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Multilingualism and creativity: A multivariate approach

Original research article

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Abstract

This paper proposes a contribution to the investigation of the relation between multilingualism and creativity. Past evidence of a correlation between multilingualism and creativity is reviewed in a generalist perspective, that is, without focusing on a specific population such as migrants or highly proficient bilinguals. This review is also anchored in contemporary cognitive psychology and specialized research on creativity, allowing for a consideration of different levels and domains of creativity, as well as a distinction between creative potential and manifest creativity. On this basis, we test various hypotheses with a sample of 596 participants, using multiple regressions that incorporate several control variables. Key results shows that L2 skills are systematically and positively related to virtually all indicators of creativity. Additional results reveal effects of other linguistic variables, along with effects of control variables related to cultural diversity (traveling and experience of living abroad), as well as interactions between linguistic and control variables. These results are contrasted with earlier findings and then discussed in terms of language policy implications and perspectives for future research.

Keywords

multilingualism, plurilingualism, creativity, advantages of bilingualism

Introduction

A frequently made claim is that diversity carries various benefits, both tangible and intangible. One of the reasons often invoked in support of the claim that diversity, which can encompass linguistic aspects (“multilingualism”) and cultural ones (“multiculturalism”), delivers benefits is that it is conducive to creativity (e.g., Baycan-Levent, 2010; Furlong, 2009). In this paper, we take a closer look at the language side of this argument, and investigate the correlation between individual multilingualism² and creativity, beginning with a theoretical examination, followed by an empirical study and a discussion of the results.

Although bi- or multilingualism generally implies the co-presence in a person’s repertoire of more than one language, the literature does not always emphasize the same features (e.g., Baker, 2001; Coulmas, 2013; Dewaele, House, & Wei 2003; Edwards, 1994; Heller, 2007; Wei, 2013, 2014). However, our question requires a more specific definition, since instead of a binary opposition between “monolinguals” and “bilinguals”, we treat language profiles as positioned along a continuum. While we are aware that “competence” is situational and that the continuum itself is not merely unidimensional, we concur with Edwards (2013, p. 12) that “any attempt to come to grips with bilingual competences [...] must obviously start from definable levels or degrees”. Yet this does not necessarily require a clear cut-off point or an all-or-nothing definition. All we need is a way to differentiate between different levels of competence, for example with reference to the *Common European Framework of Reference*

² Although “plurilingualism” is increasingly used when referring to individual language repertoires, the term “multilingualism” is more common. Therefore, we have opted to retain the latter in order to ensure continuity with earlier research as well as with the notion of multiculturalism. Wherever necessary, we explicitly make the difference between individual and societal multilingualism.

for Languages (CEFRL) allowing for an operational definition of multilingualism based on a continuum rather than on categories.

The vast question of whether multilingualism generates positive outcomes in general can be addressed from a variety of angles, from the realization of linguistic human rights to improved educational success among allophone children. Enhanced creativity might then be an additional benefit. Likewise, the literature in language economics shows that individual multilingualism has a positive effect on earnings (Grin, Sfreddo & Vaillancourt, 2010), but it usually falls short of explaining how economic value emerges from more extensive language skills, but one possible explanation could rest on the multilingualism-creativity link, where individual creativity breeds innovation, and hence on value creation..

Turning now to creativity, it can be defined as “the interplay between ability and process by which an individual or group produces an outcome or product that is both novel and useful as defined within some social context” (Plucker, Beghetto, & Dow, 2004, p. 90). This definition posits creativity as a complex, multivariate phenomenon. Indeed, creativity research traditionally distinguishes between at least three key components: process, product and person (e.g., Runco, 2004). Confluence approaches (e.g., Sternberg & Lubart, 1995) further posit that the creative person is shaped by several variables such as intelligence, thinking style, knowledge, personality, and motivation. Specific combinations of these variables (e.g., open personality, inquisitive thinking style, motivation to generate and elaborate new ideas) typically lead to high creative ability, or high creative potential. In this paper, we essentially focus on the person component, showing how linguistic variables on one hand are related to creativity variables on the other hand. More specifically, we distinguish between variables that represent potential creativity and other variables that represent actual creative activities and achievements.

