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FOUNDATIONS OF INNOVATIVENESS IN THE INTERNATIONAL ARENA:

FOREIGN LANGUAGE USE AND CREATIVE PERFORMANCE

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ABSTRACT

Individuals' creativity is a key resource underlying organisations' innovativeness. With workplaces becoming increasingly multilingual, a question of growing relevance concerns whether using a native versus a foreign language affects individuals' creativity. This study integrates research on foreign language in international business and on determinants of individual creativity with cognitive psychological research. Experiments suggest a detrimental effect of foreign versus native language use on creative performance, which is stronger in verbal tasks. Subjectively perceived foreign language proficiency appears to mitigate this negative effect. In tasks framed in figural terms, foreign language use even seems to stimulate creativity compared to a native language setting. This finding implies a potential lever for organisations seeking to stimulate employees' creativity to deliberately use a foreign language context to encourage 'thinking outside the box', particularly when using nonverbal creativity tools. Important implications arise for future research and practice in international management and creativity and innovation management.

Keywords: foreign language use; foreign language proficiency; foreign language anxiety; creativity; creative performance; divergent thinking; innovativeness.

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INTRODUCTION

Creativity represents the human capacity for the production of novel and useful or appropriate ideas (Amabile et al., 1996; Oldham and Cummings, 1996; Shalley et al., 2004; cf. Runco and Jaeger, 2012). Creative ideas are key to organisations' growth and performance (Cefis and Ciccarelli, 2005) and—in a business world characterised by increasing automation and advanced artificial intelligence, also described as the 'second machine age' (Brynjolfsson and McAfee, 2014)—creativity is frequently viewed as a distinctive competence of human beings, difficult to be substituted by 'machines' (Frey and Osborne, 2017), yet vital to organisations' innovativeness. Understanding individual-level creativity of employees is often considered as a key building block of group-level creativity and innovation is, therefore, of paramount importance (for a review, see, e.g. Shalley et al., 2004).[1] Thus, scholars have sought to identify antecedents of individuals' creativity (e.g. Anderson et al., 2014; Dietrich and Kanso, 2010; Oldham and Cummings, 1996) including both personal and contextual factors (e.g. Hughes et al., 2018; Shalley et al., 2004). In so doing, they have identified a range of factors that determine creativity at the individual level, in particular *motivational, cognitive,* and *affective* influences (e.g. Hammond et al., 2011; Klijn and Tomic, 2010; Liu et al., 2016; Shalley and Gilson, 2004; for a comprehensive conceptualization, see e.g. Amabile and Mueller, 2008; Amabile and Pratt, 2016) and have obtained crucial insights into how organisations can design work environments that are conducive to fostering employees' individual creativity.

Yet, surprisingly, given its prominence in the modern, globalised business world, there is a contextual factor that has largely eluded the attention of researchers: the *language* in which employees work on tasks that call for them to apply their creativity. For many of them, in many instances, this may be a language other than their mother tongue, most often: English. Accompanying the wide-spread internationalization of organisations and businesses, English has emerged as the predominant 'lingua franca' (Tietze and Dick, 2013), with many

organisations formally adopting it as common corporate language (e.g. Kankaanranta et al., 2018; Neeley, 2012). As a result, increasing numbers of managers and employees communicate in their daily jobs in English—even if this is not their native language. The resulting challenges at the inter- and intra-organisational, team, and individual level, have been addressed by a growing literature at the intersection of international management/international business (IB), (socio-)linguistics, and psychology (e.g. Angouri, and Piekkari, 2018; Costa et al., 2014a; Harzing and Pudelko, 2013; Keysar et al., 2012; Neeley, 2013; Tenzer and Pudelko, 2015; Tenzer et al., 2020; Welch and Welch, 2008; Welch et al., 2005; for overviews, see Brannen et al., 2014; Lecomte et al., 2018; Tenzer et al., 2017).

At the individual level, language research has addressed a broad range of topics (for an overview, see Tenzer et al., 2017) including human and social capital-related implications of individuals' language skills both in the labour market and within organisations (e.g. Barner-Rasmussen et al., 2014), the consequences of language skills for cross-cultural adjustment of expatriates (e.g. Selmer and Lauring 2015; Zhang and Peltokorpi 2016), and the (adverse) emotional implications of a lack of language proficiency (e.g. Neeley, 2013; Tenzer and Pudelko 2015). In so doing, this literature has employed a variety of empirical methodologies, ranging from qualitative interview studies, sometimes coupled with observational elements (e.g. Neeley, 2013; Zhang and Peltokorpi, 2016) or ethnographic-like case studies (e.g. Vigier and Spencer-Oatey, 2017) to quantitative questionnaire surveys (e.g. Peltokorpi and Pudelko, 2021; Tenzer et al., 2020; Selmer and Lauring, 2015) and, further, to experiments (e.g. Akkermans et al., 2010, Urbig et al., 2016; Urbig et al., 2020). Such quantitative empirical methods have begun to increasingly complement qualitative methods in language-related IB research, presumably due to the growing maturity of the field (Tietze, 2020). This maturity implies that, meanwhile, an impressive body of literature exists, that allows for quantitative methods to be employed in order to quantitatively estimate relationships, statistically test

hypotheses, and, in the case of experiments, more reliably infer causality. Within IB, experiments are still comparatively rare (cf. Fan and Harzing, 2020), but are viewed as a promising complementary research methodology (e.g. Tietze, 2020) due to their clarity, accessibility, and the connections that may be established with other disciplines (e.g. economics, psychology) as well as with managerial practice (Tietze, 2020).

While experimental studies on (foreign) language effects have been relatively scarce in IB, there is a considerable literature in psychology, in particular, that has investigated how using a non-native language fundamentally impacts human cognition, emotion, moral choices, and behaviour (e.g. Costa et al., 2014a; 2014b; Keysar et al. 2012; Hayakawa and Keysar, 2018), which we integrate here with extant IB research. In sum, these prior studies have mostly analysed whether and to what extent outcome variables such as cognitive decision tasks (e.g. Costa et al., 2014b; Hadjichristidis et al., 2017; Volk et al., 2014), choices in ethical dilemma situations (e.g. Costa et al., 2014a; Geipel et al., 2015), decisions in social dilemmas (e.g. Urbig et al., 2016, 2020), or emotional responses (e.g. Gargalianou et al., 2016; Hadjichristidis et al., 2019) are affected by the language (native versus foreign) in which individuals are required to consider a given task. Tentative evidence suggests that the changes effectuated by the need to communicate in a foreign language may well extend to other types of tasks and decisions, such as creative work. For example, Ahmad and Widén (2018) discuss how practices such as code-switching (i.e., switching from one language to another, or, more formally, following Li (2013), the alternating and mixing of different languages within the same episode of language production) may influence individual-level knowledge sharing—arguably a construct of relevance also for creativity-based innovative processes—in multilingual organisations.

Yet, implications of using a foreign language on performance in creative tasks have remained virtually unexplored. To the best of our knowledge, to date, only two other studies have attempted to assess the effect of using a foreign language on individual creative

performance[2]: Using an experimental approach with two Dutch student samples, Haans and van Witteloostuijn (2018) identified affect—more specifically: foreign language anxiety (FLA)—as a potential moderating influence on the relationship between foreign language use and, in particular, convergent thinking, while results for divergent thinking were inconclusive. Convergent thinking relates to the process of converging the thinking towards one right answer. In contrast, divergent thinking requires a more explorative, open, and undirected thinking process driven by cognitive processes of fluency, flexibility, and originality. Similarly based on an experimental approach, Stephan (2017) observed that a foreign language setting was positively associated with the originality of solutions in nonverbal drawing tasks. However, the study did not include verbal tasks, nor did it take into account any possible moderating factors (e.g. foreign language anxiety or skills) or alternative operationalizations of performance, such as fluency or flexibility. Therefore, as important as these insights are, considering the complexity of creative processes, we suggest here to extend these perspectives by, first, proposing an overarching framework that explicitly integrates in one study selected moderating influences from the motivational, cognitive, and affective domains; and, second, by considering the boundaries of possible foreign language effects on creative performance by considering various types of tasks including verbal and figural ones and systematically comparing the effects of the moderators across the different types of tasks.

Zooming in on the divergent thinking component of creativity, the present study therefore examines how using English as foreign language affects individuals' creative performance, moderated by influencing factors from the motivational, cognitive, and affective domains in order to account for individual heterogeneity in international management (e.g. Minbaeva, 2016). In so doing, we conceptualise the foreign language context as affecting the importance of factors from these different domains—motivational, cognitive, and affective—which have been shown to impact creativity. In terms of hypotheses, to start with, the expectation is that individuals' divergent thinking performance decreases when using a

foreign language. Turning to the moderating effects, we propose that the basic creativity-enhancing effect of motivation—operationalised as task commitment—as found in native language settings also holds for non-native contexts. In particular, we suggest, that task commitment weakens the hypothesised adverse effect of foreign language use on individuals' divergent thinking. Further, we suggest that foreign language proficiency (FLP) reflects the cognitive domain and weakens the hypothesised detrimental effect of foreign language use on individuals' divergent thinking. Moreover, we suggest that foreign language anxiety reflects the affective domain and aggravates the adverse effect of foreign language use on individuals' divergent thinking.

To test these hypotheses, we conducted an experimental study, in which participants (working professionals and university students) were randomly assigned to either a native or a non-native (foreign) language setting, and then processed several creative tasks (aiming at both verbal and figural divergent thinking). In order to measure resources of creativity in a foreign language setting, we operationalised task commitment as a motivational influence, FLP as a cognitive resource, and FLA as an emotional influence. Results show that a foreign language setting appears to trigger distinct influences on creativity. In particular, the hypothesised negative effect of foreign versus native language use on creative performance (in terms of divergent thinking) is supported, but more strongly for verbal thinking, whereas in figural tasks, the negative effect is weaker and can even be reversed, turning overall positive for participants who are (according to their own perception) highly proficient in the foreign language. This result indicates a potential lever for organisations seeking to stimulate employees' creativity to deliberately use a foreign language setting to encourage 'thinking outside the box' and the use of figural nonverbal or at least less verbally oriented creativity tools (e.g. mind maps, rapid prototypes etc.). Overall, the results support some of our hypotheses, with a few important exceptions, which we discuss in detail.

In sum, this study makes contributions to two streams of literature. The first literature that the study contributes to is research on individual creativity. For one, it adds to analysing determinants of individual creativity. While various studies that have investigated antecedents of creative processes have focused on cultural rather than linguistic aspects, this study addresses a pure foreign language effect on creative processes, independent of and supplementing any possible effects of culture or cultural diversity. The results suggest that foreign language use as such has an adverse effect on divergent thinking performance, presumably due to the associated higher cognitive load. However, we also observe a robust moderating effect of subjectively perceived foreign language proficiency (which appears to even link cognitive and affective moderators), which ameliorates this adverse effect. For highly proficient individuals engaging in types of tasks that are less subject to barriers to expression (here: figural tasks), the moderator effectuates an even positive overall effect on divergent thinking—presumably, as the foreign language use not only raises the cognitive load but also stimulates 'thinking outside the box', which may support creative performance. These empirical results in conjunction with the conceptual arguments underlying our hypotheses also suggest a potential second contribution to creativity research, that is to the advancement of conceptualizing the impact of language within the componential theory of creativity (Amabile, 1983; Amabile and Mueller, 2008; Amabile and Pratt, 2016; Cromwell, 2020).

The second literature that the study adds to is research on the influence of foreign language in international management. It does so by adding creativity to the range of individual-level outcome variables that are important for modern, internationally interconnected organisations and may be affected by foreign language use—the third major contribution of this study. The specific pattern of results suggests that there are likely multiple mechanisms at play: a cognitive load mechanism as hypothesised and as predominant in the prior literature (e.g. Just and Carpenter, 1992; Takano and Noda 1993; Urbig et al., 2020;

Volk et al., 2014); and a mechanism that stimulates unusual associations and thereby exerts a positive influence on creativity-relevant processes. In emphasizing this latter mechanism, we contribute to a nascent literature that emphasises the potential positive effects of foreign language use in international management (e.g. Piekkari et al., 2020).

