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**Bilingualism and Creativity: Towards a Situated
Cognition Approach**

ABSTRACT

In this paper, the association between bilingualism and creativity is investigated. In the first part, the results of a literature review are reported. Previous research predominantly found that bilinguals outperform monolinguals on creativity tasks, which was explained by bilinguals' enhanced executive functioning compared to monolinguals, and their experience with multiple cultures. Most previous research has examined the relationship between bilingualism and creativity within a psychological trait framework, which does not take into account that cognitive processes are regarded to be situated-embodied, meaning that they are influenced by environmental factors, and by a person's perceptions of and actions towards these environmental factors. In the second part, we discuss an alternative approach, in which creativity can be defined as the emerging skill of an individual to discover affordances, to come up with creative ideas and products. Recommendations for future research are discussed as well.

Keywords: creativity, bilingualism, situated-embodied cognition, affordances.

This paper focuses on creativity among bilingual children. Various studies have shown that bilingualism is positively associated with creativity and researchers have pointed to the role of executive functioning to explain this association, following research that has demonstrated that several executive functions are better developed among bilinguals in comparison to monolinguals (e.g., Hommel, Colzato, Fischer & Christoffels, 2011; Kharkhurin, 2011; Lee & Kim, 2010, 2011; Leikin & Tovli, 2014). This approach fits the traditional psychological trait theory, which states that cognitive skills, such as intelligence or creativity, should be seen as personal characteristics that are relatively stable over time and inherently differ between individuals. Recent findings, however, suggest that cognitive processes, and actions that result from these processes, are to be regarded as situated-embodied, meaning that they are influenced by environmental factors and by a person's perceptions of and actions towards these environmental factors (Barsalou, 2008). In this paper, we will first provide an overview of the current state of knowledge regarding the relationship between bilingualism and creativity. Subsequently, this relationship is explored from a situated-embodied cognition point of view. Finally, recommendations for future research are proposed.

Creativity is commonly defined as the act of generating new ideas or new connections between existing ideas or concepts (Simonton, 2008). Creative products are both original and useful. In a classical trait theory

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perspective, creative thinking is conceived as a person's ability to generate new ideas or products, which consists of (multiple cycles of) divergent and convergent thinking (cf. Guilford, 1967). Divergent thinking can be defined as the process that allows people to generate as many responses as possible to a particular trigger or problem (e.g., generate as many uses for a brick). This definition has been the starting point for the development of several creativity measures. Two well-known divergent thinking tests are the Torrance Test of Creative Thinking (TTCT, Torrance, 1998) and the Abbreviated Torrance Test for Adults (ATTA, Goff & Torrance, 2002). Results of divergent thinking tasks are usually evaluated with respect to the number of responses (fluency), the number of different categories being used (flexibility), the degree to which the responses differ from the standard (originality), and the amount of detail (elaboration). In contrast, convergent thinking can be defined as a constraining process, which aims at finding a single, best outcome given a particular problem (Cropley, 2006).

Individual differences in creativity, as measured by standard tests, emerge already in early childhood (Runco, 2004). These differences partially relate to differences in, for instance, age, seen as an index of cognitive maturity (Kim, 2011; Kostandyan & Ledovaya, 2013). More recently, attention is given to the ways in which the environment may influence creativity. In accordance with recent views on learning, we assume that creative skills, like other cognitive skills, emerge in the interaction of an individual with his or her environment (cf. Glăveanu, 2013). The environment is thought to influence creative skills in multiple ways. People evaluate and label creative acts and products. By doing this, they are expressing value, and help to establish what is called creative (Corraza & Agnoli, 2015; Glăveanu, 2013). In addition, the physical surroundings can be more or less inspiring, which may also determine to what extent creativity can or will be expressed (see Guegan, Nelson & Lubart, 2017, for an example, where this is demonstrated using a virtual environment).