Although this paper does not aim to review the full range of theories of creativity, we believe that the study of the multilingualism-creativity link can benefit from a more comprehensive perspective. Most past research has tended to focus either on cognitive factors that are only indirectly related to creativity, or on relatively isolated and specific manifestations of it (e.g., divergent thinking). Moreover, this research has often focused on bilingual individuals, using a relatively strict definition of bilingualism. Nevertheless, it provides significant insights into the question of why multilingualism could be positively related to creativity. We review these elements in the following section. The third section presents a synthesis of the possible measurements of creativity (other than divergent thinking tasks), in order to delineate the empirical contribution of this paper.

Past research on multilingualism and creativity

The results from earlier research can be roughly classified of two categories. The first category includes relatively indirect evidence, that is, when bilingualism or multilingualism is found to be correlated to certain cognitive aptitudes that may be relevant to creativity. Such aptitudes typically include general mental control and cognitive flexibility, which seem stronger for bi- or multilingual individuals (e.g. Bialystok, 2017; Bialystok, Craik, & Luk, 2012). Other studies suggests that these aptitudes could be relevant to creativity (e.g., Benedek, Jauk, Sommer, Arendasy, & Neubauer, 2014; Pan and Yu, 2016). Additional mechanisms that are potentially relevant include metalinguistic awareness and, by extension, meta-cognition, as well as overall fitness of the mind (see Marsh & Hill, 2009 for an overview). Though relatively abundant, this research almost never considers the multilingualism-creativity alink as a primary research question, hence its indirect and rather speculative nature.

The second category includes studies that specifically focus on the multilingualism-creativity

link. Though fewer, these studies show that multilingualism is related to specific manifestations of creativity. In an early study, Okoh (1980) has shown that bilingual children in Nigeria and Wales have significantly higher verbal creativity scores. No differences, however, were found in the nonverbal creativity tests. Kharkhurin (2008) has shown that Russian-English bilingual immigrants perform better on verbal divergent thinking tasks than monolingual native speakers. Bilinguals have higher levels of fluency (number of ideas) and flexibility (diversity of ideas). In another study, Kharkhurin (2009) partially expands these results with Farsi-English bilinguals, showing that bilinguals have stronger innovative capacity, as measured by originality of ideas, both in a verbal divergent thinking task and in a drawing task. In a slightly different perspective, Ghonsooly & Showqi (2012) have shown that foreign language learning was positively related to four classical indicators of creativity (fluency, flexibility, originality, and elaboration). This last study is of particular interest, because it is one of the very few that focuses on L2 acquisition in a non-immigration context, and on individuals with a relatively modest L2 level, as opposed to highly proficient bilinguals. A few studies have focused on the mechanisms that could account for the positive correlation between multilingualism and creativity (e.g., selective attention and inhibition, see Kharkhurin, 2011; language-mediated concept activation, see Kharkhurin, 2012; code-switching habits, see Kharkhurin & Wei, 2015; conceptual metaphor and metonymy, see Onysko, 2016).

Finally, it has also been argued that multilingualism offers alternative ways of organizing thought. By allowing access to different cultures, multilingualism can let people see the world through different lenses; diversity of experience can reinforce creativity, which often manifests itself when remote, very different ideas are combined (e.g. Mednick, 1962; Smith, Ward, & Finke, 1995). Being exposed to a variety of cultures and points of view can be useful for creativity, whether for idea production and originality (diversity of experience increases

“raw mental elements” and the probability of an original combination thereof) or for idea evaluation (diversity of experience increases the variety of criteria that can be used to assess the quality of an idea).

Multilingualism often occurs when traveling or living abroad, and such experience might also correlate creativity. Maddux and Galinsky (e.g. 2009) have shown that experience of living abroad is related to enhanced creativity in several tasks. By extension, exposure to cultural diversity seems to be conducive to creativity (for a review, see Gocłowska & Crisp, 2014).

Although this literature is somewhat peripheral to the questions addressed here, variables such as traveling and living abroad provide useful controls when estimating the connection between multilingualism and creativity.