THEORY AND HYPOTHESES

Creativity in a Foreign Language Setting

In the tradition of Guilford (1957), creative acts include three categories of intellectual thinking: cognition, production, and evaluation, whereby production represents the most crucial factor. The production of creative ideas proceeds in convergent and divergent thinking processes. Even though researchers dispute the use of divergent thinking as a synonym of creativity (e.g. Runco, 2008), because divergent thinking is but one of several necessary ingredients, it is one of the most promising predictors of creativity and is, consequently, used by the vast majority of creativity tests (Silvia et al., 2008). Divergent thinking is also that specific part of the production of creative ideas that this study centres on.

In terms of theoretical framework, from the variety of creativity theories that have been proposed in the fields of psychology and organisational studies, we draw on the componential theory of creativity as initially proposed by Amabile (1983), and subsequently further developed and extended, in particular by Amabile and Mueller (2008) to additionally include the role of affective states, and, towards capturing creativity as a dynamic phenomenon (Amabile and Pratt, 2016). This theory is one of the major creativity theories in management, having received vast empirical support for its main propositions, and is arguably the first such theory seeking to offer a comprehensive account of "both the process of individual creativity and the process of organisational innovation, as well as the ways in which the two are linked through mutual influence" (Amabile and Pratt, 2016, p. 158). Thus, its multi-level perspective is a key feature of this framework, with individual-level processes consequently being embedded in and intertwined with contextual factors at the organisational

level. Also, the model is particularly comprehensive in that it includes, first, *domain-relevant skills*, second, *creativity-relevant processes* including affective states, and third, *motivation*, as essential components at the individual level for producing creative outcomes. In addition, the social *environment* represents the fourth component of the framework and is conceptualised in its impact on the individual engaged in a creative task (cf. Amabile, 2013; Amabile and Pratt 2016). At the individual level, Amabile and Pratt (2016) characterise intrinsic (rather than extrinsic) motivation as the key driver of an individual's engaging in a creative task. In performing this task, the individual draws on her skills in the task domain (e.g. technical skills or expertise in the specific domain such as, for example, robotics). The 'glue' that binds together these inputs in order to generate a creative outcome is what is referred to as creativity-relevant processes. This component comprises, for example, personality traits but also perceptual styles and "thinking skills that are conducive to taking new perspectives on problems […] and making unusual associations" (Amabile and Pratt, 2016, p. 160). Despite its conceptual appeal and broad empirical support, the componential model is not without its limitations. For example, Amabile and Pratt (2016, p. 179) specifically call for future research into "the role of the institutional context, economic and socio-cultural forces […] and how these institutional pressures may ultimately influence group and individual level creativity"—issues that have remained underexplored within the framework, both conceptually and empirically, to date.

Here, we take up this call, zooming in on one such element of the broader social environment, that is: the language context, in which an individual performs a creativity task. That language has neither been conceptually integrated nor empirically investigated in its role within the componential theory is surprising: Concerning the organisational level of the componential theory, pressures to innovate as well as organisational efforts to address them (e.g. by consolidating their creative resources in multinational R&D teams) are inextricably interrelated with globalization and challenges associated with multilinguistic communication.

Regarding the individual level, the absence of an in-depth discussion of the impact of language seems even more surprising given the fundamentality with which language shapes our minds and actions (e.g. Boroditsky, 2001; Chen, 2013). To the extent that different (natural) languages may be interrelated with distinct worldviews, variations in the language employed in addressing a creativity task might be expected to fundamentally impact the component of creativity-relevant processes—an issue that, to the best of our knowledge, has not been discussed within the framework of the componential theory.

We thus address this limitation by proposing that language forms part of the social environment, in which a person engages in a creative process, with a foreign language setting representing a significant environmental variation. Further, we suggest that this variation affects creative processes primarily through its impact on individual cognition: A simultaneous need arises for—compared to a native language setting—more demanding language processing to complement the processing of the creative task. Therefore, because of this focus on language processing, we draw—in addition to the componential theory—on capacity-based models from cognitive neuroscience, an approach that is becoming increasingly common in managerial studies of foreign language effects (e.g. Presbitero, 2020; Urbig et al., 2016; Volk et al., 2014), in order to develop our hypotheses. In so doing, we follow the lead of recent studies (e.g. Cromwell, 2020) that have also emphasised ways in which the environment may influence the component of creativity skills, striving to build "a theory for the social psychology of creativity *skills*" (Cromwell, 2020, p. 25).

Specifically, in terms of the four components of the componential theory, we propose that foreign language represents an environmental variation, which implies that distinct moderating influences become relevant with respect to the individual-level components. For one, in a foreign language setting, distinct affective states [in particular: foreign language anxiety, (FLA)] associated with foreign language use complement those creativity-relevant processes such as affective states that prevail in a native language setting.[3] Similarly, foreign

language proficiency (FLP) may influence the degree to which individuals may be able to capitalise on creativity relevant-processes such as taking new perspectives on problems or making associations; and the extent to which they are able to draw on and express their domain-relevant skills (e.g. Neeley, 2013). Finally, we argue that the importance of task motivation increases in the foreign language setting, as a buffer against the additional cognitive strain and potential adverse feelings such as FLA. Figure 1 presents an overview of the resulting conceptual framework, which we derive in detail below in motivating our hypotheses. Referring to divergent thinking performance as dependent variable, the hypotheses depicted in Figure 1 essentially suggest (1) an adverse impact of foreign language use, which is moderated by (2) task commitment (weakening effect), (3) foreign language proficiency (FLP; weakening effect), and (4) foreign language anxiety (FLA; aggravating effect).

[Insert Figure 1 about here]

Engagement of cognition appears to constitute a necessary precondition of creativity (Karwowski et al., 2016). However, cognitive psychologists point out the finite nature of cognitive resources, such as attention, working memory capacity, informational processing activities, or recognition (Baddeley, 2003; Norman and Bobrow, 1975). These capacity-based models postulate that, when dealing with multiple tasks simultaneously, mental resources are allocated to different processes (Kahneman, 1973). The larger the number of tasks that run in parallel and the higher their complexity, the more mental resources have to be assigned to address the different tasks, including a potential 'reshuffling' of resources across different tasks. If too many processes run at the same time, this double load may challenge mental resources and performance may suffer. Neuroscientific studies have shown that using a foreign instead of a native language demands a higher working memory load, especially in the early phases of information processing, and thus increases the cognitive load associated with information processing (Abutalebi, 2008; Chee et al., 2001; Van den Noort et al., 2006; for an

application of this insight to the impact of foreign language use in IB in general, see the conceptual study by Volk et al., 2014). Applying this view of limited mental resources and considering the parallel demands on information processing exerted by both creative thinking and foreign language use, individual creative performance should suffer if too many cognitive processes are simultaneously involved when performing a creative task. As task processing in a non-native language tends to require additional mental resources, which are not available for the task itself (e.g. Hayakawa and Keysar, 2018; Volk et al., 2014), we expect an adverse effect of foreign language use on divergent thinking, as the aspect of creativity that represents the key outcome variable of interest in this study. As an illustration: Imagine a French engineer in China who is commissioned to develop a more powerful engine together with his or her Chinese and American colleagues. Most likely, the engineers exchange their ideas in English. Whereas the American engineer is able to focus all of his or her cognitive resources on the generation of creative ideas, the non-native speakers have to invest some of these resources into communicating (and possibly thinking) in the foreign language, as a necessary prerequisite for the collaboration. This double burden might then reduce the creativity of the French and Chinese engineers.

Hence, non-native speakers acting in a foreign language setting are likely to experience the additionally required investment of cognitive resources (due to using the foreign language) as a strain and a factor that potentially reduces work-related competencies (Just and Carpenter, 1992; Neeley et al., 2012; Volk et al., 2014). Drawing on the double load view, we therefore suggest that individuals' creative performance in terms of divergent thinking changes when using a foreign language. Thus, we propose:

Hypothesis 1 (H1): Individuals' divergent thinking performance is lower when using a foreign language, i.e., they generate fewer divergent thoughts.

Motivational Domain: Task Commitment as Moderator of the Relationship between Foreign Language Setting and Creativity

Some scholars frame creativity as 'a choice made by an individual to engage in producing novel ideas' (Drazin et al., 1999, p. 290). It is therefore not surprising that a large body of literature has examined the relationship between motivational factors and individuals' creativity (Amabile, 1985; Amabile et al., 1996; Oldham and Cummings, 1996; Shalley et al., 2004). According to psychological research, motivation is a key driving force of intentional human behaviour, inducing engagement in effortful mental processes (Fazio, 1990; Kanfer and Ackerman, 1989). As such, motivation represents a necessary condition for devoting mental resources to any task. In the context of creative tasks, motivation characterises the intentional pursuit of a creative action (Ford, 1996). Closely related to motivation is commitment as 'a force that binds an individual to a course of action of relevance to one or more targets' (Meyer and Herscovitch, 2001, p. 301). Considering motivation as a broader concept consisting of several energizing forces (Meyer et al., 2004) leads us to propose that the motivational basis of creativity emerges from individuals' commitment to a creative task.

At the individual level, evidence exists for a positive relationship of creativity and goal orientation, a construct similar to commitment, which has been shown to foster perseverance if confronted with obstacles (Hirst et al., 2009). As such, goal setting theory (Locke and Latham, 1990a, 1990b) represents a useful frame for conceptualizing the relationship between task commitment and performance in creative tasks, in particular, divergent thinking. Generally, goal setting theory proposes that task performance is regulated by the goal that a person is aiming for on the task (Locke and Latham, 1990b), a notion that has been supported by a large number of empirical studies, which additionally showed that more specific, difficult (but attainable) goals tend to lead to better task performance. However, goals only affect task performance if the person is committed to achieve the goal (Locke and Latham, 1990b). The prediction from this theory that difficult (yet attainable) goals tend to more effectively

stimulate performance is also in line with Kahneman's (1973) suggestion that difficult tasks lead to stronger recruitment of cognitive resources. Consequently, we propose that task commitment constitutes a necessary precondition for the assignment of mental resources to a task, independent of whether they perform this task in their native or a non-native language. Building on the definition of goal commitment by Hollenbeck et al. (1989) und Locke et al. (1981), we define task commitment here as the determination to try to accomplish a given task and to persist in one's best efforts towards completing the task. Task commitment in general thus increases mental resources recruited for a task.[4]

In the following, we address distinct effects of task commitment across foreign versus native language settings. The more difficult a task, the stronger the effect of task commitment on mental resources, and, thereby, on performance can be assumed to be (cf. Campbell and Ilgen, 1976). Having to perform a task in a foreign (rather than the native) language tends to make the task more difficult. Therefore, an interaction of foreign language use and task commitment on mental resources is to be expected, with a corresponding effect on task performance. Thus, we propose that when task commitment is low, foreign language has a negative effect on performance, as suggested in *H1*. However, when task commitment is high, the suggested positive interaction effect between foreign language and task commitment implies that the negative effect of foreign language is ameliorated. In other words, mental resources needed to perform a creative task can be overburdened when foreign language use leads to dual loads, but such overburdening is less likely when mental resources are high because of high task commitment. So, overall, the negative effect of foreign language use on divergent thinking is weaker when task commitment is higher and we propose:

Hypothesis 2 (H2): Task commitment weakens the adverse effect—hypothesised in H1—of foreign language use on individuals' divergent thinking performance.