Research has shown that language (Wang & Cheng, 2016) and experiences with multiple cultures (Leung & Chiu, 2010) can have a positive effect on creativity. In this paper, the focus is on children who are surrounded by multiple languages and cultures. Bilingualism, very generally, is defined as the use of multiple languages in everyday life on a regular basis (Grosjean & Li, 2013) and is a highly heterogeneous phenomenon. People may become bilingual early in life but also at later ages. Even in childhood bilingualism, there is considerable variation in age of acquisition of the languages. Although some children learn two languages from birth (i.e., simultaneous bilingualism), other children acquire their second language later (i.e., successive bilingualism), for example, when they enter kindergarten. Variation can also be found in the origin of bilingualism. Some children become bilingual because they speak a different language at home than the national language, for example, due to immigration. Other children become bilingual, because they live in a bilingual region or country (e.g., Wales or French immersion in Canada in the English-speaking part). Within these different bilingual learning contexts, there can be large variation in relative exposure to the two languages, and in the domains of exposure (e.g., official, unofficial, home, school; Bialystok, 2009).

The language environments of bilingual children differ from the language environments of monolingual children. For instance, bilingual children are exposed to two different vocabularies and to two partly different conceptual systems underlying these vocabularies. Related to this, bilingual children often experience the customs, values, knowledge, and wisdom of two or more cultures. In this regard, the environments of bilingual children can be considered richer than the environments of monolinguals, and, following the suggestion of Glăveanu (2013), it is conceivable that this explains the positive relationship between bilingualism and creativity.

To summarize, there is convincing evidence for a positive relationship between bilingualism and creativity. The nature of this relationship, however, is still not clear. Therefore, this study aims to examine the possible mechanisms that underlie this relationship. In the remainder of this article, we first report on a literature review that was undertaken. Then, we explore the positive association between bilingualism and creativity from a situated-embodied cognition point of view. Finally, recommendations for future research are proposed.

PREVIOUS RESEARCH

For this article, a review was undertaken of thirteen empirical studies published between 2007 and 2017 in which the relation between creativity and bilingualism was studied. These articles were identified through keyword searches within specific academic journals in the fields of creativity and linguistic studies, as well as keyword searches in the online database *Web of Science* and *PsychINFO*. The terms bilingualism, multilingualism, and second language learning were used, combined with one of the following terms: creativity, creative thinking, divergent thinking, or convergent thinking. Studies that reported on an intervention to increase creativity were excluded. The reviewed articles are listed in Table 1. As can be seen, most studies involved relatively small samples and were conducted among university students. Studies among children are scarce.

TABLE 1. Summary of Previous Research

Authors	Date	Sample		Creativity measure	Conclusion
		Monolinguals	Bilinguals		
Adi-Japha, Berberich-Artzi, & Libnawi	2010	25 Hebrew kindergartners	25 English–Hebrew and Arabic–Hebrew kindergartners	Drawings	The bilingual children showed a higher rate of inter-representational flexibility (i.e., links between components) in their drawings, compared to the monolingual children. Level of complex intra-presentational change (i.e., changes in components of a representation) was similar across groups.
Hommel, Colzato, Fischer, & Christoffels	2011	–	21 low-proficient young adults from Germany, & 21 high-proficient Dutch–English young adults from the Netherlands	RAT & AUT	High-proficient bilinguals outperformed low-proficient bilinguals on the RAT task. Low-proficient bilinguals had a significant higher fluency score on the AUT than high-proficient bilinguals (but equal on flexibility, originality, and elaboration).
Kharkhurin	2007	52 English psychology students	103 Russian–English psychology students	ATTA	Bilinguals outperformed monolinguals on measures of fluency, flexibility, but not on elaboration and originality.
Kharkhurin	2009	37 Farsi students living in Iran	34 Farsi–English students living in the United Arab Emirates	ATTA & IAC	Bilinguals outperformed monolinguals on originality and ability to violate a standard set of category properties, but not on the ability to generate a large number of unrelated ideas (i.e., fluency, flexibility).
Kharkhurin	2010	–	Same as Kharkhurin, 2007	–	A bilingual advantage in non-verbal creativity and a monolingual advantage in verbal creativity was shown.
Kharkhurin	2011	–	90 students from the American University of Sharjah	ATTA & IAC	High-proficient bilinguals outperformed moderate proficient bilinguals on the production of useful ideas and on thinking beyond standard categories in creative problem-solving. The inhibition of irrelevant information seemed to enhance the capacity to produce original and useful ideas. The facilitation of relevant information enhanced the ability to activate unrelated concepts.

