 1. In so doing, we theorize how the (foreign) language used by a team in conjunction with the

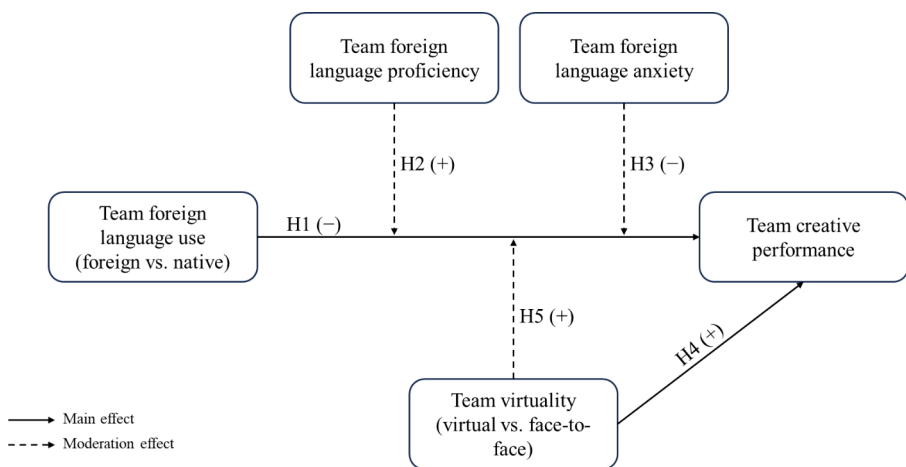


Fig. 1 Conceptual model

type of work setting (physical or virtual) affects team creative performance through a groups-as-(motivated)-information-processors lens.

## 2.1 Foreign Language Use and Team Creative Performance

To date, no studies have systematically investigated the influence on team creativity of using a non-native language. Although several studies indicate that foreign language use affects the creative performance of *individuals* (Geenen et al., [in press](#); Haans & van Witteloostuijn, [2024](#); Hayakawa & Keysar, [2018](#); Nothelfer, [2020](#); Stephan, [2017](#)), it is widely recognized that, at least in the creativity domain, assuming homology (i.e., assuming that antecedents have the same effects at different levels) is not necessarily justified, because the processes and dynamics involved in generating outcomes at different levels tend to vary considerably (Zhou & Hoever, [2014](#); Zhou & Shalley, [2008](#)). More specifically, the perspective of groups as (motivated) information processors introduced previously suggests that the consequences of foreign language use for individual information processing *and* for team information processing need to be considered to predict its overall effect on team creative performance. Therefore, we subsequently integrate, from a perspective of groups as (motivated) information processors, insights on how foreign language use influences the creative performance of *individuals* (Geenen et al., [in press](#); Haans & van Witteloostuijn, [2024](#); Hayakawa & Keysar, [2018](#); Nothelfer, [2020](#); Stephan, [2017](#)) and shapes processes of team communication and interaction *in general* (e.g., Chen et al., [2006](#); Kassis-Henderson, [2005](#); Klitmøller et al., [2015](#); Peltokorpi & Vaara, [2014](#); Tenzer & Pudelko, [2017](#)), to develop our theoretical reasoning.

In principle, *positive* effects of foreign language use on teams' creative performance seem possible. Using a foreign language may potentially enable unfamiliar associations and facilitate 'thinking-out-of-the-box' among individual team members (e.g., Skalicky et al., [2022](#); Stephan, [2017](#)). Moreover, through an applied linguistics and sociolinguistics lens, a potential for creativity enhancement arises at the team level: When interlocutors use a foreign language rather than their native language when jointly working on a creative task, they are more likely to make language-related mistakes (i.e., make grammatical errors, use words incorrectly, or produce semantically meaningless combinations of words; Swann & Deumert, [2018](#)). At the group level, such rule-breaking creativity related to language use (i.e., linguistic creativity; Swann & Deumert, [2018](#)) may trigger novel associations by other team members, which can in turn positively contribute to the team's overall creative performance.

However, there is even more compelling evidence to suggest that foreign language use might have a *negative* effect on team creativity. Research on individual creativity has found that foreign language use mostly tends to reduce creative performance, especially for verbal creative tasks such as brainstorming (e.g., Geenen et al., [in press](#)). These negative effects have been attributed to increased cognitive load, which binds resources that are thus not available for the (creative) task itself (Geenen et al., [in press](#); Volk et al., [2014](#)). Additionally, the quality of information processing may suffer because vividness of mental imagery can be reduced in a foreign language (Hayakawa & Keysar, [2018](#)). The perspective of groups as (motivated) information processors introduced previously suggests that the creative performance of teams



builds on the resources that individual members contribute to information processing for achieving “a thorough, rich, and accurate understanding of the world” (De Dreu et al., 2011, p. 82). Therefore, it seems reasonable to expect that by depleting the cognitive resources that team members have available, using a foreign language will adversely affect their individual capacities to contribute to the information processing, which is essential for team creative performance.

Similarly, team-level research (e.g., Chen et al., 2006; Kassis-Henderson, 2005; Klitmøller et al., 2015; Peltokorpi & Vaara, 2014; Tenzer & Pudelko, 2017) suggests that using a foreign language will likely also have a negative impact on team information processing. First, studies indicate that foreign language use can slow down communication processes because it makes it more challenging for team members to send and receive messages (Aichhorn & Puck, 2017; Tenzer et al., 2021). Foreign language use can make it more difficult to express oneself (Du-Babcock, 1999; Kassis-Henderson, 2005), and to use linguistic features such as metaphors, humor, and word play (e.g., Skalicky et al., 2017), thus also preventing team members from effectively contributing their ideas and suggestions to the joint team information-processing space. Moreover, foreign language use makes it more difficult to fully and quickly comprehend the contributions of other team members (Kassis-Henderson, 2005; Lauring & Klitmøller, 2017), which may further interfere with effective knowledge integration (Hinsz et al., 1997; Huang & Liu, 2022). Hindering the effective communication and integration of knowledge and information, foreign language use thus likely obstructs the thorough and undistorted processing of information in teams (De Dreu et al., 2008; Dreu et al., 2011; Miron-Spektor et al., 2022), which is crucial for generating creative outcomes (De Dreu et al., 2011).