Cognitive Domain: Foreign Language Proficiency as Moderator of the Relationship between Foreign Language Setting and Creativity

While prior studies have not explicitly investigated creative tasks (with the exceptions of Haans and van Witteloostuijn, 2018; Stephan, 2017), extant literature on the impact of foreign language on performance of other types of tasks has argued and found that thinking and acting in a foreign language lead to the activation of controlled cognitive processes, which claim a considerable amount of working memory capacity (Oganian et al., 2016; Volk et al., 2014). Controlled or deliberate cognitive processes are associated with conscious awareness and effort (Evans, 2008; Evans and Stanovich, 2013). Mental resource-related capacity-based theories suggest that cognitive resources are limited, that an allocation of available resources to the various tasks or task elements is necessary (Kahneman, 1973), and that a greater number of processes involved in handling a task simultaneously implies a more substantial burden on the available mental resources. As task processing in a non-native language tends to require additional mental resources, which are not available for the task itself (e.g. Hayakawa and Keysar, 2018; Volk et al., 2014), we hypothesised in *H1* that a negative effect of foreign language use on divergent thinking could be expected.

However, non-native speakers differ in their proficiency in the foreign language (FLP) and prior studies have argued that foreign language proficiency constitutes an important moderator of the basic foreign language–task performance relationship (e.g. Presbitero, 2020; Volk et al., 2014). Specifically, superior foreign language skills can be expected to buffer how engagement in foreign language processing decreases the ability to regulate the attention (Volk et al., 2014). Higher need for attention regulation (as exhibited by low proficiency speakers) could be classified as undermining the cognitive resource requirements needed for creativity, resulting in increased distractibility, which, in turn, decreases creative performance (Hao et al., 2015). Thus, effectively, lower proficiency speakers experience a greater strain on their mental resources because of the language processing, which, all other things being equal,

undermines the mental resources available for engaging in creative processes. Overall, individuals with higher foreign language proficiency will need to allocate fewer mental resources to foreign language processing. Therefore, the simultaneous need for language processing and task processing is a less substantial burden on the available mental resources for them. Thus, we posit that individuals with superior foreign language skills will perform a creative task in a foreign language setting better than individuals with lower proficiency. Thus, we propose:

> *Hypothesis 3 (H3): Foreign language proficiency weakens the adverse effect—hypothesised in H1—of foreign language use on individuals' divergent thinking performance.*

Affective Domain: Foreign Language Anxiety as a Moderator of the Relationship between Foreign Language Setting and Creativity

Prior research has identified affect as a third important domain from which influences on individuals' creativity arise (e.g. Baas et al., 2008), resulting ultimately also in its incorporation in the componential theory of creativity (Amabile and Mueller, 2008; Amabile et al., 2005). While affect—as a fundamental category of emotions and moods—has consistently been shown to strongly impact individuals' creativity, the direction of the effect is less clear. In terms of valence, recent studies predominantly support the notion of superiority of positive over negative affect in creative processes (Baas et al., 2008; Conner and Silvia, 2015; Fernández-Abascal and Díaz, 2013; To et al., 2012). Further research highlights the role of activation vis-à-vis deactivation of emotions as a second dimension, which boosts or hinders individuals' creativity, largely independently of the emotions' valence (To et al., 2012). Especially highly activated positive emotions, such as energetic or enthusiastic feelings, appear to stimulate creativity (Baas et al., 2008; Conner and Silvia, 2015, To et al., 2012). Compared to positive emotions, negative affect tends to display either considerably smaller positive effects on individuals' creativity, no significant effects, or even

negative effects, as in case of highly activated emotions, such as anxiety (Baas et al., 2008; To et al., 2012). Functional magnetic resonance imaging (fMRI) investigations point to an association of anxiety with reduced top-down control (e.g. Bishop et al., 2004). This reduced recruitment of prefrontal cortex-related circuitry should weaken individuals' creativity. A third stream of studies has proposed that the coexistence of both positive and negative emotions boosts creativity (Bledow et al., 2013; Fong, 2006).

Studies in business contexts, specifically, have mostly confirmed the boosting effect of positive emotions, for example by reinforcing the mediating effect of positive emotions between authentic leadership and creativity (Rego et al., 2014). Consequently, Amabile and colleagues (2005) integrated employees' positive affect in an organisational context and developed an affect-creativity cycle that displays the reciprocity between positive affect and creativity. Overall, thus, a large body of literature has reported empirical evidence of affect influencing creativity in a diverse range of tasks and contexts (Amabile et al., 2005; Rego et al., 2014).

Studies in linguistics (e.g. Dewaele and Ip, 2013), as well as recent IB studies on the role of foreign language for other outcome variables (e.g. Neelely, 2013; Tenzer and Pudelko, 2015), suggest that in non-native language settings, complementary affective influences may arise that are absent in native language settings; and which have, so far, remained underexplored in research on determinants of individual creative performance. Of particular relevance appears to be what linguists refer to as 'foreign language anxiety' (FLA)—a situation-specific emotion that emerges when acting in a foreign language setting. It has been defined as a 'feeling of tension and apprehension specifically associated with second language contexts, including speaking, listening, and learning' (MacIntyre and Gardner, 1994, p. 284). In terms of mood-related activation, FLA may be classified—similar to general anxiety—as a negatively valenced and highly activated emotion. In their meta-analysis, Baas and colleagues (2008) reported a generally negative effect of highly activated negative emotions on creative

processes. Moreover, FLA seems to negatively affect subjective measures of creativity such as self-perceived creativity (Onwuegbuzie et al., 1999), and to raise individuals' stress level (Gargalianou et al., 2016; Horwitz et al., 1986). A higher stress level is generally related to negative emotions (Lazarus, 1993), which, in turn, appear to exert a draining effect on task-related processing resources (Meinhardt and Pekrun, 2003). Research on emotion regulation suggests that this inhibitory effect of negative emotions on cognitive performance is a consequence of a suppression of negative emotions that requires a high degree of self-control (Baumeister et al., 1998). This high degree of self-control, again, leads to a reduction in cognitive resources (Richards and Gross, 1999; Baumeister et al., 1998). For the processing of a cognitively demanding task in a foreign language setting, this should lead to reduced performance for persons with a high level of FLA, as opposed to those with low or no FLA. High FLA individuals have less cognitive capacity available for the actual creative task due to the capacity-binding suppression processes of the negative emotion. Thus, overall, we suggest:

> *Hypothesis 4 (H4): FLA strengthens the adverse effect—hypothesised in H1—of foreign language use on individuals' divergent thinking performance.*

METHOD

We test our hypotheses based on a between-subject experiment, where participants faced creative tasks, and the language of presentation (treatment) varied between subjects between foreign language and mother tongue. Participants first processed the creativity tasks and answered the task-specific commitment items in the treatment language. Participants subsequently provided information on all other variables in a mother-tongue follow-up survey part. On average, it took them approx. 30–45 minutes to complete the experiment.

Sample

We approached German-native non-bilingual speakers[5], including both working professionals and university students. We varied the procedure for data collection across two waves to draw

more robust conclusions. In the first wave, we used an online experiment. We recruited participants (students and working professionals) through a link that we posted in internet forums devoted to creativity, on social media websites (such as Facebook), and in university mailing lists (universities where the authors were affiliated with/had close links with). We employed an offline pen-and-paper approach in the second wave and recruited students through local announcements at a major German university. To sample working professionals in this second wave, we approached a wide range of regional companies for whom an international perspective was critical (including, for example, both manufacturing and services companies; and for-profit and non-profit organisations). We asked these firms whether they would be willing to allow their employees to participate in a brief creativity-related experiment. To control for possible confounding effects due to heterogeneity in recruitment channels during the second wave of data collection, we control for four sub-groups in this second wave. These four groups differ concerning the researchers heading the respective data collection effort and how participants were approached.

After excluding participants with missing values, 398 usable observations remain in total. We excluded another six participants, who indicated that they have no competence in reading or writing English, not even a few words or sentences. To avoid endogeneity concerns, these were excluded even in the mother-tongue treatment where their insufficient English-language skills would not have mattered for understanding and performing the task. The resulting sample included both working professionals (50%, *N*=196) and university students (50%, N=196), 39% (N=153) individuals reported to be male, and the average age is 31.27 years (SD=11.42, and range=19–69 years). The first wave accounts for 50.5 percent (N=199) of the sample.

Variables

Dependent Variable. To operationalise divergent thinking, we used the *test of divergent thinking* (TDK, Mainberger, 1977), adapted from Guilford's (1950) creativity

concept with divergent thinking as the key characteristic. Participants had one minute (timed) in the first two tasks to find as many comparisons between two objects (e.g. mouse and cat) as possible. Following the test manual (Mainberger, 1977), we evaluated each correct comparison with one point. Comparisons stemming from the same category (such as *anatomy*) were limited to three points at maximum. For example, we allocated three points for the answers *nose, fur, ears*, and *paws.* For the two tasks, the average scores across both waves were 4.14 and 5.39. In the third and fourth tasks, participants faced three incomplete pictures, e.g. an isosceles triangle without hypotenuse (TDK, Mainberger, 1977). Participants were asked to think of as many things or situations as possible that the picture, once completed, might show and to write them down in 90 seconds (timed). Possible answers were, for example, a *pyramid* or a *tent*. For the two tasks, the average scores across both waves were 5.25 and 5.49, respectively.

To more comprehensively assess creativity beyond the verbal domain (cf. Stephan, 2017; Hayakawa and Keysar, 2018), the second wave of data collection also included a figural creative task, i.e., a *drawing completion*, extracted from the Berlin Intelligence Structure (BIS)-Test (Jäger, Süß, and Beauducel, 1997). Initially designed for teens and young adults, the test includes tasks that focus on ingenuity in terms of fluency and diversity of ideas. To ensure understanding, participants got an example figure, a *circle*, which was shown to be completed into a sun. Participants were asked to add to a *tick mark* to develop realistic objects in 150 seconds. Following standard procedures for assessing test performance in this task (Jäger et al., 1997), we evaluated both a wide variety and quantity of objects by summing up each drawn picture (*Fluency*) and each used category (*Flexibility*). The average scores for Fluency and Flexibility across both waves were 6.71 and 5.01, respectively.

Independent variable. *Foreign language* captures the language treatment [0=native (here: German) or 1=foreign (here: English)] and constitutes the key independent and exogenously randomised variable of interest.

Moderator: Motivational domain. For the *motivational domain*, we adapted an established self-report scale initially developed for assessing goal commitment as a measurement of *Task commitment* (Hollenbeck, Williams, and Klein, 1989; Klein et al., 2001). We adapted the five items proposed based on a measurement-model meta-analysis (Klein et al., 2001). We translated them from a goal to a task focus and adopted a retrospective perspective on the tasks they had just completed. This resulted in the following five adapted items (adaptations in italics, original wording in brackets, "(r)" indicates reverse-coded items): 'It *was* hard to take this *task* [goal] seriously (r)', 'Quite frankly, I *didn't* care if I *solved* this *task* [achieve this goal] or not (r)', 'I *was* strongly committed to *solving* this *task* [pursuing this goal]', 'It wouldn't *have taken* much to make me abandon this *task* [goal] (r)', and 'I think this *task was good to answer*' [is a good goal to shoot for]. Participants rated on a 7-point Likert scale, ranging from (1) to (7), how strongly they agreed or disagreed. In both waves, participants responded twice to all items. In the first wave, they responded after the second task, which is after the first type of verbal divergent thinking, and after the fourth task, that is, after the second type of verbal thinking. In the second wave, they responded after all verbal divergent thinking tasks and after the figural task. To merge data from the first and the second wave, we generate a single response per item for verbal tasks by averaging the two responses in the first wave. The averages of responses to items relating to the verbal and figural tasks form the task commitments to the verbal tasks (TCv, α=.78) and the figural tasks (TCf, α=.68), respectively. For an aggregate analysis, we formed an overall task commitment score for each participant relating to all tasks that a participant performed. We averaged across all responses to task commitment items (TCa), which results in TCa = TCv for the first wave and a weighted average of TCv und TCf for the second wave (TCa = 2/3*TCv + 1/3*TCf, because figural tasks accounted for two out of the six scores).