TABLE 1. (Continued)

Authors	Date	Sample		Creativity measure	Conclusion
		Monolinguals	Bilinguals		
Kharkhurin	2017	28 Russian students	58 Russian-English students	ATTA	The flexibility score of bilinguals was higher than the score of monolinguals, which was explained by the translingual priming effect.
Kharkhurin & Wei	2015	–	157 multilingual students from the American University of Sharjah	ATTA	Habitual code-switchers had higher originality scores than their non-habitual counterparts.
Kostandyan & Ledovaya	2013	–	12 simultaneous bilinguals & 16 successive bilinguals, speaking Armenian-Russian	AUT & TTCT (Unfinished Figures)	Simultaneous bilinguals performed better on flexibility.
Lee & Kim	2010 & 2011	–	116 Korean-American children ($M = 11$ years)	TTCT (Figural subtests)	More balanced bilinguals performed better on the TTCT than the less balanced bilinguals, but when they were divided into groups (i.e., monolingual, less balanced and balanced bilinguals), no group differences appeared.
Leikin	2012	14 Hebrew preschoolers	23 Hebrew-Russian preschoolers	PMS & CEN	Difference on originality measure of general creativity and mathematical creativity.
Leikin & Tovli	2014	16 Hebrew preschoolers	15 Hebrew-Russian preschoolers	PMS & CEN	No differences on PMS. Bilinguals scored better on flexibility and originality on the CEN.

Note. ATTA = Abbreviated Torrance Test for Adults (Goff & Torrance, 2002); AUT = Alternative Uses Task (Guilford, 1967); CEN = Creating Equal Number task (Tsamir, Tirosh, Tabach & Levenson, 2009); IAC = Invented Alien Creatures task (Ward, 1994); PMS = Pictorial Multiple Solution (Leikin, 2012); RAT = Remotes Associates Test (Mednick & Mednick, 1967); TTCT = Torrance Test of Creative Thinking (Torrance, 1998).

In previous research, roughly two types of research can be distinguished. In the first type of research, the abilities of monolinguals and bilinguals are compared. In the second type of research, a comparison is made between two groups of bilingual participants (e.g., low-proficient and high-proficient bilinguals). Regarding the first type of research, Kharkhurin (2007, 2017) found that bilingual Russian–English students were more fluent and more flexible in their divergent thinking than both monolingual English and monolingual Russian participants. In another study among Farsi–English bilinguals and English monolinguals, Kharkhurin (2009) found a difference in the originality score of the ATTA (Goff & Torrance, 2002). In order to obtain a better understanding of the mechanisms that underlie bilinguals' better performance on the ATTA, Kharkhurin (2017) investigated if the structure of bilingual memory could play a role. Bilingual memory facilitates greater spreading activation between conceptual representations (i.e., transfer of activation between conceptual features, providing facilitation for related concepts and inhibition for unrelated ones), which, as a result, may support divergent thinking. With use of a translingual priming test, it was tested whether Russian–English bilinguals were better able to activate words that are semantically unrelated in Russian but indirectly semantically related to English compared to Russian monolinguals (e.g.: a marker is/*floMASTER*/in Russian, a stamp is/*marku*/). This hypothesis was partly borne out, namely for those bilinguals with high proficiency in English. Moreover, the translingual priming test scores predicted flexibility (but not fluency) as measured by the ATTA, supporting the idea that conceptual spreading in the bilingual memory is related to bilinguals' better divergent thinking skills.

Kharkhurin (2010) further explored whether the bilingual advantage held equally for verbal and non-verbal forms of creativity. He showed that Russian–English bilinguals outperformed English monolinguals on non-verbal creativity, whereas the opposite was shown for verbal creativity. These results are in line with findings regarding the performance of bilinguals and monolinguals on other language and non-verbal cognitive tasks. In general, monolinguals outperform bilinguals on language tasks in which language abilities in only one of the bilinguals' languages is measured (Hammer et al., 2014). The experiences with language among bilinguals are distributed across two languages, which means that they have less experience in one specific language and, therefore, perform less well on tasks that require knowledge of this language (Hoff et al., 2012). In cognitive tasks that are non-verbal, an opposite effect is found, namely a bilingual advantage. Bilinguals are found to outperform their monolingual peers on non-verbal tasks that require processes such as selective attention, inhibition, and switching (cf. Bialystok, 2009).