Overall, based on a groups-as-(motivated)-information-processors perspective, we therefore expect that the potential positive consequences of utilizing a foreign language will likely be outweighed by the potential adverse effects on team creative performance. We consequently propose:

**H1** Using a foreign rather than a native language has a negative effect on team creative performance.

## **2.2 The Moderating Effects of Foreign Language Proficiency and Foreign Language Anxiety**

Prior research has identified various contextual and compositional features of teamwork as motivational antecedents of team members’ “tendency to engage in systematic and effortful information processing” (De Dreu et al., 2011, p. 83). We integrate into a groups-as-(motivated)-information-processors perspective insights from literature that has investigated foreign language processing in multinational organizations through a (neuro-)cognitive perspective (e.g., Geenen et al., *in press*; Hadjichristidis et al., 2017; Urbig et al., 2016; Volk et al., 2014) and argue that foreign language use introduces a complementary set of relevant personal characteristics on which team composition may vary and that may impact teams’ creative performance: team foreign language proficiency and team foreign language anxiety.



### 2.2.1 The Moderating Effect of Team Foreign Language Proficiency

Foreign language proficiency captures the degree to which a person can competently use a non-native language (encompassing, at minimum, listening and speaking, reading and writing [e.g., Hammadou, 1991]). Prior research has identified this proficiency as influential for interactions and performance in a non-native language (e.g., Fleischmann et al., 2020a; Fleischmann et al., 2020b; Tenzer et al., 2021). Building on insights generated by this research stream and the groups-as-(motivated)-information-processors perspective introduced previously, we suggest that the foreign language proficiency of team members moderates the relationship between foreign language use and team creative performance.

When team members' foreign language proficiency is low, team creative performance likely suffers from the adverse effects on individual and team information processing that are associated with using a foreign rather than a native language. As described previously, this is because using a foreign language tends to increase team members' cognitive load (Geenen et al., *in press*; Hadjichristidis et al., 2017; Urbig et al., 2020; Volk et al., 2014) and may negatively affect both individuals' development of high-quality contributions and an effective exchange of information, ideas, and knowledge within the team (Aichhorn & Puck, 2017; Tenzer et al., 2021). When team members are highly proficient in a foreign language, in contrast, these effects are alleviated. Foreign language proficiency reduces the cognitive load associated with using a foreign language (e.g., Geenen et al., *in press*; Presbitero, 2020; Volk et al., 2014). When team members' language proficiency is high, they suffer less from the strain on their cognitive resources that results from using a non-native language and thus can contribute more resources to systematic and effortful task-related information processing (De Dreu et al., 2011). Similarly, foreign language proficiency also reduces the occurrence of language-related misunderstandings (Brannen et al., 2014; Klitmøller & Luring, 2017; Tenzer et al., 2021), which allows members to communicate their own ideas and perspectives more clearly and to integrate the contributions of other team members more effectively and efficiently when using a foreign language. As such, team members who are highly proficient in a foreign language are more likely to be able to bridge representational gaps within the team, which is a precondition for making productive use of different perspectives and jointly generating creative outcomes (e.g., Miron-Spektor et al., 2022).

In sum, by allowing team members to devote more cognitive resources to information processing and by alleviating the negative consequences of foreign language use for the exchange of ideas and information, we expect foreign language proficiency to mitigate the adverse effect of foreign language use on team creative performance. We thus propose:

**H2** Team foreign language proficiency positively moderates the effect of foreign language use on team creative performance.

### 2.2.2 The Moderating Effect of Foreign Language Anxiety

Foreign language anxiety refers to the negative emotional reactions and feelings of tension and apprehension that can arise when learning or using a foreign language (Dewaele & Al-Saraj, 2013; MacIntyre & Gardner, 1994). Initially observed in and conceptualized for language learning contexts, foreign language anxiety has subsequently also been found to be relevant in business contexts (e.g., Neeley, 2013). Related to global personality traits such as neuroticism and emotional intelligence (Dewaele & Al-Saraj, 2013), foreign language anxiety represents a disposition that may differ considerably even between individuals with a similar level of language proficiency (e.g., Gargalianou et al., 2016) and has been identified as an important predictor of how individuals communicate and interact in foreign language settings (Aichhorn & Puck, 2017). Taking this conceptualization as a point of departure and based on the groups-as-(motivated)-information-processors perspective introduced previously, we suggest that team members' foreign language anxiety affects the relationship between foreign language use and team creative performance.

Generally, experiencing negative emotions is associated with threat perceptions and higher levels of stress and strain (Akinola et al., 2019). Coping with stress, in turn, drains the cognitive resources that individuals have at their disposal (Hobfoll, 1989). By binding mental resources and diverting attention away from a focal task (Byron & Khazanchi, 2011) such as creative work (Baas et al., 2008), the negative emotions that result from foreign language anxiety are thus likely to aggravate the strain that foreign language use puts on the cognitive resources that team members can devote to information processing (Volk et al., 2014). Beyond aggravating team members' cognitive strain and reducing the resources they can expend on the creative task, foreign language anxiety may also reduce the probability that team members will "engage in the complex process of exploring their inconsistent perspectives to enable a deeper understanding" (Miron-Spektor et al., 2022, p. 3) when using a foreign language. Foreign language anxiety increases the likelihood that individuals experience communication apprehension and fear of negative evaluation (Horwitz et al., 1986; Presbitero, 2020). It thus raises the probability that foreign language use is experienced as a significant stressor, and prior research based on a groups-as-(motivated)-information-processors perspective suggests that being confronted with stressors can hamper team members' motivation to engage in systematic and effortful information processing (see, e.g., De Dreu et al., 2008; De Dreu et al., 2011; Miron-Spektor et al., 2022). In fact, foreign language anxiety has been found to reduce team members' willingness to engage in foreign language communication, at times to such a degree that they may refrain from participating at all in group discussions (Aichhorn & Puck, 2017). Higher levels of foreign language anxiety are thus likely to result in team members withholding at least some of their ideas and perspectives that they might have contributed to the joint information-processing space in a native language setting. Therefore, foreign language anxiety is likely to interfere with a team's capacity to fully capitalize on the potential benefits of team members' diverse perspectives (De Dreu et al., 2008, 2011; Miron-Spektor et al., 2022).