Moderator: Cognitive domain. For the *cognitive domain*, we assessed foreign language proficiency as *Subjective English Proficiency* (SEP) using a 4-item self-report scale

adapted from Swift and Wallace (2011). Participants rate their competence level of English speaking, listening, understanding, and writing on a scale from (1) no competence to (6) fluent/near-native. Since the study did not involve any spoken interaction, we used the average of the two items related to understanding written text and writing (α=.92). Self-reported data are unlikely to capture an individual's actual language competence. However, it is a suitable measure in our study because the subjective experience is what likely makes the difference for the amount of stress an individual experiences, beyond the direct task-induced stress, and, hence, strains cognitive resources and influences behavioural responses (e.g. Neeley 2013; Presbitero, 2020; Urbig et al., 2020).

To increase validity, we added a measurement of *Objective English Proficiency* (OEP) in the second wave and assessed it with an English text extracted from the *C-Test* (2007). This test normally helps instructors allocate prospective foreign language students to the appropriate English course level based on their proficiency level. In the C-Test participants face an English-language text, in which some of the words and parts of words are intentionally left blank and have to be filled in by participants, based on their reading of the context. Thus, we also asked participants to fill in the blanks by adding the missing words and parts of words, respectively. The higher the number of correct answers, the higher is the proficiency level (continuous variable, ranging from zero to 20).

Moderator: Affective domain. For the *affective domain*, we measured *Foreign Language Anxiety* (FLA) based on the 10-item self-report short-scale constructed specifically for assessing individuals' emotional reactions to operating in formal, professional contexts in a foreign language (Gargalianou et al., 2016). We formulated all items with reference to English as the focal foreign language. A sample item is 'I get nervous and confused when I am speaking English.' Participants had to indicate on a 5-point Likert scale to what degree those statements applied to them, ranging from (1) strongly agree to (5) strongly disagree. The score for FLA was calculated based on the average of available responses (α=.92). For

technical reasons, we lack responses from many participants on one item in the first wave (86%), such that we only averaged over nine items in these cases.

Control Variables. We included several groups of control variables. First, we control for wave differences by including a dummy for the second wave. Moreover, we included three dummies that control for heterogeneity in data collection across the above-mentioned four groups in the second wave.

Second, we control for variables that had been included as standard control variables previously or were identified as potential antecedents *at the intersection* of the two fundamental strands of literature that we draw upon in this study: (1) experimental and observational research in IB on individual-level effects of foreign language use and (2) research on determinants of individual-level creative performance. We included *age* (in years) (e.g. Akkermans et al., 2010; Rhee and Choi, 2017; Urbig et al., 2016), *gender* as a dummy variable (1=male; 0=female) (e.g. Akkermans et al., 2010; Gargalianou et al., 2016; Rhee and Choi, 2017), and *conscientiousness* (e.g. Taggar, 2002; Urbig et al., 2016; Rhee and Choi, 2017). We assessed *conscientiousness* using a common and validated 10-item short version of the corresponding factor of the HEXACO-Personality Inventory Revised (HEXACO-PI-R) (Ashton and Lee, 2009; Moshagen et al., 2014). The response scale was a 5-pointed Likert scale, ranging from (1) strongly disagree to (5) strongly agree (α=.80).

Third, we included control variables to account for the composition of our sample, which deviates from most prior experimental studies in IB on effects of foreign language use that used student samples (e.g. Akkermans et al., 2010; Gargalianou et al., 2017; Stephan, 2017; Urbig et al., 2016; Urbig et al., 2020; for an overview, see Fan and Harzing, 2020). Given an ongoing debate in the field (cf. Bello et al., 2009) regarding whether and when student samples might constitute appropriate second- or even first-best sampling choices, we sought to include both university students and working professionals. We included a dummy variable *Student* that indicates whether a participant was (primarily) a student (1) or a working

professional (0). Furthermore, concerning this dummy variable and the inclusion of working professionals, we additionally included the level of *Education* in order to be able to control in a more fine-grained manner for possible differences in creativity performance related to the distinction between working professionals and students (e.g. Rhee and Choi, 2017; Tierney and Farmer, 2002), with *Education* ranging from 1=no educational level to 6=university degree. Since the lower levels were only sparsely populated, we pooled the lower three categories to end up with four groups: secondary school and less (0, base group), b) high school diploma (1), university of applied sciences degree (2), university degree (3).

Fourth, as part of an exploratory analysis, we included the dummy variable *Switch* (0=answers fully within the provided language frame; 1=otherwise) to account for possible code-switching of participants during task completion (i.e., interjecting on occasion words outside the specified language frame, in particular in the mother tongue) and for possible implications of such code-switching for creative performance (see Ahmad and Barner-Rasmussen, 2019; Ahmad and Widén, 2018; Tange and Lauring, 2009; Woolard, 2004).

Table 1 presents summary statistics, measures of measurement reliability when available, and binary correlations.

[Insert Table 1 about here]

RESULTS

General latent divergent thinking approach

As a first step and following the theoretical discussion where we considered an individual's creative thinking as a singular characteristic, we take all measures of divergent thinking as reflective of a single latent divergent thinking variable. Table 2 reports corresponding estimations of generalised structural equation models (GSEM). GSEM allows us to model divergent thinking as a latent variable with missing values in some measurements, because the two figural divergent thinking measures are only available for the second wave. Since the two figural thinking measurements are derived from the same set of participant responses, their

errors likely correlate. Hence, we allow their measurement errors to be correlated. Also, to cope with the missing assessment of objective English proficiency in the first wave, we set these missing values to the sample's mean value. By also controlling for the wave, we nevertheless get unbiased estimates for this variable.

[Insert Table 2 about here]

For the sake of completeness, we report a pseudo R-squared for the dependent variable (divergent thinking) and block-wise increments in pseudo-R-squared. The three blocks relate to control variables (when including the interaction of foreign language (FL) with SEP, this also includes the interactions of FL with wave and OEP), the hypothesised foreign language effect, and the hypothesised interactions effects. When discussing the effects in the text, we additionally report f^2 as a measure of effect size (Dawson, 2014). Table 2 reports the estimated models, but omits the measurement model for brevity (available upon request).

Model 1 tests the average effect of the foreign language treatment and, supporting *H1*, finds it to be significantly negative (FL: ß = -.49; $p < 0.001$; $f^2 = 0.086$). Since the latent divergent thinking variable has an estimated variance of about one ($\hat{\sigma} = 0.98$), a change in the language leads, on average, to about half a standard deviation difference in divergent thinking performance between language treatments. Concerning linear effects of other variables, foreign language anxiety negatively affects divergent thinking (FLA: ß = -.25; $p = 0.001$; $f^2 = 0.057$), objective English proficiency affects it positively (OEP: ß = 0.12; $p = 0.043$; $f^2 = 0.009$), and aggregate task commitment also positively (TCa: ß = 0.23; $p = 0.001$; $f^2 = 0.071$).

Models 2-4 insert the hypothesised moderation effects (*H2-H4*), one at a time. Since we control for spurious associations due to objective English proficiency being correlated with subjective English proficiency and these spurious associations can extend to related interaction effects, we also include the interaction of foreign language with objective English proficiency as a control variable. Since we lack related data for the first wave, also include the interaction with the wave. Since the other moderators are standardised, we use a contrast

code, -1/+1, for the wave. For aggregate task commitment, the interaction is negligible and statistically not significant (FL×TCa: ß = -.11; $p = 0.395$; $f^2 = 0.004$). Interestingly, the effect of objective English proficiency is not moderating the effect of the foreign language treatment (FL×OEP: ß = 0.01; $p = 0.936$; $f^2 < 0.001$). Hence, the effect of objective language proficiency seems to be a general competence effect rather than an effect specific to the foreign language context. In contrast, for subjective English proficiency, the interaction is statistically significant (FL×SEP: ß = 0.50; $p < 0.001$; $f^2 = 0.086$). For foreign language anxiety, the interaction is slightly smaller but still statistically significant (ß = -0.36; $p = 0.002$; $f^2 = 0.051$).

Model 5 includes all interactions simultaneously, focusing on the independent interaction effects of TCa, SEP, and FLA; that is, the effects of changes conditioned on the corresponding other variables remain constant. Here, only the interaction effect of subjective English proficiency is significant (FL×SEP: ß = 0.41; $p = 0.002$; $f^2 = 0.041$). There are no other significant interaction effects of the variables of interest with the foreign language setting (FL×FLA: ß = -0.14; $p = 0.325$; $f^2 = 0.005$; FL×TCa; ß = -0.12; $p = 0.539$; $f^2 = 0.005$). Hence, when considering it in isolation, the interaction effect identified for foreign language anxiety is likely to be explained by anxiety correlating with lower levels of subjective English proficiency. In sum, we find unambiguous support for *H3*, suggesting that subjective English proficiency positively moderates the foreign language effect, and partial support for *H4*, suggesting that foreign language anxiety negatively moderates the foreign language effect. However, the latter effect is spurious and appears to be primarily due to foreign language anxiety decreasing with higher levels of subjective English proficiency.

Exploiting the opportunities offered by using a GSEM, we test the robustness of our findings and change the measurement model. Rather than considering metric measurements with Gaussian distributions for the measurement errors, we assume Poisson distributions, which might be more appropriate for count variables (see Model 6). By better accounting for

measurement errors, these estimations have the advantage of even less attenuation. Consequently, the estimated effect size of the foreign language treatment becomes even larger for the language effect in terms of differences in Pseudo R-squared (FL: ß = -.16; $p < 0.001$; $f^2 = 0.170$, estimated based on a not reported model without interaction terms; available upon request). Since the latent divergent thinking variable now has an estimated variance of about 0.25, a change in the language leads on average to about two-thirds of a standard deviation difference in divergent thinking performance between language treatments. Estimated interaction effects are also larger on average (FL×TCa: ß = -0.03; $p = 0.379$; $f^2 = 0.006$, FL×SEP: ß = 0.12; $p = 0.010$; $f^2 = 0.072$, FL×FLA: ß = -0.04; $p = 0.284$; $f^2 = 0.011$), but only the interaction with subjective English proficiency is significant, as before, supporting the robustness of the results.

Separating verbal and figural divergent thinking

We continue by estimating the effects separately, first, for *verbal* divergent thinking as a latent dependent variable reflected in four verbal divergent thinking tasks and, second, for the two *figural* divergent thinking measures (Fluency and Flexibility). Parting with the idea of divergent thinking as a singular construct, we also acknowledge that Fluency and Flexibility are distinct expressions of divergent thinking. Furthermore, as we only have one measurement per individual of both Fluency and Flexibility, respectively, we cannot model these as latent variables but model them as directly observed variables. Still, we allow for the errors associated with Fluency and Flexibility to be correlated. Separating the different types of divergent thinking performances also enables us to use the task commitment scores that were measured specifically for verbal (TCv) and for figural tasks (TCf) and relate them to the corresponding task performances rather than using the aggregate measure that was averaged over the verbal and figural tasks (TCa). Estimates are reported as Model 7 (Table 3).

The previously identified interaction of foreign language with subjective English proficiency is significantly positive for all three types of divergent thinking measurements,

although the standardised effect size is largest for verbal divergent thinking (verbal: ß = 0.40; $p = 0.002$; $f^2 = 0.040$, figural, Fluency: ß = 0.32; $p = 0.079$; $f^2 = 0.016$, figural, Flexibility: ß = 0.42; $p = 0.009$; $f^2 = 0.028$). This supports the generalizability of our test of *H2* based on the aggregate analysis.

Since the conditional effect of foreign language, conditioned on average levels of the moderators (i.e., FLA=0, TCv=0, SEP=0, OEP=0, wave=0), differs in sign across the different measurements of divergent thinking (verbal: ß = -0.54; $p < 0.001$; figural, Fluency: ß = 0.24; $p = 0.048$; figural, Flexibility: ß = 0.13; $p = 0.318$), we further consider the foreign language effect in more detail. Note that these conditional effects reflect the average effect of foreign language, averaged over all levels of the moderating variables (Cohen et al., 2003). To shed more light on the related conditional effects, Figure 2 plots the interaction effects, that is, the estimated scores for divergent thinking for both language treatments and for low and high levels of subjective English proficiency (sample mean minus/plus one standard deviation). For visualization, we standardised the dependent variables to compare the effects more easily, but we report and statistically test the conditional effects as derived from Model 7 (Table 3).