In the second type of research, the creative abilities of different groups of bilingual participants are compared. For example, Kharkhurin (2011) found that high-proficient bilinguals outperformed moderate proficient bilinguals on a divergent thinking test. The evidence is mixed, however. Hommel et al. (2011) compared the creative thinking skills of low-proficient German–English bilinguals and high-proficient Dutch–English bilinguals. In contrast to Kharkhurin's results, they found that low-proficient bilinguals obtained higher fluency scores than high-proficient bilinguals on a divergent thinking task, whereas high-proficient bilinguals showed more developed convergent thinking than low-proficient bilinguals. As a possible explanation, Hommel et al. (2011) suggested that language proficiency is positively related to focusing and selective attention, thus to convergent rather than divergent thinking (Colzato et al., 2008). High-proficient bilinguals would have better selective attention abilities than low-proficient bilinguals, because they hold two languages in mind and have to resist the intrusion of words from one language into the other on a daily basis (Poarch & Van Hell, 2012). This would result in an advantage when bilinguals need to focus on the correct solution (i.e., convergent thinking), but in a disadvantage when multiple responses need to be generated (i.e., divergent thinking). Kostandyan and Ledovaya (2013) compared the creative abilities of simultaneous and successive Armenian–Russian bilinguals with modified Russian versions of the Unfinished Figures Torrance Test and Alternative Uses Task. The results revealed that simultaneous bilinguals outperformed successive bilinguals on non-verbal flexibility and non-verbal originality. In another study, Kharkhurin and Wei (2015) assigned the bilingual participants to two groups based on the extent to which they used code-switching in their daily life. Code-switching was defined as the alternation and mixing of different languages in the same episode of speech production (Li, 2013). Code-switching, according to some authors (e.g., Wei & Wu, 2009), as such, can be regarded as a creative act in which new forms of language are created to ease communication, but in any case requires cognitive flexibility. A comparison between these two groups indeed revealed that habitual code-switchers outperformed non-habitual code-switchers on the ATTA's originality score. More specifically, it was shown that code-switching induced by a lack of specific vocabulary in a target language led to increased use of novel forms of language in bilinguals.

The studies described above were all conducted among adults. In the literature search, five studies on the relationship between bilingualism and creativity were found which involved young children. One study with 4- to 6-year-old preschoolers demonstrated that Hebrew–Russian bilinguals outperformed Hebrew monolinguals on mathematical creativity (Leikin, 2012). In a similar study involving 5-year-old monolingual and bilingual children (Leikin & Tovli, 2014), a bilingual advantage was found in general creativity, but only regarding the originality dimension. Lee and Kim (2010, 2011) found that in Korean–English 11-year-olds the balance in children’s proficiency in both of their languages was positively correlated with the mean score on the Torrance Tests of Creative Thinking (TTCT): Balanced bilinguals obtained higher scores than less balanced bilinguals. As a possible explanation, the authors suggest that balanced bilinguals make more use of both of their linguistic systems, whereas unbalanced bilinguals mostly rely on one system, but Lee and Kim do not detail how the use of two linguistic systems versus one would specifically relate to the TTCT outcomes. However, this indicates that switching between multiple languages may positively contribute to combining different ideas, which—in turn—affects creativity. Adi-Japha, Berberich-Artzi and Libnawi (2010) conducted research on cognitive flexibility in drawings among English–Hebrew and Arabic–Hebrew bilingual 4- and 5-year-olds and their monolingual counterparts in either English or Hebrew. Their findings indicated that 4- and 5-year-old bilingual children produce a variety of inter-representational modifications. These modifications can be characterized as cross-category insertions when they have to draw an object, for example, a flower that, following the instruction, “does not exist.” Instead, monolingual children show within-category deletion as the main response to the same instruction. Although monolinguals mostly used deletion of components of the flower (such as drawing a flower without petals), bilinguals tended to insert features of other representational categories in their drawings (such as drawing a flower as a heart). According to Adi-Japha et al., these findings reflect bilinguals’ advantages in switching between multiple languages and mixing representational systems.