Building on the arguments developed previously and in line with prior research indicating that foreign language anxiety increases tendencies to refrain from partici-

pating in group discussions and may interfere with a joint production of meaning in teams (Aichhorn & Puck, 2017), we therefore suggest that foreign language anxiety amplifies the negative effect of foreign language use on team creative performance. Consequently, we propose:

**H3** Team foreign language anxiety negatively moderates the effect of foreign language use on team creative performance.

### 2.3 Virtuality and Team Creative Performance

Owing to advances in information and communication technology (ICT) and further accelerated by the COVID-19 pandemic (e.g., Caligiuri et al., 2020), team creativity frequently unfolds in virtual settings (e.g., Charlier et al., 2016), enabling geographically dispersed individuals to collaborate as a team on creative tasks. Thus, reliance on modern ICT for interaction constitutes the distinguishing feature of virtual vis-à-vis face-to-face collaboration (Gibson & Cohen, 2003; Johnson et al., 2009; Kirkman & Mathieu, 2005; Manzevski & Chudoba, 2000).

From a groups-as-(motivated)-information-processors perspective, replacing physically embodied with virtual (i.e., computer-mediated) interaction comprehensively alters the space within which group information processing takes place (De Dreu et al., 2008; Hinsz et al., 1997; Nijstad & De Dreu, 2012). In line with this notion, prior research indicates that interacting virtually rather than face-to-face can profoundly affect creative teamwork (e.g., Brucks & Levav, 2022; Giambatista & Bhappu, 2010; Kerr & Murphy, 2004). The magnitude and directionality of this impact appear to be tied to the simultaneous presence of both *reductive* and *additive* features of computer-mediated technologies.

*Reductive* features of computer technologies imply that virtuality scales down communication compared to face-to-face settings by reducing the possibility to visually and vocally transmit social and nonverbal cues (Carte & Chidambaram, 2004). This reduction in the size of the symbol set that is enabled by virtual technology has multifaceted effects on the joint information-processing space and the cycling between individual and team information processing. On the one hand, there are adverse effects: Interacting virtually can result in an increased potential for misunderstandings and communicative inefficiencies (e.g., Cramton, 2001), which may interfere with the effective processing of information and knowledge. On the other hand, there are beneficial effects: By decreasing communication richness, the reductive features of virtual technologies can diminish the probability that team effectiveness is negatively affected by social categorization processes and social evaluative pressures (Mesmer-Magnus et al., 2011; Ocker, 2005; Rains, 2005), which represent important sources of team inefficiency (Lauring, 2008; Staples & Zhao, 2006). Such liberating effects appear to be primarily associated with a higher level of visual anonymity in virtual settings, because such anonymity results in surface level features—which may highlight interpersonal differences—being less salient than in face-to-face settings (Ocker, 2005; Rains, 2005).

Computer-mediated interaction typically also entails *additive* features, such as online chat options (Carte & Chidambaram, 2004). Such additive features can help structure group and task processes (Giambatista & Bhappu, 2010) by allowing for parallel processing and by enhancing reprocessability and rehearsability. Rehearsability captures the degree to which a medium enables senders to modify and “fine tune a message during encoding, before sending” (Dennis et al., 2008, p. 587). Reprocessability relates to the degree to which a medium allows for messages to be reanalyzed “during decoding, either within the context of the communication event or after” (Dennis et al., 2008, p. 587). Thereby, additive features offer superior tracking of work process by allowing members to search for and retrieve information during collaboration, reduce redundant contributions, and overall increase communication efficiency (Giambatista & Bhappu, 2010; Mesmer-Magnus et al., 2011).

Reflecting these diverse and partly countervailing consequences associated with interacting virtually rather than face-to-face, prior empirical studies on the impact of virtual interaction on team creative performance in terms of new and valuable ideas generated (Baer, 2014; Paulus, 2000) have yielded mixed results. Observed effects range from positive (e.g., Kerr & Murphy, 2004) to negative (e.g., Brucks & Levav, 2022), and prior evidence suggests that these effects may be contingent on factors such as team composition (e.g., Giambatista & Bhappu, 2010), task type, and features of the specific technology used.

From a groups-as-(motivated)-information-processors perspective, the effective cycling between individual and team information processing and the activities involved in combining, modifying, and refining team members’ contributions for generating novel and useful team outcomes (De Dreu et al., 2011; Nijstad & De Dreu, 2012) may benefit from the potential for parallel processing and improvements in group memory due to superior rehearsability and reprocessability, and reduced social categorization tendencies associated with virtual interaction. Members may feel more comfortable voicing even radically novel ideas, taking interpersonal risks, and challenging others’ ideas openly to encourage controversial discussions (Berg, 2012; Mesmer-Magnus et al., 2011). To the extent that such beneficial effects outweigh potential adverse effects from the reduced possibility to visually and vocally transmit social and nonverbal cues, a positive overall effect of interacting virtually rather than face-to-face on the joint generation of novel ideas in teams can be expected. Building on this interpretation of prior empirical evidence within a groups-as-(motivated)-information-processors framework, we suggest that interacting via a technology that combines typical reductive features (e.g., anonymity) with typical additive features (e.g., parallel processing) will facilitate team performance in collaborations that aim at generating a variety of new and valuable ideas. In sum, we propose:

**H4** Interacting virtually rather than face-to-face has a positive effect on team creative performance.

## 2.4 The Moderating Effect of Virtuality

Complementing H4, we additionally suggest that the reductive and additive features associated with interacting virtually can help alleviate the negative consequences of foreign language use on team creative performance as hypothesized in H1.