[Insert Figure 2, Table 3 about here]

In the verbal domain, foreign language use negatively affects divergent thinking ($ß_{SEP=low} = -0.94$; $p < 0.001$), but less negatively for those with higher subjective proficiency ($ß_{SEP=high} = -0.14$; $p = 0.426$).[6] Hence, on average there is a negative foreign language effect. In contrast, these effects are less negative for figural divergent thinking of less proficient participants (Fluency: $ß_{SEP=low} = -0.08$; $p = 0.693$, Flexibility: $ß_{SEP=low} = -0.30$; $p = 0.090$) and even turn positive for more proficient individuals (Fluency: $ß_{SEP=high} = 0.57$; $p = 0.019$, Flexibility: $ß_{SEP=high} = 0.55$; $p = 0.018$). In sum, it seems that while subjective English proficiency renders the foreign language effect less negative for verbal tasks, consistent with findings by Stephan (2017), we find that this foreign language effect can even turn positive for performances in nonverbal (here: figural) tasks.

Additional robustness checks

We conducted two additional robustness checks. First, we explored differences between the online and offline approaches, thereby exploring whether pooling across both data collection waves is a viable strategy. We focused this analysis on verbal divergent thinking, because only these tasks were included in both waves. We employed a generalised Chow test, based on including and jointly testing interaction terms of all variables with a wave contrast code (Doran, 1989). By using a wave contrast code (+1/-1) rather than a wave dummy (1/0), the coefficients estimated for the model variables reflect the averages between estimated effects for both waves, and the coefficients estimated for the wave-interaction effects reflect half the difference in estimated effects between both waves (Cohen et al., 2003). Model 8 reports the estimated coefficients. Regarding the reporting of results in Table 3 (Model 8), note that the interaction of foreign language with the wave contrast code was already part of Model 7 and is now reported in the second column together with the other differences. Moreover, since objective English proficiency was only measured in the second wave, we cannot estimate a difference between waves.

In order to not be misled by multiple testing of multiple differences between waves, our analyses of differences between waves used joint significance tests. A joint significance test of differences in the control variables is not significant (χ^2=6.18, df=8, p=0.627). Hence, the effects of control variables do not seem to differ between waves. A joint test of differences in effects of model variables, i.e., foreign language, TCv, SEP, FLA, and the corresponding interactions with the foreign language, reveals significant wave-related differences (χ^2=17.31, df=7, p=0.016). The conditional effect of foreign language does not significantly differ between the waves (FL: diff/2 = 0.07, p=0.497) nor does the interaction between foreign language and subjective English proficiency (FL×SEP: diff/2 = -0.17, p=0.160).[7] This further supports the robustness of our conclusions concerning the tests of *H3*. However, we find significant differences across waves for the interaction of the foreign language effect with task

commitment (FL×TCv: diff/2 = 0.24, p=0. 053); it is negative for the first, but positive for the second wave (FL×TCv: $ß_{wave=first}$ = -0.32; p = 0.099, $ß_{wave=second}$ = 0.15; p = 0.245). Hence, *H2* cannot be supported because it is not significantly positive for any wave and is even rejected for the first wave. Our observation may possibly indicate a substantial context sensitivity of the corresponding effect.

Finally, we explored the possible influence of a particular approach of individuals' dealing with foreign language settings: In response to being asked to respond in a foreign language, participants might opt for code-switching; that is, they might nevertheless respond in their native language (see related, e.g. Ahmad and Barner-Rasmussen, 2019; Ahmad and Widén, 2018; Tange and Lauring, 2009; Woolard, 2004). This coping might itself affect their divergent thinking. We, therefore, explored the robustness of the estimations when including a variable that indicates such switching back into the native language into the estimations. Since only verbal responses were (and could be, in our setting) subject to such behaviour, we again restricted our analysis to the verbal response (see Model 9). We observe a strong negative association between switching and verbal divergent thinking (Switch: ß = 1.04; $p < 0.001$, f_2 = 0.097). Hence, this strategy does not appear to recover participants' creative potential, but seemingly, is just a reflection of them being overloaded and, eventually, 'giving up'.[8]

DISCUSSION

The objective of this study was to assess the impact of foreign language on individuals' creative performance. Based on an experimental study, we tested hypothesised relationships between motivational, cognitive, and affective influences on individuals' creativity in a native versus foreign language context. We proposed that working in a foreign language setting would adversely affect creative performance in a divergent thinking task (*H1*) due to limited cognitive resources; and that task commitment (*H2*) and foreign language proficiency (*H3*) would ameliorate this negative effect, while foreign language anxiety (*H4*) would reinforce it.

The main results are visually summarised in Figure 3 and are as follows: First, as expected, foreign language use negatively affected individuals' performance in divergent thinking tasks, but this generally adverse effect was restricted to verbal tasks. In figural tasks, performance of individuals with higher subjective foreign language skills benefited from foreign language use, while those with lower skills performed worse in the foreign compared to the native language treatment. Moreover, the conditionally negative effect of foreign language use for the less proficient participants was smaller in the figural than in the verbal tasks. Second, subjective foreign language proficiency robustly positively moderates the relationship between foreign language and creative performance. For individuals with higher foreign language proficiency, the adverse effect of a foreign language context is less negative or may even be positive (for figural tasks). Third, foreign language anxiety seemingly moderates the relationship between language and divergent thinking, but only when one does not control for correlated variation in subjective foreign language proficiency (indicated by the dotted arrow in Figure 3). Finally, the hypothesised buffering effect of task commitment was not robustly supported. In fact, there is some evidence that this effect might depend on the context of a study, such as online or offline approaches.

[Insert Figure 3 about here]

Overall, we believe that this study makes several contributions to the literatures on language in international management and on individual creativity.

The study adds to research on individual creativity (e.g. Hughes et al., 2018; Shalley et al., 2004; Amabile and Pratt, 2016), especially in the international domain (e.g. Hoegl et al., 2012; Tadmor et al., 2012), first, by pointing to foreign language use as a feature of employees' and managers' everyday work life, which is, generally, of growing importance but has hitherto remained underexplored in its effects on individuals' creative performance.[9] Focusing on divergent thinking, we found adverse effects of foreign language use on creative performance, especially in verbal tasks. Performance in figural tasks seemed less negatively

affected and potentially even benefitted, at least for highly proficient individuals. Together, we interpret these findings as pointing towards foreign language use impacting creative performance through multiple channels: On the one hand, foreign language use implies an increased cognitive load and, possibly, raises barriers to the ability to express one's ideas, arguably reducing task performance especially in creativity tasks that require verbal expressions of creative ideas. On the other hand, in figural tasks, performances of individuals who were highly proficient in the foreign language appeared to even benefit, overall, with creativity-enhancing effects of foreign language use outweighing the adverse effects of increased cognitive load (see, related, Stephan, 2017), presumably due to reduced language-related barriers to the expression of ideas in nonverbal tasks. Specifically, we propose that foreign language use might stimulate to a greater degree 'thinking outside the box' by reducing the constraining impact on idea generation exerted by salient knowledge associated with semantic processing in the mother tongue (cf. Abraham, 2014; Smith et al., 1993). Indeed, such an effect would be well aligned with modern linguistic perspectives on how language shapes our minds and actions: Boas, Sapir, Wharf, and even Humboldt have variously been credited with being the first to develop the original ideas underlying the notion of 'linguistic relativity', which, in its weak form, has emerged as the predominant linguistic paradigm (e.g. Boroditsky, 2001; Tietze, 2008), and which argues that "each language divides the world up differently" (Tietze, 2008, p. 23) because of fundamental differences between the semantic structures of languages (Gumperz and Levinson, 1991). For example, a term like 'fairness' may take on different meanings in different societies and languages (e.g. Buchan et al., 2004). Consequently, speakers of a particular language (also referred to as members of a specific 'linguistic culture') are argued to perceive the world differently and think differently about it compared to speakers of another language (e.g. Chen, 2013). Thus, this study suggests foreign language use as a potential pathway, for individuals who are highly proficient in a foreign language and particularly when results are expressed and

communicated nonverbally, to circumvent individuals' "default tendency to rely too heavily on familiar or easily accessible information during idea generation" (George and Wiley, 2020, p. 226).[10]

Moreover, based on these empirical findings, we consider as supported our basic contention that variations in the language setting might profoundly impact the different components of creativity-relevant processes. Thus, we further propose that language as a fundamental yet pervasive influence might be fruitfully incorporated into further advancements of the componential theory of creativity (Amabile and Pratt, 2016; Cromwell, 2016). Specifically, we propose that a foreign versus native language setting could be meaningfully conceived of as a change in the social environment, with implications for several individual-level components. In this respect, the strongest empirical evidence relates to the effect of foreign language use on the component of creativity-relevant skills, in particular in interaction with individuals' subjective foreign language proficiency, whereas the analysed affective and motivational factors appear less relevant. On the one hand, having to use a foreign language appears to add a further constraint on creativity-relevant processes by increasing cognitive load and/or restricting individuals' abilities to express their creative ideas. On the other hand, as evident from the difference in findings for verbal and figural task performance, it allows highly proficient individuals to tap into unfamiliar perceptual styles and "thinking skills that are conducive to taking new perspectives on problems […] and making unusual associations" (Amabile and Pratt, 2016, p. 160). Thereby, this study directly speaks to recent developments related to the componential theory: Cromwell (2020, p. 28) discusses the tension between a social-psychology theory of creativity and the creative-cognition theory perspective, which diverge on the issue of whether external constraints predominantly hinder or stimulate "the exploration of divergent cognitive pathways to search for novel and useful ideas". For the specific external constraint of having to use a foreign language, we offer evidence that both types of effects are to be expected, depending on an

individual's subjective foreign language proficiency. As such, both our concrete findings for a specific type of constraint and the conceptual links we establish to the literature on foreign language effects in psychology and IB may be useful for future research efforts to "reconceptualise the componential model so that it encompasses both theoretical perspectives and can explain both sets of findings" (Cromwell, 2020, p. 28).

When considering in detail the results for the proposed three moderators, the evidence regarding task commitment is particularly mixed: We did not find task commitment to be a robust moderator. Instead, the moderating effects of task commitment were highly variable, even possibly switching signs across the two waves. We, thus, do not reject the notion that it might have an impact, but suggest that it might be more context-dependent (e.g. offline versus online), requiring further research in order to isolate its effects.

Regarding foreign language proficiency, the main results relate to the moderating effect of subjective foreign language proficiency, which ameliorates the negative effect of foreign language use, possibly to the extent of turning the adverse effect into a positive one. Interestingly, we observed this effect only for subjective (SEP), but not for objective language proficiency (OEP). First, regarding the insignificant effects of OEP compared to SEP, we tentatively propose the following explanation, which aligns with the reasoning that motivated our choice of SEP as primary measure of FLP: Even if an individual's OEP is considerably lower than her SEP, as long as she is not aware of the low OEP or does not care about it, it is unlikely that coping with a foreign language setting poses a particular strain on her cognition. However, if, in turn, an individual possesses high objective skills but is constantly trying to find precisely correct ways of expressing herself, thus perceiving herself to possess low subjective proficiency, the cognitive strain may be substantial in the foreign language setting. There are two reasons why subjective, rather than objective proficiency appears relevant for the chain of effects towards higher or lower creative performance: First, according to dual process accounts (e.g. Evans and Stanovich, 2013; Thompson, 2009) subjective perceptions of

disfluency (cf. Alter and Oppenheimer, 2009) are key to whether a deliberate thinking mode (which requires more mental resources and cognitive capacity than the intuitive mode) is triggered or not. Second, a subjective perception of a high proficiency level implies that—all other things being equal—a person will be less stressed out by having to solve tasks in a foreign language setting compared to a person with lower subjective proficiency. Stress, however, taxes mental resources (e.g. Meinhardt and Pekrun, 2003) such that less cognitive capacity is available for processing the task at hand.