To summarize, there is evidence for a bilingual advantage in creativity. As may be clear from the current review, research on the association between bilingualism and creativity is still in its infancy. Therefore, it may not be surprising that many of the studies have methodological shortcomings, which emphasizes the need to interpret the results with caution. There is a need for larger and more homogeneous bilingual samples. Furthermore, the heterogeneous nature of bilingualism emphasizes the importance of identifying the characteristics of bilinguals, such as their language proficiency and the age of language acquisition. Most studies did not make a distinction between bilinguals with different linguistic backgrounds or different levels of language proficiency. If participants indicated that they could speak multiple languages, they were considered bilingual, a criterion that leaves room for much variation in proficiency.

EXPLAINING THE FINDINGS

An important question is *why* bilinguals outperform monolinguals on creative measures. Authors of previous research have pointed to enhanced executive functioning as a potential underlying mechanism (e.g., Hommel et al., 2011; Kharkhurin, 2011; Lee & Kim, 2010; Leikin & Tovli, 2014). Indeed, evidence is accumulating that bilingualism is advantageous for cognitive development (Dong & Li, 2015; but see Paap, Johnson & Sawi, 2015). The enhancement of executive functions has been reported as one of the main cognitive effects of learning multiple languages. Bilinguals are confronted with the lexical competition between two languages (e.g., Green, 1998). They need to focus their attention to choose the correct language and inhibit the interference of the other language (Costa, Hernández, Costa-Faidella & Sebastián-Gallés, 2009). This would make bilinguals advantaged in executive functioning compared to monolinguals. Executive functioning enables people to manage a complex set of task demands, to switch attention to goal-relevant information, and to inhibit irrelevant or competing information (e.g., Barac, Bialystok, Castro & Sanchez, 2014; Blom, Küntay, Messer, Verhagen & Leseman, 2014). These skills are also important for creative thinking. Recent studies have found evidence that creativity depends on executive functions (Benedek, Franz, Heene & Neubauer, 2012; De Dreu, Nijstad, Baas, Wolsink & Roskes, 2012; Zabelina, O’Leary, Pornpattananangkul, Nusslock & Beeman, 2015). In order to produce an original idea or product, people have to focus and persist on the task at hand. Updating incoming information and shifting are beneficial to both divergent and convergent thinking. Furthermore, inhibiting noise and other environmental stimuli can prevent creative people from being distracted.

Another explanation, proposed by authors of previous research, may be that bilinguals are often engaged in two or more different linguistic and cultural environments, and are surrounded by the norms, values, and knowledge of these cultures that enrich their associations and conceptual systems. Therefore, the

bilingual advantage in creativity may not (only) be attributed to the general cognitive effects of managing and monitoring multiple languages, but also to different and enriched associative networks and conceptual spreading activation, as suggested by Kharkhurin (2017) and Adi-Japha et al. (2010). Spreading activation may establish new associations from which original and novel ideas arise. Research among young adolescents (Chang, Hsu, Shih & Chen, 2014) revealed that living in bicultural families indeed positively affected fluency, flexibility, and originality of divergent thinking. Furthermore, Leung and Chiu (2008) showed that the extent of multicultural experiences (e.g., foreign language and exposure to different cultures) of European-American undergraduates predicted creativity.