We previously argued that foreign language use negatively affects team creative performance because it makes it more challenging for team members to send and receive messages and accurately process their content (Aichhorn & Puck, 2017; Tenzer et al., 2021), which adversely affects individual and team information processing. As also described previously, team members can benefit from interacting virtually, because the additive features of computer-mediated interaction, such as online chat options, offer superior rehearsability and reprocessability. Superior rehearsability allows senders to “fine tune a message during encoding, before sending” (Dennis et al., 2008, p. 587) and may thus be particularly suited to alleviate challenges associated with team members having difficulties to contribute their informational and knowledge resources to the joint information processing space when having to express themselves in a foreign language (Du-Babcock, 1999; Kassis-Henderson, 2005). Superior reprocessability allows for messages to be reanalyzed “during decoding, either within the context of the communication event or after” (Dennis et al., 2008, p. 587). As such, a communication channel with superior reprocessability grants team members the opportunity to revisit others’ contributions (Kassis-Henderson, 2005; Lauring & Klitmøller, 2017) and can help ensure that these resources are effectively processed and integrated, especially when a foreign language is used. Moreover, being able to utilize communication channels with superior rehearsability and reprocessability should be particularly valuable when information processing is conducted in a foreign language because it can help prevent misunderstandings in the processes of knowledge sharing and retrieval that often stem from differences in accents and pronunciation (Klitmøller & Lauring, 2013; Tenzer & Pudelko, 2016).

Complementing these lines of reasoning, virtuality may further benefit teams communicating in a foreign language because of the reductive features associated with computer-mediated interaction. When communicating face-to-face in a foreign language, individuals pay comparatively more attention to non-verbal cues, relative to communication in their native tongue (e.g., Batty, 2021), potentially giving rise to an increase in the adverse effects related to social categorization processes and social evaluative pressures (Mesmer-Magnus et al., 2011; Ocker, 2005; Rains, 2005). By reducing the possibility of transmitting nonverbal cues, virtual technology may thus help team members refrain from engaging in such a shift of attention (Carte & Chidambaram, 2004). Indeed, prior studies have suggested that when teams communicate in a non-native language, virtual settings may help mitigate social categorization processes (Klitmøller et al., 2015; Stahl et al., 2010). Further, virtuality may enable members to focus more on informational than the social and symbolic aspects of interaction (Klitmøller & Lauring, 2016), thereby allowing them to instead focus on the task-related cycling between individual and team information processing (De Dreu et al., 2011).

Taken together, we thus expect virtual interaction to alleviate (i.e. positively moderate) the negative consequences of foreign language use on the creative performance of teams. Thus, we propose:

**H5** Interacting virtually rather than face to face positively moderates the negative effect of foreign language use on team creative performance.

### 3 Method

#### 3.1 Participants and Sample

To test our hypotheses, we chose an experimental research design, which allows us to draw inferences about causality with considerable confidence (Aguinis & Edwards, 2014; Grant & Wall, 2009; Podsakoff & Podsakoff, 2019). Responding to discussions related to the generalizability of insights generated using laboratory experiments with homogenous student samples (e.g., Bello et al., 2009; Bönte et al., 2016; Harzing et al., 2013), we decided to recruit students and professional participants with various educational and functional backgrounds for our study. We recruited study participants through multiple channels (e.g., lectures, university messaging channels, public university events, the online recruitment platform Prolific [[www.prolific.com](http://www.prolific.com)]). Students were enrolled in programs relating to management, psychology, human medicine, law, natural sciences, and education. Among the professionals, there were physicians, tax consultants, those working in education and science, in the public sector, in controlling, and in administration, representing industries such as automotive, event management, and sports.

We followed earlier research using an experimental design in the team creativity domain (Giambatista & Bhappu, 2010) and incentivized participation in our study with a fixed show-up fee (roughly corresponding to the minimum wage) and the chance to win one of several additional monetary prizes (prizes ranged from 100€ to 300€ per team). A total of 238 individuals participated in our study. To ensure internal validity and rule out that effects related to cross-country variations in formal and informal institutions impacted our results, we restricted our sample to participants with the same native language (here: German). As a result, our final sample comprised 190 individuals (132 students and 58 professionals). On average, study participants were 27.6 years of age (range=51 years,  $SD=8.43$ ); 108 were female (56.8%).

#### 3.2 Experimental Design and Procedure

Our study encompassed three stages: (1) participants filled out a pre-questionnaire (in German) that provided us with information on demographics, language proficiency, and language anxiety; (2) participants were randomly paired to work on creative tasks in dyadic teams; and (3) participants filled out a post-questionnaire (in German), in which they reflected on team processes and outcomes. To match data from all three parts while ensuring anonymity, we followed established procedures (e.g.,

Urbig et al., 2016) and generated identification codes that consisted of unique combinations of letters and numbers for each participant.

The second experimental part of our study started approximately one week after participants filled out the pre-questionnaire. We temporally separated the first two stages of our study to reduce the salience of the self-reports on language anxiety in the experimental stage. In the experimental stage, we followed earlier research (Martins & Shalley, 2011) in randomly assigning teams to either the foreign language (43 teams) or the native language (52 teams) condition. The assignment of teams to the virtual (41 teams) or face-to-face (54 teams) conditions followed constraints imposed by the COVID-19 pandemic. Of the 54 teams in the face-to-face condition, 50 teams participated before the pandemic (up until February 2020), and 4 teams participated during the pandemic. In the virtual interaction condition, all 41 teams participated in the second half of 2020, during the pandemic. Of the 43 teams in the foreign language condition, 17 teams interacted virtually, and 26 teams interacted face-to-face. Of the 52 teams in the native language condition, 24 teams interacted virtually, and 28 teams interacted face-to-face. Team language and team virtuality were unrelated ( $p=0.517$ ; chi-square test).

Teams in the face-to-face condition participated in the university building. Teams in the virtual interaction condition participated using Slack, a tool that allowed participants to simultaneously communicate via voice-call (orally) and via instant chat (written). To familiarize participants with the functionality, we created an instructional video and sent it to every participant. With participants' informed consent, we audio-recorded all team sessions to ensure that teams communicated in the assigned language. Trained student assistants acted as instructors for the experiments. We equipped them with instructional guidelines that they read to each team prior to the start of the experimental session. Except for the technical instructions provided to participants in the virtual interaction condition, instructions were identical for all teams. Depending on the language condition, instructions were read in either German (native language condition) or English (foreign language condition). Teams then worked on their creative tasks. In the face-to-face condition, teams handed over their results to the instructor on paper, which was then scanned and stored. In the virtual interaction condition, teams produced a digital output, which was stored. We assessed team creative performance based on the files stored (for details, see the next section). After completing the experiment, participants filled out the post-questionnaire and received their reward for participating.