Moving on from the distinct effects of SEP and OEP to the difference between verbal and figural divergent thinking, we further propose that the observed performance-enhancing effect may potentially less be due to a cognitive-skill based mechanism (as originally envisaged in the motivation of *H3*)—superior language skills exerting less of a strain on cognitive resources and allowing for better idea expression—but more to the overcoming of barriers to the accessibility of (remote) associations during idea generation, which may apply in the mother tongue (cf. Abraham, 2014; Smith et al., 1993). This change in associative reasoning due to the foreign language context may thus lead to an improved divergent thinking, which individuals are able to primarily express in nonverbal tasks.

Somewhat surprisingly from the viewpoint of our conceptual framework, although partly aligned with prior studies (Haans and van Witteloostuijn, 2018), the negative moderating effect of foreign language anxiety is not robustly supported but seems spurious and primarily driven by foreign language anxiety decreasing with higher levels of subjective foreign language proficiency. While our data do not allow us to substantiate speculations on potential reasons, one explanation for this puzzling observation could be that the individual-level experimental setting employed in this study was a setting in which foreign language anxiety was simply less relevant. For example, due to the anonymity of the experiment, there was no public audience that one might be afraid to be embarrassed in front of. We thus encourage future research to dig deeper into this puzzle.

The second literature that this study contributes to is research on the influence of (foreign) language in international management (for overviews, see Brannen et al., 2014; Lecomte et al., 2018; Tenzer et al., 2017). It does so by emphasizing individual creativity and, more specifically, divergent thinking as an individual-level outcome variable that is important for internationally interconnected organisations, but has remained underexplored, to date, in the way that it is affected by foreign language use. Specifically, as our third major contribution, we show that using a foreign language (here: English) indeed impacts creative performance in divergent thinking tasks, with the task type (verbal versus figural) representing an important boundary condition as to the precise effect. The pattern of results across the different task types is nuanced: Foreign language use has a generally negative effect in verbal tasks (albeit less so, the higher an individual's subjective language proficiency). However, in figural tasks, this negative effect is relatively less pronounced for low proficiency individuals and turns even positive for highly proficient individuals: their divergent thinking performance may even benefit from the language setting. This pattern of results strongly suggests that there are likely multiple mechanisms at play: a cognitive load mechanism as hypothesised; and a mechanism that stimulates unusual associations and thereby exerts a positive influence on creativity-relevant processes. This result is particularly important as it corroborates a nascent but growing perspective that discusses possible positive effects of foreign language use in international management, arising not so much from efficiency gains but precisely from the creative potential entailed in multilinguistic environments. Piekkari and colleagues (2020, p. 1311), for example, conceptualise the meeting of languages as opening up a space for translator agency to unfold—in a process which, ultimately, includes a (potentially highly) creative element, as moving from one language to another requires re-verbalization of meaning. Our empirical results not only support this general notion but also provide evidence in a specific task context, calling for future research to explore alternative task contexts for which this space may exist.

Moreover, this study's findings are a further step towards identifying distinct effects of language, independent of potential confounds by culture (cf. Brannen et al., 2014). A considerable body of literature exists on the issue of potential cross-cultural differences in creativity (e.g. Lubart, 2010; Tang et al., 2018; Wong and Niu, 2013). To the extent that prior studies may have used standardised English-language instructions in cross-national and cross-cultural samples, it is not clear whether any such results on possible differences in performance on creativity measures (e.g. Wong and Niu, 2013) are solely attributable to cultural differences or whether differences regarding the use of a native or foreign language might have played a role, too. Unfortunately, many such studies do not clarify the language of instruction for the different subsamples. Our findings related to a purely language-related effect highlight the need for cross-cultural studies of creativity to carefully consider possible distinct language- and culture-related factors in the research design in order to prevent possible confounding effects.

Furthermore, the research design of the present study with the exclusion of bilingual-bicultural individuals also points to potentially valuable future extensions by relating to the extant literature on the role and function of bilingual-bicultural individuals within organisations (e.g. Brannen and Thomas, 2010). Specifically, while they were deliberately excluded from this study, systematically including them in future research (cf. Ringberg et al., 2010) and comparing their behaviour and performance in creative tasks relative to bilingual-monocultural individuals may reveal interesting insights into the distinct roles of culture and language (although the distinction may turn out to be rather one of degree, see, e.g. Barner-Rasmussen et al., 2014). Of relevance for individual level creativity, for example, prior research has found that language may trigger frame switching among bicultural-bilinguals (Ringberg et al., 2010). This may lead to misunderstandings resulting from differences in underlying meanings (Ringberg et al., 2010) but, in our view, also holds potential for increased creative performance due to a broader available set of nuanced associations.

Furthermore, especially interesting from the viewpoint of creativity and innovation at the organisational level is the positive association that has been found between language skills, in particular of bilingual-biculturals and knowledge transfer and boundary spanning (e.g. Barner-Rasmussen et al., 2014; Barner-Rasmussen, 2015; Brannen and Thomas, 2010)—arguably core ingredients of creative processes within organisations.

Practical Implications

This study adds to prior research on how using a foreign language affects individual-level processes within organisations (e.g. Costa et al., 2014b; Urbig et al., 2016, 2020; Tenzer et al., 2017; Welch and Welch, 2019) by drawing attention to an individual-level outcome variable, which has, to date, remained severely underexplored despite its practical relevance, that is, individual creativity, as an important antecedent of organisational innovation (e.g. Shalley, 1995; Amabile and Pratt, 2016). On the one hand, it supports a basic thrust of prior research: Organisations that adopt common corporate language policies and, thereby, force increasing numbers of members to go about their daily job activities in a non-native language may encounter unexpected and potentially adverse side effects, for example from reduced individual performance (here: decreased divergent thinking performance in verbal tasks). Moreover, the unexpected finding of a potentially performance-boosting effect of (subjective) foreign language proficiency on creative performance in figural divergent thinking tasks suggests two practical implications. First, firms may find it advantageous to adopt, whenever possible, nonverbal tools (e.g. mind maps, nonverbal design thinking tools, (rapid) prototyping, and so on) for stimulating and capturing individual creativity when employees need to communicate in a non-native language (e.g. company-wide idea suggestion systems (e.g. Rigtering et al., 2019), multilingual teams (e.g. Tenzer, Pudelko, and Harzing, 2014, in R&D). Second, the mechanism suspected to underlie this possibly performance-boosting effect—i.e. circumvention of individuals' "default tendency to rely too heavily on familiar or easily accessible information during idea generation" (George and Wiley, 2020, p. 226)—

points to the possibility of deliberately making use of foreign language communication as an easily accessible and efficient means of breaking constraining cognitive patterns in stimulating individuals' 'thinking outside the box'.

Limitations and Future Research

As with most research, this study has limitations, which, at the same time, point to fruitful avenues for future research. To start with, as all research methodologies, also the experimental method has its strengths and weaknesses. Well-designed experiments, that is, those, which involve randomization of controlled treatments offer advantages associated, in particular, with internal validity and the identification of causal mechanisms (van Witteloostuijn, 2015; Falk and Heckman, 2009). However, this comes at a cost: Experimental studies are at a disadvantage when it comes to capturing the richness and complexity of context. So, while the random assignment of participants to different treatments (here: native versus non-native language setting) in this study conferred advantages in terms of internal validity, these advantages were accompanied by issues of external validity. In particular, the results do not allow us to generalise to the complex multi-level environments of modern organisations. For example, in many instances, employees in the workplace self-select into roles and settings, including those that do or do not require (extensive) use of foreign language as part of their work activities. Also, organisation-level characteristics such as organisational culture might impact the relationship between foreign language use and individual divergent thinking—factors that are difficult to manipulate in a controlled manner as part of an experimental design. In addition, apart from organisational elements such as suggestion systems (e.g. Frese et al., 1999; Rigtering et al., 2019) that explicitly rely on encouraging individual-level creativity, creativity in the workplace is mostly a dynamic, group-based activity (Barczak et al., 2010; Hoever et al., 2012; Pirola-Merlo and Mann, 2004), implying challenges of aggregation across both people and time. For example, generally, the presence of others has been shown to influence performance in complex tasks

(e.g. Blascovich et al., 1999), with possible positive as well as negative influences. More directly related to the impact of language, language barriers within teams, which may, for example, arise from diverging proficiency levels of team members (e.g. Tenzer, Pudelko, and Zellmer-Bruhn, 2021; Vigier and Spencer-Oatey, 2018), have been found to adversely affect trust formation within teams (e.g. Tenzer et al., 2014). Team trust, in turn, has been identified as an important antecedent of team creativity (e.g. Barczak et al., 2010). Also, language barriers within teams, both hidden and evident ones, have been shown to negatively affect another ingredient to creative processes in teams, that is, knowledge processing (Tenzer et al., 2021). These complexities of team creative processes in the workplace, furthermore, often play out across time and space (e.g. in global virtual teams; see e.g. Klitmøller et al., 2015), implying that procedural aspects including, for example, the choice of communication media are vital (e.g. Tenzer and Pudelko, 2016). Perhaps not surprisingly, the predominant research methodology used by studies that have aimed at capturing language influences on dynamic, group-based activities in the workplace has been qualitative, including ethnographic methods, interviews, and observations. As such, we propose that this study's results point to many avenues for interesting future follow-up research—which may well find different types of research design more useful in order to explore the role of contextual variations. Recently, scholars have indeed suggested that mixed method designs may hold particular promise in integrating the strengths of the different methodologies (e.g. Tenzer et al., 2017; Tietze, 2020). For example, future research might build on this study by opting for a similar experimental design but including other types of creativity tasks, which are 'richer' in terms of the language component (e.g. asking participants to engage in writing lengthier texts) and might lend themselves to other types of analysis, such as, for example, textual analysis. Emphasizing procedural analysis (e.g. using thinking aloud protocols) may be another interesting, related type of extension.

Beyond these issues directly related to the richness and complexity of context that is not captured in our experimental setting, we note three further issues related to the research design. Future research should probe to what extent the results of this study depend on the type of creativity tasks. In this study, we relied on tasks assessing responsive creativity, whereas organisational environments arguably require their members to engage as well in other types of creativity, most notably proactive creativity, but also expected and contributory creativity (Unsworth, 2001). Assessing the impact of language setting on volunteered types of creativity, in particular, is likely to require a different methodological approach, though, which represents a challenge in its own right.

Moreover, relatedly, this study focused on divergent thinking in idea generation as the sole outcome variable. While divergent thinking arguably represents a key element of creativity (e.g. Runco, 2012), future research may nevertheless seek to broaden the focus to include also idea evaluation and, specifically, convergent thinking. As generation and evaluation of ideas appear to use the neural networks in the brain differently, giving rise to distinct cognitive processes (e.g. Kleinmintz et al., 2019), it is quite conceivable that the effects of foreign language use differ across both elements of creativity.

In addition, this study used a specific pair of native/non-native languages (German-English). Especially the use of English as foreign language appears justified given its importance as the world's dominant second language and its use as lingua franca in many domains of business a society. Still, future research should investigate whether this study's results hold across other native and non-native languages.

Turning to the theoretical foundations of this study, although the conceptual framework builds on the componential theory of creativity and in so doing integrates selected motivational, cognitive, and affective influences on the relationship between foreign language setting and creativity, it remains highly selective in the choice of factors within each of these three domains. Future studies may, thus, wish to consider complementary motivational,

cognitive, and affective antecedents of creativity in the specific context of native versus foreign language settings.