Reframing the multilingualism-creativity link

Past research has shown that multilingualism enhances the capacity to produce original, creative ideas, mainly in verbal domains (although some exceptions exist, e.g., Kharkhurin, 2010). This pioneering work, however, still leaves some conceptual and methodological questions open. First, much past research tends to focus on high-proficiency “bilinguals”, often bypassing other ways of experiencing linguistic diversity. We may also consider (i) the case of “traditional” foreign language learners, who may have achieved a greater or lesser degree of fluency in a non-native language; (ii) the fact that multilingual abilities are not necessarily confined to the diptych of heritage language plus host language; (iii) the possibility that people acquire skills in *more* than two languages (L3, L4, etc.). This problem may reflect the fact that the bilingualism-creativity link is often analyzed with samples entirely made up of migrants. A more inclusive understanding of the connections between multilingualism and creativity should encompass a broader range of situations, including those described just above (Gasquoine, 2016).

Second, multilingual individuals tend to have a significant multicultural experience. Consequently, as there is a significant amount of research showing that multicultural experience is positively related to creativity, there also is a strong need to systematically control for multicultural experience when investigating the multilingualism-creativity link.

Third, creativity has often been approached through one measurement method only (divergent thinking tasks). In this paper, we propose a more multivariate approach integrating more facets of creativity, using two sets of measures: (1) one set, labelled “potential creativity”, focuses on general cognitive processes and habits that are central to almost all creative activities; (2) another set, labelled “manifest creativity”, focuses on explicit, actual creative interests, activities and achievements in specific domains. The labels “potential” and “manifest” are only used for convenience and do not necessarily carry strong theoretical implications.

Potential creativity variables encompass two general cognitive processes known to be essential for creativity, namely *Generation* and *Selection* (see Bink & Marsh, 2000; Fink, Ward, & Smith, 1992; Fürst, Ghisletta, & Lubart, 2016). Generation represents the ability to produce many original ideas (divergent thinking) and, to a certain extent, the ability to combine ideas (creative synthesis). Selection processes encompass the evaluation, formalization, and elaboration of ideas. Their role is to discard or retain subsets of relevant information coming from generative processing. Generation and selection work together in order to lead to the elaboration of a coherent final creative product. Fürst et al. (2012, 2016) have developed and tested questionnaires assessing these two dimensions. These instruments show good psychometric properties, with reliability coefficients (Cronbach’s alpha) around .70 or more, and strong evidence of convergent validity. They are positively correlated to several creativity measures in a variety of situations: other self-reported measures of creativity, personality traits related to creativity (e.g. Openness), performance in divergent

thinking and verbal fluency tasks, creative writing tasks in experimental studies, and real-life creativity tasks in a longitudinal study.

Manifest creativity can be approached with questionnaires assessing a person's creative interests, activities and achievements in a variety of domains (e.g. Carson, Peterson, & Higgins, 2005). Especially when assessing creative achievements, they were designed to be as objective and precise as possible, in order to minimize the risk of under- or overestimation due to subjective interpretation of items. Moreover, their predictive validity was convincingly established against artist ratings of actual creative products, as well as against divergent thinking performance. As Silvia, Wigert, Reiter-Palmon, & Kaufman (2012, p. 19) observe, "self-report creativity assessment is probably much better than creativity researchers think it is".

Summing up, this paper focuses on testing the relations between multilingualism and a variety of creativity measures, in a large sample of adult, largely non-immigrant participants, while controlling for the impact of additional important variables. Overall, we expect a positive effect of L2 skills on all creativity measures, and these effects may be complemented by additional positive effects of L3 and L4 skills. Some of these effects may be related to traveling or living abroad experience, but we still expect a unique, specific impact of language skills on creativity.