### 3.3 Measures

#### 3.3.1 Team Creative Performance

In line with our conceptualization, we measured *team creative performance* based on how teams performed in three divergent thinking tasks (for similar measurements, see, e.g., De Rooij & Vromans, 2020; Koivisto & Grassini, 2023). Two tasks stemmed from Mainberger's (1977) Test of Divergent Thinking. In the first task, teams provided as many different *comparisons between two objects* (e.g., cat and mouse) as possible within five minutes. In the second task, teams were presented with



two incomplete pictures (e.g., a triangle open at the bottom). Their task was to write down, within five minutes, as many ideas as possible on what these pictures could be if someone were to complete the drawing. We followed Mainberger's (1977) assessment scheme to calculate creative performance and excluded all ideas that were not useful in terms of not being task related. The third task was an *unusual uses* task (Schoppe, 1975), in which teams had to find as many unusual uses as possible for an *empty tin can* and a *simple piece of string* within five minutes each. We followed Schoppe's (1975) assessment scheme to retrieve creative performance by counting the number of ideas teams generated. Two specifically trained raters independently assessed the responses. Inter-rater correlations exceeded 0.94 for all tasks, indicating a high level of consistency (Stemler, 2004). Following prior research (e.g., Geenen et al., [in press](#); Pesout & Nietfeld, 2021), we z-standardized the scores from all three tasks to ensure equal weighting and comparability before aggregating them to an index reflecting team creative performance.

### 3.3.2 Team Foreign Language Use/Team Virtuality

We effect-coded *team foreign language use* (1 = foreign; 0 = native) and *team virtuality* (1 = virtual interaction; 0 = face-to-face interaction).

### 3.3.3 Team Foreign Language Proficiency

In line with prior research (e.g., Geenen et al., [in press](#)), we captured the foreign language proficiency of our study participants during the pre-questionnaire using a "fill-in-the-blanks" English test (see, e.g., C-Test, 2007), equivalent to the one which is commonly used to assign learners to appropriate English-language courses according to their proficiency levels.<sup>2</sup> We summed up the number of correct responses for each participant. A higher number of correct responses indicates a higher level of English proficiency, with a maximum score of 20. We calculated the mean of team members' individual language proficiency scores to obtain a measure of *team foreign language proficiency*.

### 3.3.4 Team Foreign Language Anxiety

We measured foreign language anxiety using a ten-item scale (Gargalianou et al., 2016; adapted from Horwitz et al., 1986). All ten items pertained to English as the focal foreign language (e.g., "I feel overwhelmed by the number of rules you have to learn to speak English"). Participants indicated the extent to which the statements applied to them on a seven-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (7). We observed an excellent level of reliability ( $\alpha=0.93$ ) and thus combined the items into a single index. We then calculated the mean levels of team members' foreign language anxiety scores to reflect team foreign language anxiety.

<sup>2</sup> Using a seven-item scale adapted from Costa et al. (2014), the pre-questionnaire additionally captured team members' perceptions of their English language proficiency. We found this subjective measure to be highly correlated ( $r=0.5$ ,  $p<0.01$ ) with our objective measure, on which we focus in our further analyses.

### 3.3.5 Control Variables

We also captured several aspects of team composition that have been shown to potentially relate to foreign language use, team creativity, or virtuality in prior research. First, recognizing that prior research has associated team gender composition with team creative performance (e.g., Pearsall et al., 2008), we measured the number of female members (*no. of female participants*) within teams. Second, we followed earlier research (Barczak et al., 2010) in accounting for the mean age of our team members in years (*team age*). Third, we captured the number of students in a team (*no. of students*) and the average work experience of team members in months (*team work experience*).

## 4 Results

As preliminary analyses, we examined whether the teams in our conditions differed with respect to demographic characteristics. With respect to the number of students, we found no significant differences across the conditions related to team language ( $U=1,130.5, p=0.917$ ) and team virtuality (Mann-Whitney  $U=933, p=0.147$ ). Similarly, a Mann-Whitney  $U$  test did not indicate significant differences in number of female participants across the language conditions ( $U=1.188, p=0.571$ ) or the virtuality conditions ( $U=981.5, p=0.308$ ). For work experience ( $U=1,199, p=0.543$ ) and age ( $U=1,147.5, p=0.825$ ), we found no significant differences between the team language conditions, but we did observe significant differences between those teams that interacted face-to-face and those teams that interacted virtually ( $U=734.5, p<0.01$  for work experience;  $U=1,480.5, p<0.01$  for age). Thus, we included work experience and age as control variables in our regression analyses. Table 1 shows descriptive statistics and bivariate Pearson correlation coefficients.

We used IBM SPSS Statistics (Version 28) and a sequence of five linear regression models to test our hypotheses. Table 2 contains the detailed regression results of all fitted models. Model 1, which contains our covariates, that is, age and work experience, is not significant ( $F=0.453, p=0.637$ ). Model 2, which contains the main effects of our study variables, is significant ( $F=2.446, p<0.05$ ), reaching an adjusted  $R^2$  of 8.4%. Models 3–5, which include the interaction terms corresponding with our three moderation hypotheses are also significant (Model 3:  $F=3.183, i<0.01, R^2=14.0\%$ ; Model 4:  $F=2.162, p<0.05, R^2=8.0\%$ ; Model 5:  $F=2.472, p<0.05, R^2=9.9\%$ ).

H1 posits that using a foreign rather than a native language has a negative effect on team creative performance. Providing evidence in support of H1, Model 2 shows a significant negative effect of team foreign language use on team creative performance ( $B=-0.322; p<0.01$ ).