To summarize, two types of explanations of the relation between bilingualism and creativity stand out. The first refers to general cognitive advantages of bilingualism, the second to enriched conceptual knowledge. Note that the two approaches are not mutually exclusive and could both contribute to explaining the observed effects of bilingualism on creativity. The two approaches share a view on creativity as an either domain general (enhanced executive function) or domain-specific (conceptual knowledge) individual characteristic. Creative performance in an actual situation is assumed to be largely determined by this individual characteristic; neither approach specifies hypotheses of how characteristics of the situation or context may influence creative performance. In this respect, both approaches resemble the classical trait theory of creativity, which assumes that creativity is a personality trait, which differs between individuals, but is relatively stable across situations. The evidence, however, indicates that the cross-situational stability is the exception rather than the rule. Studies have revealed only modest intra-individual stability of creativity test scores (Jeon, Moon & French, 2011). The dependence of creativity measures on task and situation characteristics has also been shown in experimental studies. For example, Kharkhurin and Altarriba (2016) explored whether bilingual participants' mood state in either an English or an Arabic context would lead to variation in creativity. Testing in English was found to enhance verbal fluency and originality, as compared to testing in Arabic. In addition, an interaction effect of mood state induction (positive, negative) and language (English, Arabic) on creativity emerged. These results indicate that creativity can be different across situations due to manipulated situational factors. Therefore, we will challenge this trait-view on creativity. More specifically, we will examine the value of a situated-embodied cognition approach to creativity and propose an integrative re-interpretation of the current findings. We subscribe to the view that cognitive processes can be seen as situated and embodied, and therefore bound to social, cultural, and physical contexts (Barsalou, 2008). In the remainder of this paper, we explore whether a situated-embodied cognition perspective provides a useful framework to interpret and explain the bilingual advantage in creativity.

BILINGUALISM AND CREATIVITY FROM A SITUATED-EMBODIED COGNITION PERSPECTIVE

The situated-embodied approach to human cognition refers to a set of theories that postulate the grounding of human cognition in individuals' perception and action in the real physical environments (e.g., Barsalou, 2008; Gallese & Lakoff, 2005; Glenberg & Gallese, 2012; Pulvermüller, 2013; Smith & Gasser, 2005). Moderate embodiment (e.g., Gallese, 2009; Goldman, 2012; Lakoff, 2012; Pulvermüller, 2013) stands for approaches in which situated-embodied knowledge through perception-action provides a direct and primary sensorimotor basis for word meanings (semantics) and conceptual knowledge. According to Gibson's ecological psychology, physical environments are structured and contain rich, potentially relevant information for a person who can perceive this information. For the match between what a person currently is able to and interested in, on one hand, and the relevant properties of the physical environment, on the other hand, the term affordance was coined. For example, a horizontal surface allows for walking, but only for a person who is able to walk.

In addition to this main tenet, moderate embodiment specifies three mechanisms: (a) abstraction processes which lead to increasingly abstract sensorimotor concepts that, however, still directly represent ("mirror") information structures in the environment in relation to the actual action capabilities and the action goals of the individual (e.g., the "graspability" of different objects, the "serving-the-goal-of-eating" of different actions; Gallese, 2009); (b) associations of embodied multimodal sensorimotor knowledge with disembodied amodal conceptual systems that come with acquiring the language system and that have their own sets of combinatorial rules to define concepts in terms of other concepts and to assemble concepts into more complex concepts (Lakoff, 2012); and (c) sensorimotor simulation, referring to the possibility to activate sensorimotor circuits for particular actions without actually performing these actions (Gallese, 2009; Goldman, 2012). An intriguing, and for the present purpose highly relevant, notion is that abstract concepts

through their grounding in the sensorimotor system can—in a top-down fashion—bias attention, that is, they can influence the speed, accuracy, and level of detail of perception, thus, in that sense, *what* is perceived.

We can now extend the theoretical framework to the understanding of creativity as a situated-embodied skill and propose hypotheses about the underlying mechanisms of the relationship between bilingualism and creativity. Creativity, which was before defined as the act of generating new ideas or new connections between existing ideas or concepts through cycles of divergent and convergent thinking (Guilford, 1967; Simonton, 2008), can now be defined as the emerging skill of an individual to discover more complex affordances, in which several action possibilities are combined. This could lead to discovering and applying novel uses of objects, ideas, and solutions. Creativity requires extensive exploration of possible affordances and their possible consequences in terms of simulated blends of sensorimotor schemes. Exploration is needed to uncover new action possibilities, and intermediate outcomes need to be evaluated with regard to their usefulness. Observed creativity, then, depends on the situation (what is there to start with), the skill and drive to explore the multiple action affordances present in the situation, and the capacity to assemble new skills upon uncovering new affordances.