Method

Participants

The total sample is made up of 596 persons (65.9% women; mean age of 28.01 years, SD=11.2). Observations were gathered in 2015 in four waves distributed over eight months, either with paper-and-pencil questionnaires (42.6% of respondents) or with computerized

questionnaires. The questionnaires, described below, had the same content in both cases. The majority of respondents were undergraduate students from the University of Geneva (71.8%); other respondents came from the general population (18.7% contacted through an on-line survey company; 9.4% were volunteers recruited at a language fair held in Liège (Belgium)). The vast majority of respondents (95.5%) had at least a high school degree; 45% of them had a university degree. Additional information regarding these four subsamples appears in Table 1.³

[Insert Table 1 about here]

Procedure

In its paper-and-pencil version, the various parts of the questionnaire were administered in a fixed order, starting with general questions, then questions about multilingualism and experience abroad, and finally questions regarding creativity. In the computerized version (all subsamples except the first one), blocks appeared in randomized order.. The mean administration time of the questionnaire was about 30 minutes.

Material & variables

Multilingualism. Four competences (understanding, speaking, reading, and writing) in three foreign languages (L2, L3, L4) were measured using a self-assessment grid based on the CEFRL (*Common European Framework of Reference for Languages*). For each competence, possible scores are “0” (no competence reported at all), “1” (minimal competence), “2” (equivalent to an A1 level in the CEFR), “3” (equivalent to A2), “4” (equivalent to B1), “5”

³ The very diverse language repertoires and nationalities represented in the sample is unsurprising, and reflects the fact that its two bigger waves of the sample were collected in Switzerland, country with four official languages where over 20% of residents are non-nationals.

(equivalent to B2), “6” (equivalent to C1), and “7” (equivalent to C2).⁴ Additionally, participants also reported the total number of languages they knew. This procedure enables us to construct four main linguistic variables: L2 skills (mean across the four corresponding competences), L3 skills, L4 skills, and total number of languages known.

Experience abroad. In this paper, multicultural experience is proxied by two variables, traveling abroad and living abroad.

The experience of *traveling abroad* was investigated with two questions: (1) the total number of countries in which the respondent has travelled for a duration of at least seven days (1=“none”; 2=“one or two”; 3=“three to four”; 4=“five to seven”; 5=“eight to ten”; 6=“eight to ten”; 6=“eleven to twenty”; 7=“more than twenty”); (2) the diversity of this travel was also investigated; answers to this question referred to a world map showing seven simplified regions (North America, South America, Africa, Europe, Middle-East, Asia, Oceania); participants had to indicate how many regions they had visited (scores ranging from 1 to 7). In the following analyses, we use a single “travel” variable combining both items (arithmetic mean).

Experience of *living abroad* was also investigated with two questions: (1) the total number of different countries where the respondent has lived (answers from 1=“I’ve always lived in the same country”; 2=“two different countries”; 3=“three different countries”, 4=“four different countries”; 5=“five or more different countries”). If the respondent had travelled abroad, s/he was asked to indicate the approximate total duration of residence abroad (1=“more than three months but less than six months”; 2=“more than six months but less than one year”; 3=“more than one year but less than two years”; 4=“more than two years but less than five years”;

⁴ The descriptors themselves, tested in previous, trilingual large-scale studies are shorter than the standard CEFRL ones, but better suited to survey approaches.

5="more than 5 years"; a "0" was assigned to participants who had not travelled abroad or spent less than three months away from their country of residence). In the following analyses, we use a single "living abroad" variable combining both items (arithmetic mean).

Idea generation and selection. Idea generation and selection were measured with 12 items, 6 for each factor, all worded positively, using a scale developed by Fürst et al. (2012, 2016). Sample items for idea generation are: "I easily come up with a lot of ideas"; "I like to play with ideas just for the fun of it"; and for idea selection, "I carefully craft and elaborate my ideas", "I criticize and evaluate my work thoroughly". For each item describing a prototypical sub-process, participants were asked to tell how frequently it applied to their work or leisure activities, using a scale from 1='almost never' to 5='very often'. In this sample, the reliability (Cronbach's alpha) of both scales was high, with .87 for Generation and .85 for Selection.

Creative interests, activities and achievements. To assess creative interests, activities and achievement, we used a synthesis of the best available instruments to date (Carson et al., 2005; Silvia et al, 2012). These interests, activities and achievements were assessed in seven broad domains (or groups of domains). These domains are the following: music (singing, playing an instrument, composing); literature/writing (e.g., fiction, prose, scenarios); performance art (e.g., dance, drama, humor), visual arts (e.g., drawing, photography, graphical design), 3D design (e.g., architecture, industrial design, fashion), inventions & technical solutions (e.g., DIY, electronics, computer programming), and science (e.g., academic work in the social sciences, the humanities or the life sciences).