H2 proposes that team foreign language proficiency positively moderates the effect of foreign language use on team creative performance. Lending support to H2, Model 3 reveals a significant positive interaction effect of team foreign language proficiency and team foreign language use ( $B=1.794; p<0.01$ ). To further examine this interaction effect, we ran simple slope analyses (Aiken & West, 1991; Preacher et al., 2006). While these analyses revealed negative conditional effects of team foreign language

**Table 1** Descriptive statistics and correlations

<b>(a) Descriptive statistics by team language and team virtuality</b>									
<b>Team creative performance</b>		<b>Foreign language</b>			<b>Native language</b>				
		<b>total</b>	<b>virtual</b>	<b>face-to-face</b>	<b>total</b>	<b>virtual</b>	<b>face-to-face</b>	<b>total</b>	<b>face-to-face</b>
Mean		-0.258	0.062	-0.468	0.213	0.251	0.181		
Standard deviation		0.724	0.688	0.680	0.846	1.036	0.659		
Sample size		43	17	26	52	24	28		
<b>(b) Correlations among metric variables</b>									
	<b>Mean</b>	<b>s.d.</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
1 No. of female participants	1.14	0.72	1	0.040	-0.151	-0.117	0.035	0.184	0.258*
2 No. of students	1.39	0.72		1	-0.602**	-0.331**	-0.099	0.045	-0.174
3 TA	27.60	5.78			1	0.483**	0.110	-0.069	-0.014
4 TWE	19.71	36.76				1	-0.170	0.083	-0.092
5 TFLP	15.27	2.30					1	-0.440**	0.055
6 TFLA	3.01	0.95						1	-0.121
7 TCP	70.41	16.25							1

TA = team age; TWE = team work experience; TFLP = team foreign language proficiency; TFLA = team foreign language anxiety; TCP = team creative performance

\*  $p < 0.05$ ; \*\*  $p < 0.01$

use on team creative performance at one standard deviation below ( $B_{\text{low}} = -0.983$ ;  $p < 0.01$ ) and above the mean ( $B_{\text{high}} = -0.136$ ;  $p < 0.05$ ) of team language proficiency, they also revealed that the magnitudes of the two conditional effects differed considerably. Figure 2 illustrates the interaction result.

H3 proposes that team foreign language anxiety negatively moderates the effect of foreign language use on team creative performance. In contrast to H3, Model 4 does not reveal a significant interaction effect between team foreign language anxiety and team foreign language use ( $B = -0.132$ ;  $p = 0.23$ ). To further probe this result, we ran simple slope analyses and found significant negative conditional effects of team foreign language use on team creative performance at both low ( $B_{\text{low}} = -0.408$ ;  $p < 0.05$ ) and high levels ( $B_{\text{high}} = -0.659$ ;  $p < 0.01$ ) of team foreign language anxiety. The conditional effects are illustrated in Fig. 2.

H4 submits that interacting virtually has a positive effect on team creative performance. In line with H4, Model 2 reveals a significant positive effect of virtuality ( $B = 0.220$ ,  $p < 0.05$ ). As evident from Model 5, however, this result is primarily driven by the interaction between virtuality and team foreign language use. We delve deeper into this finding in our Discussion (Sect. Discussion).

H5 states that interacting virtually positively moderates the effect of foreign language use on team creative performance. In line with H5, we observe a marginally significant positive interaction effect between virtuality and team foreign language use ( $B = 0.242$ ;  $p = 0.06$ ). Simple slope analyses further revealed that while the conditional effect of team foreign language use on team creative performance is significant and negative for face-to-face interaction ( $B_{\text{ftr}} = -0.764$ ;  $p < 0.01$ ), the conditional effect of team foreign language use for virtual interaction is not significant ( $B_{\text{virt}} = -0.247$ ;  $p = 0.16$ ; see Fig. 2, bottom part).

## 5 Discussion

This study examined the underexplored consequences of foreign language use and virtual interaction, which are both important elements of modern-day work settings, for the creative performance of teams. Building on a groups-as-(motivated)-information-processors perspective, in conjunction with insights from prior research on foreign language use in international business and studies on team virtuality, we developed theoretical arguments that we tested in an experimental study involving 95 dyadic teams. In the following, we discuss the implications of our findings.

### 5.1 Implications for Theory and Research

Our study provides theoretical arguments and empirical evidence for the adverse consequences of foreign language use on team creative performance. As such, our study complements prior research on the implications of (foreign) language use for the creative performance of individuals (e.g., Geenen et al., *in press*; Haans & van Witelooستuijn, 2024; Hayakawa & Keysar, 2018; Nothelfer, 2020; Stephan, 2017). This prior research indicates that using a non-native language typically has adverse consequences, especially with respect to verbal creative tasks (e.g., brainstorming), and