Further, considerations regarding how this study may inform research on group-level creativity by offering insights on important building blocks and regarding how to translate its research design adequately to the group level are constrained by a basic conceptual premise of this study: It builds on a theoretical perspective according to which group-level creativity is firmly embedded in the individual (e.g. Gong et al., 2013; Perry-Smith and Mannucci, 2017). Extensions within this model appear relatively straightforward: For example, scholars might seek to manipulate team composition with respect to proficiency levels in the (foreign) working language (related, see, for example, Tenzer and colleagues (2021) and Vigier and Spencer-Oatey (2018) on the role of language proficiency asymmetries; and Xue and colleagues (2018) on manipulating team composition in creativity experiments albeit with respect to other cognitive antecedents). However, this approach implies that a whole range of highly relevant issues exist, which are associated with situations in which "creative insight emerges not within a single individual, but rather across the interactions of multiple participants in the process" (Hargadon and Bechky, 2006, p. 484) and which are, by definition, outside the scope of this study. This alternative model of collective creativity is inherently dialectical in nature, and identifies as the root cause of (superior) group creativity (primarily) the collective and shared creative process itself (e.g. Hargadon and Bechky, 2006; Harvey, 2014), a process, which has, for example, been referred to as "creative synthesis" (e.g. Harvey, 2014, p. 324). Arguably, both the prevalence and the importance of this type of collective creativity have risen substantially in recent years, thanks to the enabling influence of modern information and communication technologies (ICT), especially the internet, and the emerging connections and networks. For example, in recent years, observers have witnessed a surge of dispersed, yet shared collective creativity initiatives, including communities of practices such as, for example, the member-initiated and member-governed online community

"February Album Writing Month" (fawm.org; for case description and in-depth analysis, see, e.g. Schiemer et al., 2019). Also, a growing scholarly literature addresses the complex collaborative dynamics that characterise the emergence of collective creativity in such situations (e.g. Hargadon and Bechky, 2006; Harvey, 2014; Kozinets et al., 2008; Schiemer et al., 2019). Despite the fundamental disparity of both theoretical perspectives regarding the primary source of (superior) group-level creativity, the present study may, nevertheless, hold valuable cues for how to integrate issues related to the working language of a group into this second model of collective creativity, in which communication represents a key factor of interest (e.g. Harvey, 2014). In terms of research design, such an approach would most likely require departing from the type of experimental design employed in this study. Data collection would need to rest more on rich, contextualised and procedural data, collected, for example, via thinking aloud protocols, audio or video recordings of behavioural interactions and analysed using content analysis in conjunction with temporal interaction analysis (e.g. Lehmann-Willenbrock and Allen, 2018). As such, while beyond the scope of the current study, we see ample scope for exciting future research also along these lines, examining how using as working language a language that is foreign to many or all of the members affects the collective, dispersed, and shared process within the group or community which gives rise to creative outcomes.

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ENDNOTES

[1] The view that group-level creativity is firmly embedded in the individual has been complemented in recent years by an alternative model of collective creativity that identifies as the root cause of (superior) group creativity (primarily) the collective and shared creative process itself (e.g., Hargadon & Bechky, 2006; Harvey, 2014).

[2] There is one further study by Ghonsooly and Showqi (2012), which considered possible links between foreign language learning and creative performance. However, this study compared creative performance assessed in the native language across two groups of individuals: one group of individuals was fluent in a second (i.e., foreign) language, in addition to their mother tongue. The other group was comprised of individuals who were able to communicate solely in their native language. Thus, this study did not investigate how using a foreign language affects creative performance among those individuals who are, in principle, proficient in this foreign language.

[3] Affective influences such as FLA are also linked to the cognitive load perspective as regulation and suppression of negative emotions also drains cognitive resources. Details are explained in the section that motivates Hypothesis 4, which addresses the moderating influence of FLA.

[4] The literature directly relating goal setting and task commitment to performance in divergent and convergent thinking tasks is surprisingly sparse, to date, and fragmented across different streams of literature. In a conceptual study, Litchfield (2008) linked brainstorming, a creativity technique aimed at idea generation, to goal setting and commitment. He proposed that antecedents of goal commitment such as, for example, an expectation of a positive outcome, would be beneficial for idea generation. An empirical study by Miron-Spektor and Beenen (2015) tentatively suggested that goal setting and task commitment might distinctly affect divergent and convergent thinking, depending on the type of goal that a person commits to in working on a task. Specifically, Miron-Spektor and Beenen (2015) found that performance achievement goals positively affected idea usefulness by increasing cognitive closure, while too much closure negatively affected idea novelty. A similar result was observed in a recent study by Wronska and colleagues (2019). However, rather exogenously manipulating the goals, they empirically investigated the impact of the personality trait need for closure. They observed that individuals who were predisposed to set themselves closure goals tended to feel less competent and to experience fewer positive and more negative emotions when solving a divergent (versus a convergent) thinking task.

[5] Note that the concept of bilingualism as applied here refers to bilingualism from an early age on (age of onset (AO) of acquisition below 5 years; with early childhood acquisition of a language usually being associated with AO ranging between 4 and 6 years across studies; for an overview, see, e.g., Tsimpli, 2014).

[6] At first glance, it may seem surprising that in the mother tongue treatment, subjective English proficiency seems to affect divergent thinking ($ß_{FL=0}$: ß = -0.23; $p = 0.007$, calculated based on Model 5). However, this can be explained by acknowledging that this is the partial effect of being less proficient while experiencing the same foreign language anxiety. If someone is comparatively less proficient in a foreign language without experiencing higher levels of anxiety, this individual is likely to be more robust to stress, in general. We expect that people who are more robust to stress, also perform better in observed creativity tasks under time pressure, independent of the language setting. Supporting this interpretation, excluding the FLA from the estimation and thereby estimating the effect of subjective English proficiency including situations where FLA co-varies, the conditional effect of SEP in the mother-tongue treatment becomes much smaller and is not statistically significant anymore ($ß_{FL=0}$: ß = -0.09; $p = 0.235$, calculated based on Model 5 when excluding all effects related to FLA). Note that

only the overall level of the effect of subjective English proficiency is affected, but not the hypothesized interaction of FL (foreign language treatment) with SEP with the related coefficient still being significant and of comparable size (FL×SEP: ß = 0.49, p<0.001).

[7] Calculating the interaction effects conditioned on the wave, they both are statistically significant (FL×SEP: $ß_{wave=first} = 0.61$; $p = 0.005$, $ß_{wave=second} = 0.26$; $p = 0.054$).

[8] We also analyzed the relationship between language switching and our other variables (available upon request). Probit regression analyses taking *Switch* as dependent variable reveal that males, those with lower SEP, and participants in the second wave using an offline approach were more likely to switch. The fact that switching depended on SEP but not on OEP further supports our assumption of the subjective perceptions as being more relevant here than objective skills (see also Urbig et al., 2020).

[9] Thereby, this study also extends the current discussion regarding foreign language and creativity (for a recent overview, see Kharkhurin, 2018), which has predominantly focused on comparing creative processes of bilinguals versus monolinguals (Adesope et al., 2010; Leikin, 2013) rather than the effects on creativity of using a second language per se; and which has often focused on children, i.e. contrasting individuals with an early age of onset of acquisition of the second language with monolingual children, rather than the vast group of adult second language users.

[10] One might even expect that this effect should be stronger in verbal tasks, which involve semantic processing even more extensively, that is, also in terms of producing speech/writing. However, especially with regard to the production part, barriers to expression are substantially higher and present to a degree in verbal tasks that they are not in figural tasks.

TABLE 1: Descriptive statistics and binary correlations

Variable	Distribution			Binary correlations															
	N	*Mean*	*SD*	1	2	3^{s}	4^{s}	5	6^{s}	7	8	9	10	11	12	13	14	15	16^{s}	17
1 Foreign language (1 = foreign)	392	0.47	0.50	1															
2 DT(verbal)	392	5.07	2.06	-.27***	(.81)														
3^{s} DT(figural, fluency)	193	6.71	3.28	.03	.39***	1													
4^{s} DT(figural, flexibility)	193	5.01	2.18	-.03	.47***	.73***	1												
5 Task commitment, verbal	392	4.96	1.11	-.25***	.19***	.17*	.26***	(.78)											
6^{s} Task commitment, figural	193	5.04	0.93	-.08	.30***	.30***	.34***	.73***	(.68)										
7 Gender (1 = female)	392	0.39	0.49	.04	-.07	.02	-.08	-.09^{+}	-.04	1									
8 Age	392	31.27	11.42	-.03	-.08	.24***	.12	.20***	.19**	.05	1								
9 Education (base)	392	0.08	0.27	-.08	-.11*	.11	-.07	.09^{+}	.03	.05	.33***	1							
10 Education 1	392	0.34	0.47	-.01	.03	-.13^{+}	-.05	-.06	-.07	.00	-.25***	-.21***	1						
11 Education 2	392	0.16	0.37	-.01	-.03	.02	-.06	-.10*	-.12^{+}	.02	.08^{+}	-.13*	-.31***	1					
12 Education 3	392	0.42	0.49	.06	.05	.04	.13^{+}	.09^{+}	.13^{+}	-.04	.00	-.25***	-.61***	-.38***	1				
13 Student (1 = student)	392	0.50	0.50	.05	.11*	-.14*	-.02	-.22***	-.19**	-.09^{+}	-.58***	-.27***	.26***	-.05	-.07	1			
14 Conscientiousness	392	3.07	0.84	.03	-.16**	.16*	.16*	.20***	.35***	.16**	.13**	.07	.00	-.07	.01	-.24***	(.80)		
15 Subj. English proficiency	392	4.58	1.00	.14**	.16**	-.08	-.05	-.08	-.00	-.02	-.23***	-.34***	.02	-.04	.19***	.28***	-.11*	(.91)	
16^{s} Obj. English proficiency	193	14.22	4.25	.06	.22**	.00	.17*	.13^{+}	.21**	.10	-.11	-.21**	.03	-.18*	.24***	.11	.10	.45***	1
17 Foreign language anxiety	392	2.50	0.94	-.10*	-.20***	-.00	.08	-.01	-.08	-.17***	-.06	.09^{+}	-.00	.04	-.08	-.07	-.01	-.59***	-.27***	(.92)

Note: N=392, DT = Divergent Thinking, Variables marked with "^{s}" are available only for the second wave with N=193. Cronbach's alpha reported on the diagonal when available.
Significance levels: + $p < .1$; * $p < .05$; ** $p < .01$; *** $p < .001$.

TABLE 2: Generalized structural equation model with latent dependent variable

Model	**1**	**2**	**3**	**4**	**5**	**6**
Divergent thinking	All	All	All	All	All	All
Measurement model (DV)	Linear	Linear	Linear	Linear	Linear	Poisson
Foreign language (FL)	-0.49***	-0.50***	-0.51***	-0.50***	-0.52***	-0.17***
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.04)
FL × TCa (z)		-0.11			-0.12	-0.03
		(0.12)			(0.13)	(0.03)
FL × SEP (z)			0.50***		0.41**	0.12*
			(0.12)		(0.13)	(0.05)
FL × OEP (z)			-0.01		0.01	0.03
			(0.12)		(0.12)	(0.05)
FL × Wave (+1, -1)			0.04		0.07	0.01
			(0.10)		(0.11)	(0.03)
FL × FLA (z)				-0.36**	-0.14	-0.04
				(0.12)	(0.14)	(0.04)
Foreign language anxiety (FLA, z)	-0.25**	-0.26**	-0.25**	-0.09	-0.19*	-0.05*
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.02)
Subj. English proficiency (SEP, z)	-0.06	-0.06	-0.26**	-0.05	-0.23**	-0.06**
	(0.07)	(0.08)	(0.08)	(0.07)	(0.08)	(0.02)
Obj. English proficiency (OEP, z)	0.12*	0.13*	0.17*	0.12*	0.16*	0.05*
	(0.06)	(0.06)	(0.07)	(0.06)	(0.07)	(0.02)
Task commitment (TCa, z)	0.23***	0.28***	0.23***	0.22***	0.28***	0.08***
	(0.07)	(0.08)	(0.06)	(0.07)	(0.08)	(0.02)
Gender (1 = female)	-0.08	-0.08	-0.05	-0.09	-0.06	-0.02
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.03)
Age	-0.01	-0.01	-0.01	-0.01	-0.01	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
Education 1	0.29	0.30	0.31	0.24	0.29	0.08
	(0.21)	(0.21)	(0.21)	(0.22)	(0.21)	(0.07)
Education 2	0.23	0.25	0.26	0.22	0.27	0.08
	(0.22)	(0.22)	(0.21)	(0.22)	(0.21)	(0.07)
Education 3	0.31	0.33	0.33	0.27	0.33	0.10
	(0.22)	(0.22)	(0.21)	(0.22)	(0.21)	(0.07)
Student (1 = student)	-0.00	-0.00	-0.01	-0.01	-0.01	0.01
	(0.18)	(0.18)	(0.17)	(0.18)	(0.17)	(0.05)
Conscientiousness	0.05	0.05	0.04	0.04	0.04	0.03
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.03)
Wave and subsample dummies	incl.	incl.	incl.	incl.	incl.	incl.
Log pseudolikelihood	-4177.9	-4177.4	-4183.7	-4171.5	-4165.5	-4270.1
AIC	8425.7	8426.7	8439.4	8415.0	8410.9	8608.1
BIC	8564.7	8569.7	8582.3	8557.9	8569.8	8743.2
Pseudo-R^2 for latent DV	0.368	0.370	0.421	0.398	0.426	0.560
Control variables	0.313	0.313	0.315	0.313	0.315	0.384
Foreign language	0.055	0.055	0.056	0.054	0.056	0.098
Moderation effects	-	0.002	0.050	0.031	0.055	0.078