For each of these domains, a first yes/no question was asked in order to ascertain if participants had any interest in the area considered. If they answered 'yes', six additional questions related to the intensity of this interest were asked (e.g., "I am interested by many things related to this domain"; "I like to learn new things in this domain"). Answers to these questions used a scale from 1='almost never' to 5='very often'. The sum of these six items

across all seven domains gives rise to the *creative interest* variable used in the following analyses. Virtually all participants had at least a minimal interest in one domain. The Cronbach's alpha across the seven domains for these six items systematically exceeds .75. Another yes/no question was asked in order to clarify whether participants had an *active practice* in a given domain. If a participant answered 'yes', two groups of five additional questions were asked, one referring to the intensity of practice of an activity, and another to the achievements in this domain. Sample items for activity are "I spend several hours every week practicing in this domain", "My practice in this domain is serious and important to me". Answers to these questions were given using a scale from 1='almost never' to 5='very often'. Sample items for achievement are "I have won prizes or awards in this domain"; "I have been paid for my work in this domain". Answers were rated as follows: 1='never'; 2='once or twice'; 3='between 3 and 5 times'; 4='6 to 10 times'; 6='more than 11 times'. The sum of these ten items across all seven domains yield the *creative activity and achievement* variable used in the following analyses. The Cronbach's alpha across the seven domains always exceeds .70.

Results

Descriptive statistics

Table 1 shows that, overall, participants have relatively high language skills, mainly for L2; variability for L3 and L4, where some participants simply have no skills at all, is higher. The mean of the total number of reported languages, at about 2.8 for the entire sample, is also fairly high. For every language, productive abilities are generally lower than receptive ones. Note also that subsample 2 presents the lowest language skills (particularly for L4). This was a deliberate sampling choice: for this particular subsample, a filter question was used to

ensure that about half of the participants would have a self-reported level below B2. This guarantees adequate variability in language skills in the final overall sample.

Table 1 also reveals (tendentially smaller) differences in creativity scores across the four subsamples. Subsample 3 tends to score higher than the other three, possibly owing to data collection context, in which creativity was referred to as a very valuable ability. As these differences across subsamples may affect the estimation of the correlation between multilingualism and creativity, they are taken into account in the multiple linear regression models below. Before turning to these detailed analyses, however, let us begin with an overview of the correlations, in the total sample, between language and creativity variables.

Correlations

Table 2 shows that L2 skills are positively correlated to virtually all creativity measures, especially with idea generation ($r=.16, p<.001$) and with the intensity of creative activities and achievements ($r=.14, p<.01$). To a lesser extent, skills in L3 and L4 are also correlated to some indicators of creativity. Correlations with idea generation are relatively consistent ($r\approx.10$ for both L3 and L4 skills; $p<.05$). In addition, L3 skills are positively correlated to the mere presence of creative activity ($r=.09, p<.05$), while L4 skills appear to be more specifically related to the intensity of creative activities and achievements ($r\approx.09, p<.01$). Finally, the total number of reported languages is also positively related to several creativity indicators, activities and achievements in particular ($r=.15, p<.01$).

[Insert Table 2 about here]

Multivariate analyses

We now turn to multiple regression analyses, starting with *potential creativity* (idea generation and selection) and then moving on to *manifest creativity* (interests, activities and

achievements). For all models, we first introduce basic control variables, then linguistic variables, and finally the experience abroad variables. We also tested interactions between L2 skills and both “traveling abroad” and “living abroad”. Additional interactions involving L3 and L4 were also tested but finally excluded from the models presented here because none of them was significant.

Potential creativity: idea generation and selection. Table 3 shows the results of the stepwise multiple regression for idea generation as a dependent variable. In the first step of this analysis, some control variables have a significant effect. Controlling for these factors, L2 skills have a significant effect on idea generation ($b=0.08, p<.001$). None of the other linguistic variables is significant. In addition, there are also a significant effect of both traveling abroad and living abroad ($b=0.034, p<.01$ and $b=0.033, p<.05$, respectively). The impact of L2 skills remains significant after including these predictors, even though the effect is a bit weaker ($b=0.055, p<.05$).