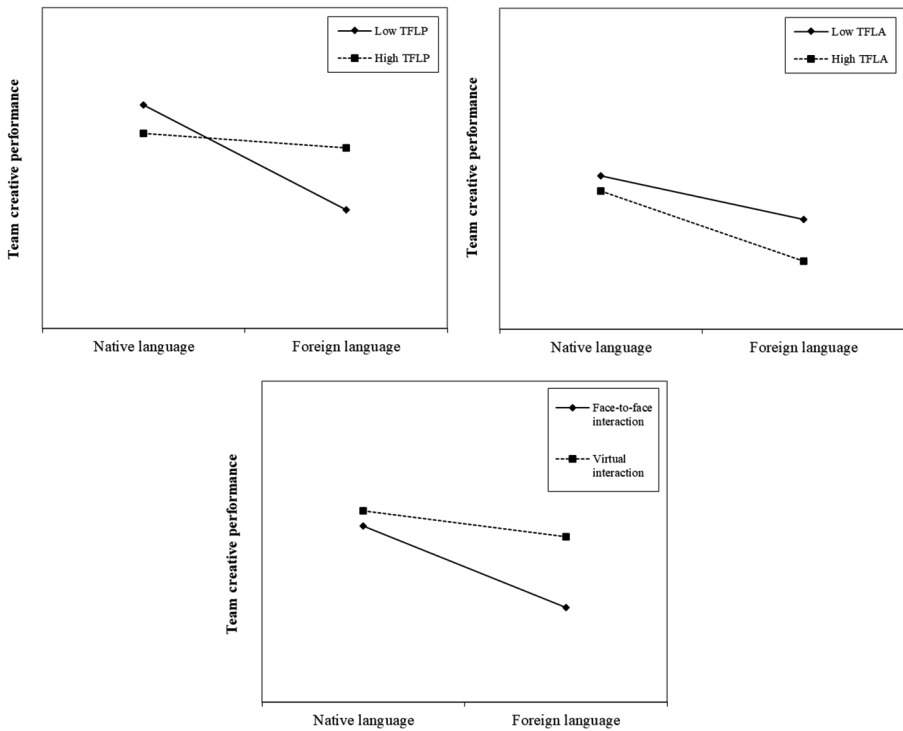
**Table 2** Regression results

		Team creative performance				
		Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	Coeff.		0.700	1.842 <sup>†</sup>	0.581	0.645
	SE		0.862	0.945	0.879	0.856
TFLU	Coeff.		-0.530**	-3.369**	-0.136	-0.764**
	SE		0.171	1.112	0.565	0.228
TV	Coeff.		0.363*	0.440*	0.356*	0.145
	SE		0.205	0.201	0.206	0.247
TFLP	Coeff.		0.019	-0.058	0.016	0.028
	SE		0.041	0.050	0.042	0.041
TFLA	Coeff.		-0.120	-0.112	-0.073	-0.113
	SE		0.095	0.092	0.115	0.095
TFLU × TFLP	Coeff.			0.184**		
	SE			0.071		
TFLU × TFLA	Coeff.				-0.132	
	SE				0.180	
TFLU × TV	Coeff.					0.517 <sup>†</sup>
	SE					0.334
TA	Coeff.	0.006	-0.022	-0.024	-0.021	-0.022
	SE	0.017	0.020	0.019	0.020	0.019
TWE	Coeff.	-0.003	0.003	0.004	0.003	0.004
	SE	0.003	0.003	0.003	0.003	0.003
<i>Effect size(s) <math>\eta^2</math> of tested variable(s)</i>			TL: 0.313 TV: 0.181	TL × TFLP: 0.266	TL × TFLA: 0.077	TL × TV: 0.164
R <sup>2</sup> (adjusted)		-0.012	0.084	0.140	0.080	0.099
F		0.453	2.446*	3.183**	2.162*	2.472*

TFLU=team foreign language use; TV=team virtuality; TFLP=team foreign language proficiency; TFLA=team foreign language anxiety; TA=team age; TWE=team work experience

<sup>†</sup> $p < 0.1$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$

suggests that an increased cognitive load (e.g. Geenen et al., [in press](#)) and reduced vividness of mental images (Hayakawa & Keysar, 2018) resulting from foreign language use might explain these effects. In line with our theoretical arguments that integrate, from a perspective of groups as (motivated) information processors, insights on how foreign language use influences the creative performance of individuals and shapes team interaction and communication (e.g., Chen et al., 2006; Kassis-Henderson, 2005; Klitmøller et al., 2015; Peltokorpi & Vaara, 2014; Tenzer & Pudelko, 2017), our study highlights that foreign language use also negatively affects teams' creative performance. Given that the processes and dynamics involved in generating creative outcomes at the individual and the team level vary considerably (Zhou & Hoever, 2014; Zhou & Shalley, 2008), this is an important finding. The result that using a non-native language negatively affects teams' creative performance also complements prior qualitative research (Loderer et al., 2024) focused on team creative *processes*, which has identified several potentially creativity-stimulating implications of foreign language use (e.g., linguistic detours, alternative associations, enhanced tolerance for mistakes within the team). Addressing the creative *outcomes* generated by teams, we did not find evidence in support of the effects Loderer et al.



**Fig. 2** Conditional effects of team foreign language use. TFLP=Team foreign language proficiency; TFLA=Team foreign language anxiety

(2024) propose. Future research should further elaborate on these conflicting findings and address possible discrepancies between procedural and outcome-based assessments of team creativity in foreign language contexts.

Highlighting negative performance implications of foreign language use in the creativity domain, our study also contributes to a stream of international management research that addresses linguistic influences on information and knowledge processing in teams (e.g., Aichhorn & Puck, 2017; Klitmøller & Lauring, 2013; Tenzer et al., 2021). Previous findings generated by this research stream indicate that, predominantly, foreign language use has adverse effects on knowledge processing in teams, because team members tend to find it more challenging to send, receive, and process messages in a foreign language (Aichhorn & Puck, 2017; Du-Babcock, 1999; Kassis-Henderson, 2005; Tenzer et al., 2021). Our study adds validity to this idea. More specifically, the adverse effect of foreign language use that we observe in our study aligns with the notion that using a non-native language may profoundly affect the repeated cycling between individual and team information processing, in which ideas and resources are contributed into a joint information-processing space, modified, and refined for generating creative team outcomes (De Dreu et al., 2008).

As such, our study also makes an important contribution to extant groups-as-(motivated)-information-processors models of team creativity (e.g., De Dreu et al., 2011; Miron-Spektor et al., 2022). Prior research on team creativity from a perspec-

tive of groups as (motivated) information processors has identified aspects of team composition (e.g., the configuration of team members' openness for experience and their need for cognition) and situation-based characteristics (e.g., time pressures) as crucial motivational factors that drive individual and group information processing (De Dreu et al., 2011). Our study suggests that groups-as-(motivated)-information-processors models of team creativity (e.g., De Dreu et al., 2011; Miron-Spektor et al., 2022) can be expanded and enriched from an international business (IB) perspective by integrating the language in which team members communicate as a critical antecedent.

Additional implications for groups-as-(motivated)-information processors models arise from our findings regarding the interactions between foreign language use and, respectively, team foreign language proficiency and work setting (virtual vs. physical). Recognizing that foreign language proficiency can alleviate the negative implications of foreign language use for team creative performance, groups-as-(motivated)-information-processors models should incorporate team compositional characteristics related to (foreign) language use as complementary variables. Moreover, such models should comprehensively consider how using a non-native language can additionally alter the effects of other, already established antecedents of team creativity. Specifically, the interaction between virtuality and team language use observed in this study suggests that the effects of other antecedents may also differ across language settings. Despite its potentially crucial importance for groups-as-(motivated)-information processors models in general and in IB settings in particular, this topic has, to our knowledge, so far not been addressed. It thus remains to be explored whether foreign (rather than native) language use might also interact with other situational antecedents (e.g., time pressure, accountability to process; Nijstad & De Dreu, 2012), and person-based antecedents (e.g., cognitive diversity; Qi et al., 2022) of team creative performance.