If concepts are indeed grounded in primary sensorimotor actions, but can also be subjected to combinatorial processes at the abstract conceptual level (Lakoff, 2012; Pulvermüller, 2013), the possibility emerges to think of situations, objects, actions, and events that a person has never observed or performed, or that are impossible in reality, which could also be expressed in language. When language is processed, both on the visual and the auditory level, the motor, perceptual, and emotional systems are activated to simulate the situations described (Adams, 2016; Gallese, 2009). The verbally expressed conceptual instruction, for example, when listening to a fairy tale, “think of a horse with a horn on its nose” would create the image of the non-existent entity “unicorn” that, according to the embodiment approach, inherits the multimodal properties of real horses and real horns.

How and why can bilinguals, on average, have an advantage in creativity? We see three possible mechanisms. First, in so far as conceptual knowledge biases attention and thereby influences affordance perception (Pulvermüller, 2013), the initial situation—“what is there to start with?”—can be both different and richer for bilinguals due to their enriched conceptual systems (cf. Adams, 2016; Bylund & Athanasopoulos, 2014; Kharkhurin, 2017), allowing for more exploratory actions and increased fluency and originality. Regarding the generating of ideas, due to bilinguals’ partly different and generally more enriched conceptual systems with wider spreading activation, an advantage can be expected, especially regarding the originality of ideas. As an example, Adams (2016) described the differences in a conceptual system in the concept of bread. When using the English word *bread*, this might evoke the image of a loaf of sliced bread bought at the supermarket, whereas the French word *pain* might evoke the image of a baguette that you buy at the bakery. The concepts would also differ in affordances (i.e., grabbing a piece of sliced bread vs. cutting the baguette). The more enriched conceptual system of bilinguals might lead to the discovery of more, different, or more complex affordances. However, the dependence on lexical-syntactic combinatorial processes in verbal creativity may hamper fluency in bilinguals due to gaps in their lexical-syntactic knowledge, which implies that the bilingual advantage might be more visible in non-verbal creativity than in verbal creativity. Second, being raised in multiple cultures with different needs, practices, and values may provide bilinguals with richer sets of action goals that embody usefulness. Third, if creativity is indeed a skill that develops through extensive exploration in a given situation controlled by usefulness, bilinguals’, on average, enhanced sustained attention (e.g., to continue exploration of action affordances), cognitive flexibility (e.g., to switch between perceptions of action affordances), and working memory (e.g., to update the match between current action results and the desirable outcome) additionally explain their higher creativity.

CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

The aim of this paper was twofold. Firstly, an overview of the current knowledge regarding the relationship between bilingualism and creativity was provided. Secondly, the relationship between bilingualism and creativity was explored in view of a situated-embodied cognition approach, which holds that creativity and creative acts are situated-embodied and bound to the environment. One challenge is to find methodological approaches that do justice to the view that creativity requires exploration of the environment to discover affordances. Future studies should focus on investigating the combination of both child and environmental factors, and by varying these factors, more insight can be given in the extent to which these factors influence creativity. For example, comparing diverse children (i.e., different

backgrounds/languages) in a comparable setting, or the same child in different settings with different affordances, may provide insight into the complex interplay between bilinguals' individual and environmental influences on creativity.

Regarding bilingualism specifically, a challenge is that the population of bilinguals is diverse and heterogeneous, with important repercussions for future research. Language proficiency seems to be key. Creativity arises from the detection of affordances. This requires broad and deep conceptual knowledge and hence a high level of language proficiency. Related to this, the context of language learning may be important as well. Some languages may only be learned in school, whereas other languages may be excluded from the school context. Some languages may only be used in specific contexts, which influences the breadth of language proficiency, which—in turn—influences conceptual knowledge. In other words, different dimensions of bilingualism (age of the first and second language acquisition, language proficiency, and the domains of language use) are expected to be involved in the effect of bilingualism on creativity.

In sum, creativity can be defined as the emerging skill of an individual discovering more complex affordances, in which several action possibilities are combined, which leads to creative ideas and products. Bilinguals have enriched conceptual systems, which allows for more exploratory actions, and—therefore—increased fluency and originality. Furthermore, being immersed in multiple cultures and having enhanced sustained attention, flexibility, and working memory may make bilinguals advantaged in discovering affordances. These insights acknowledge that both bilingualism and creativity are situated-embodied, and offer promising leads for research on the relationship between bilingualism and creativity.

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