N=392 with latent dependent variable divergent thinking based on four creativity scores for the first and six scores for the second wave, that is, we use all available scores. Measurement model omitted. Robust standard errors in parentheses. Pseudo-R^2 calculated based on linear predictions of divergent thinking as the latent dependent variable. Variables with (z) were standardized. When the effect of subjective English proficiency is estimated, we include corresponding linear and non-linear control variables with objective English proficiency and a wave contrast code (because the objective score is available only for the second wave).
Significance levels: *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

TABLE 3: Generalized structural equation model with multiple dependent variables

Model		**7**		**8**		**9**
Divergent thinking	**Verbal**	**Figural Fluency**	**Figural Flexibility**	**Verbal**		**Verbal**
				mean	***diff/2***	
Foreign language (FL)	-0.54***	0.24*	0.13	-0.61***	0.07	-0.41***
	(0.12)	(0.12)	(0.13)	(0.13)	(0.10)	(0.11)
FL × TCv (z)	-0.11			-0.08	0.24+	-0.12
	(0.12)			(0.11)	(0.12)	(0.12)
FL × TCf (z)		-0.16	-0.03			
		(0.14)	(0.13)			
FL × SEP (z)	0.40**	0.32+	0.42**	0.43***	-0.17	0.33**
	(0.13)	(0.18)	(0.16)	(0.13)	(0.12)	(0.13)
FL × OEP (z)	0.01	0.01	0.02	0.08	n.a.	-0.02
	(0.12)	(0.17)	(0.16)	(0.11)		(0.11)
FL × Wave (c)	0.03					0.11
	(0.10)					(0.10)
FL × FLA (z)	-0.13	-0.01	0.17	-0.02	0.22	-0.19
	(0.14)	(0.19)	(0.17)	(0.13)	(0.13)	(0.14)
Switch response language						-1.04***
						(0.30)
Task commitment, verbal (TCv, z)	0.27***			0.25**	-0.11	0.28***
	(0.08)			(0.08)	(0.07)	(0.08)
Task commitment, figural (TCf, z)		0.31***	0.31***			
		(0.07)	(0.09)			
Subj. English proficiency (SEP, z)	-0.23**	-0.15	-0.24*	-0.25**	0.11	-0.22**
	(0.08)	(0.10)	(0.11)	(0.09)	(0.09)	(0.08)
Obj. English proficiency (OEP, z)	0.15*	0.01	0.17+	0.13*	n.a.	0.15*
	(0.06)	(0.09)	(0.10)	(0.06)		(0.07)
Foreign language anxiety (FLA, z)	-0.20*	0.11	0.09	-0.25**	0.07	-0.20*
	(0.08)	(0.11)	(0.11)	(0.09)	(0.09)	(0.08)
Gender (1 = female)	-0.06	0.18	0.01	-0.03	0.12	-0.01
	(0.11)	(0.14)	(0.14)	(0.11)	(0.12)	(0.11)
Age	-0.01	0.01	0.01	-0.01+	0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
Education 1	0.29	-0.30	0.22	-0.05	0.32	0.29
	(0.21)	(0.25)	(0.27)	(0.29)	(0.29)	(0.18)
Education 2	0.27	-0.13	0.10	-0.03	0.44	0.22
	(0.21)	(0.31)	(0.28)	(0.29)	(0.30)	(0.19)
Education 3	0.32	-0.12	0.29	0.00	0.32	0.36+
	(0.21)	(0.25)	(0.25)	(0.28)	(0.29)	(0.19)
Student (1 = student)	-0.03	0.06	0.45*	-0.07	0.10	-0.02
	(0.17)	(0.19)	(0.23)	(0.16)	(0.16)	(0.17)
Conscientiousness	0.03	0.14	0.09	0.09	0.06	0.02
	(0.09)	(0.10)	(0.11)	(0.09)	(0.09)	(0.08)
Wave and subsample dummies	incl.	incl.	incl.	incl.		incl.
Log pseudolikelihood		-3752.0		-3321.5		-3323.9
AIC		7656.0		6735.0		6715.7
BIC		7957.8		6917.7		6850.7
Pseudo-R^2 for (latent) DVs	0.435	0.274	0.262	0.494		0.485
Control variables	0.316	0.239	0.236	0.312		0.406
Foreign language	0.061	0.010	0.001	0.061		0.029
Moderation controls	0.004	0.001	0.002	0.004		0.001
Moderation treatment	0.054	0.024	0.022	0.054		0.048
Moderation wave	-	-	-	0.060		-

N=392 (193 for Fluency and Flexibility) with latent dependent variable verbal divergent thinking based on four creativity scores; measurement model omitted. Fluency and Flexibility are modelled as directly observed single score measurements. Robust standard errors in parentheses. Pseudo-R^2 calculated based on linear predictions of divergent thinking as the (latent) dependent variable. Variables with (z) were standardized. In contrast to Table 2, task commitment scores are specific to the corresponding dependent variable. Significance levels: *** p<0.001, ** p<0.01, * p<0.05, + p<0.10

FIGURE 1: Initial conceptual framework and hypotheses

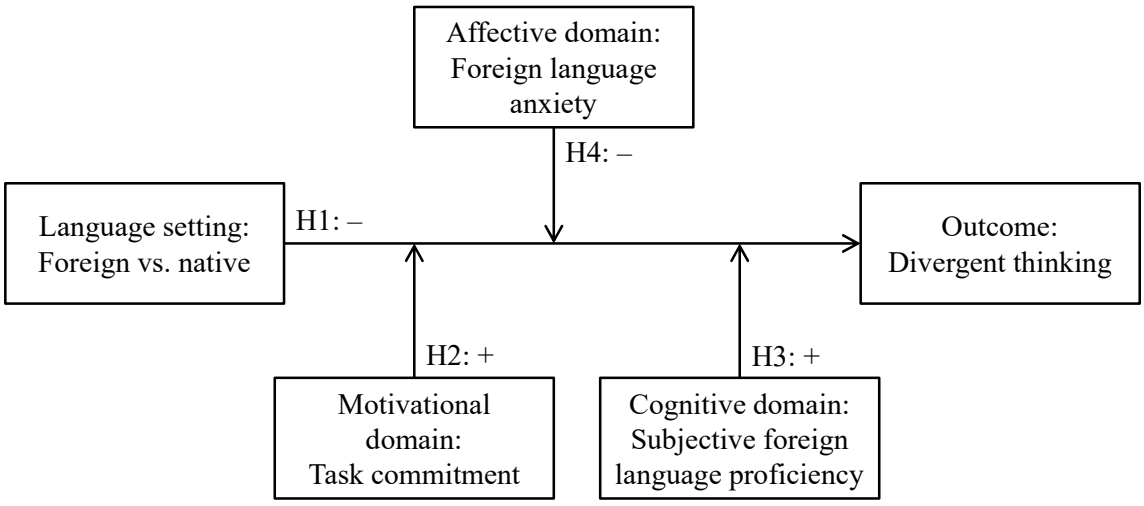


FIGURE 2: Interaction plots

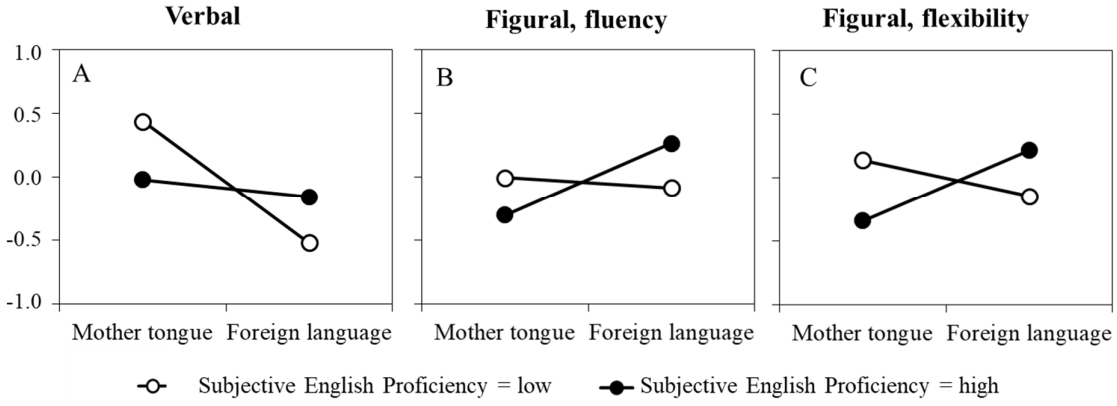
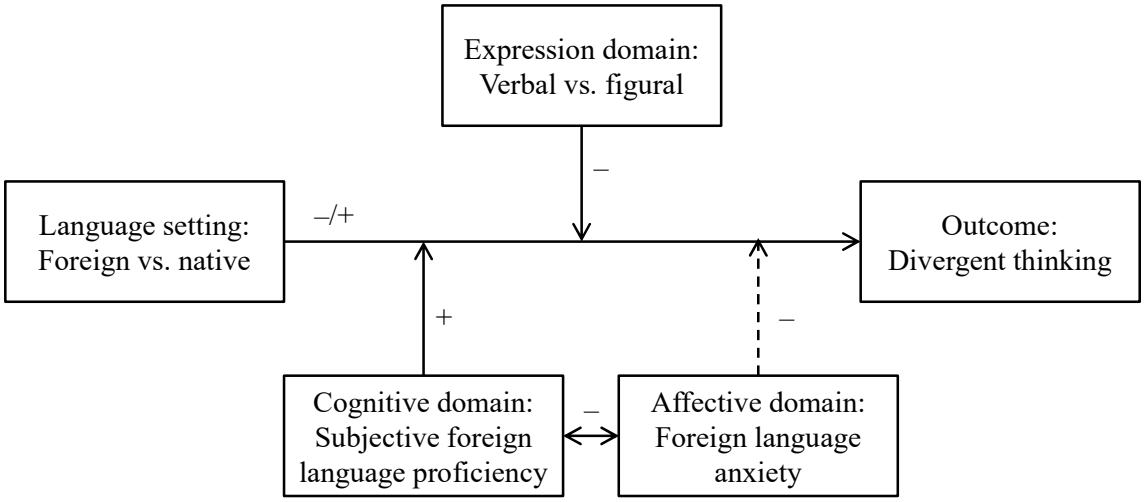


FIGURE 3: Resulting conceptual framework and visual summary of results



Notes: Dashed line for the affective domain indicates a relationship that is only present when not controlling for the correlated effect of the cognitive domain.