The findings of this study also contribute to the ongoing debate related to the consequences of virtual interaction for the creative performance of teams (e.g., Brucks & Levav, 2022; Giambattista & Bhappu, 2010; Kerr & Murthy, 2004; Pissarra & Jesuino, 2005; Wang et al., 2024). Reflecting the diverse consequences of the additive and reductive features that are associated with interacting via ICT, prior research on virtual interaction and team creative performance has yielded inconclusive findings. While Kerr and Murphy (2004) found virtuality to positively affect team creative performance, Brucks and Levav (2022) showed a negative effect of virtuality on team creativity in terms of divergent thinking. Similar to Kerr and Murphy (2004), we observe that interacting virtually may benefit the creative performance of teams, an effect primarily driven by the interplay between virtuality and foreign language use. In conjunction with insights generated on the interaction between virtuality and team diversity by Giambattista and Bhappu (2010), our study's findings imply that instead of seeking to identify uniform effects of virtual interaction, future scholarly efforts might rather want to focus on uncovering the contingencies that affect the consequences of virtuality and may even result in sign-reversals of "the virtuality effect". In doing so, future research may fruitfully elaborate in more detail on how the specific configurations of additive and reductive features that are characteristic of different types of ICT (Dennis et al., 2008) shape the consequences of interacting



virtually. For their study indicating a positive effect of virtual interaction, Kerr and Murphy (2004) utilized a chat-enabled technology, whose reductive features provide full audio-visual anonymity. In contrast, Brucks and Levav (2022) observed a negative effect of virtuality based on a study using videoconferencing technology, which is associated with a relatively low level of anonymity. In our study, we used a chat-augmented audio-virtuality tool that allows for visual anonymity and observed that—at least when communicating in a foreign language—interacting virtually can benefit team creative performance. In conjunction with Brucks and Levav's (2022) observations, this pattern of results may suggest that utilizing types of ICT that provide higher levels of (visual) anonymity can alleviate the negative consequences of interacting virtually, potentially because they allow participants to let their gaze roam freely around in their surroundings rather than fixing it onto the screen.

## 5.2 Managerial Implications

In contemporary organizations, teams—either temporarily or permanently—often collaborate in a non-native team language (e.g., Tenzer et al., 2021) and utilize ICTs for interacting virtually rather than face-to-face (Hahn & Semrau, 2023). Our study reveals a negative effect of foreign language use on the creative performance of teams and highlights interactions between foreign language use and language proficiency and virtual interaction, respectively. For organizations pondering whether to adopt a common corporate language, our study implies that they should consider contingencies of the effect of foreign language use on creative performance. Specifically, our study findings suggest that while adopting a common language can be appropriate for organizations whose employees have sufficient levels of language proficiency and are able and allowed to collaborate virtually when collectively engaging in creative endeavors, it is likely counterproductive for others. Conversely, when adopting a common corporate language is inevitable, organizations are well-advised to invest in the foreign language proficiency and the technical skills of their employees working in teams and provide them with the equipment necessary to interact virtually (preferably while maintaining at least some degree of anonymity) to ensure their creative contributions for organizational innovation and competitiveness (Zhou & Hoever, 2014).

## 5.3 Limitations and Directions for Future Research

As with any study, our research has certain limitations, which provide opportunities for future research. To test our hypotheses, we conducted a laboratory experiment with dyadic teams in Germany. While this research design allows us to draw inferences about causality with some confidence (Aguinis & Edwards, 2014), the generalizability of our findings may be limited. Future research should thus try to replicate our findings in field studies with teams tasked with generating creative outcomes in organizational settings and perhaps in different national contexts. Also related to the generalizability of our findings, we acknowledge that larger teams may have more complex dynamics than the dyadic teams in our experiment (Edwards et al., 2006).

While we believe that it is not unreasonable to assume that our findings may generalize to larger teams, further research is needed to test this assumption.

When interpreting our results, it is important to note that although we randomly assigned dyadic teams to the language conditions, assignment to the interaction conditions followed constraints imposed by the COVID-19 pandemic outbreak. While incorporating virtual interaction as a quasi-experimental variable is not uncommon in research on virtuality in the team creativity domain (e.g., Giambattista & Bhappu, 2010), future researchers should nevertheless replicate our findings using a research design that allows for a simultaneous random assignment to the different interaction conditions. Additionally, as discussed previously, future research should explicitly address virtuality as a multifaceted concept (Fiol & O'Connor, 2005; Griffith et al., 2003; Kirkman & Mathieu, 2005) and systematically elaborate on the effects of virtuality conditions that differ with respect to the reductive and additive features provided.

Future research should also elaborate on the mechanisms that can help explain the effects observed in our study. Specifically, scholars could address how the effects of foreign language use and virtual interaction are transmitted by variables such as cognitive strain (Keller & Weibler, 2015) and team communication quality (Marlow et al., 2017). Similarly, future research could examine how differences in team composition with respect to cultural and/or linguistic backgrounds may alter the effect of using a foreign language (e.g., Neeley et al., 2012).

These and related questions point to exciting avenues for future studies. We hope that they will stimulate further research at the intersection of team creativity, foreign language use, and virtuality in organizations. This area of research is of considerable and growing importance to organizational practice, and our study contributes some crucial insights: While the use of a foreign language appears to be detrimental to the creative performance of teams, interacting virtually seems to potentially alleviate this negative effect. Thus, digital technology may help mitigate some globalization-related challenges in fostering the creative performance of teams.

## 5.4 Conclusion

Teams that collaborate in a non-native language on creative tasks tend to underperform, compared with teams that communicate in their members' native language. Superior foreign language skills can alleviate this adverse effect—as can virtual interaction via certain technologies. MNEs should therefore carefully design work settings to reap possible benefits of using a common corporate language while minimizing associated disadvantages.

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**Data Availability** The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Declarations

**Conflict of interest** All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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