We also observe an interaction between L2 and traveling abroad ($b=-0.016, p<.05$), as shown on Figure 1, revealing that the overall positive impact of L2 is stronger for people who have not travelled much. Indeed, the “low travelling” line, representing a person with a traveling score located one standard deviation (SD) below the mean, is steeper than the “high traveling” line, representing a person with a score of one SD above the mean. This suggests that having strong L2 skills can partly compensate, in the development of individual creativity, for limited travel experience.

Table 4 shows the results for idea selection, where only few significant predictors appear. In step 1, virtually no control variable is significant. In step 2, L2 skills have a positive impact on idea selection ($b=0.059, p<.05$); L3 skills also have a small and marginally significant positive impact ($b=0.037, p=.08$). No other language variable has a significant effect. After introducing additional controls in step 3, the positive impact of L2 skills declines a little

($b=0.049$, $p=.053$). The effect of L3 also goes down and cannot be considered significant ($b=0.034$, $p=.118$). However, these changes are relatively minor and none of the additional controls (nor the interactions, for that matter) are significant.

[Insert Table 3 about here]

[Insert Figure 1 about here]

[Insert Table 4 about here]

Manifest creativity: interests, activity and achievements. Table 5 shows the results for the intensity of creative interests. In step 1, few control variables have a significant effect. Beyond these effects, no linguistic variable has a significant impact in step 2. In step 3, however, two significant effects emerge. The first one is a positive main effect of living abroad ($b=0.033$, $p>.05$). The second is the significant interaction between L2 and traveling abroad ($b=-0.017$, $p=.053$). This effect is analogous to the impact mentioned above, on idea generation, of the interaction between these very same variables: the impact of L2 is stronger for people who have not travelled a lot.

Table 6 shows the results for creative activities and achievements. Several control variables are significant in step 1. In step 2, a positive effect of L2 skills appears ($b=0.074$, $p>.05$), along with a marginally significant effect of the total number of languages ($b=0.01$, $p>.09$). Both effects remain virtually unchanged in step 3. No significant main effect of traveling or living abroad appears here. However, another interaction emerges, this time between L2 skills and living abroad experience. This interaction is shown in Figure 2, indicating that the effect of L2 is actually quite strong for people with substantial experience of living abroad.

[Insert Table 5 about here]

[Insert Table 6 about here]

[Insert Figure 2 about here]

Discussion

The chief objective of the present paper was to test the relation between multilingualism and creativity in a larger and more varied sample than those typically used in most earlier investigations, that is, one not limited to an immigrant population or to any specific language pair. We also expand the investigation beyond the case of bilinguals to consider a wider range of multilingual repertoires, viewing L2 skills as a continuum rather than as binary variable, and including skills in additional languages (L3 and L4). The main results are summarized and discussed below, followed by a brief discussion of some broader implications, in particular from a policy analysis standpoint.

Correlational analysis has shown that virtually all indicators of multilingualism are related to virtually all indicators of creativity. However, fewer effects emerge from multivariate analysis. The most consistent effect is the positive relation between L2 skills and virtually all the creativity variables (the only exception concerns the intensity of creative interests). These results are in line with earlier research, including Kharkhurin (e.g. 2012) on the impact of bilingualism. They confirm the existence of a positive link between L2 skills (bilingualism) and creativity, although Kharkhurin operationalizes creativity with divergent thinking tasks and his data usually focus on bilingual migrants with high L2 proficiency. By contrast, we use creativity questionnaires and consider a larger variety of L2 skills. In this regard, our results are closer to those of Ghonsooly and Showqi (2012), who report a positive effect on creativity of foreign language learning brought to a relatively high level. The fact that all these different approaches converge and find similar results clearly reinforce the idea that bilingualism is positively correlated to creativity, regardless of the methodology used to test this relationship.

Beyond the replication of past research with a different methodology, a contribution of the present paper is the comparatively far-reaching construction of the language skills variables, since it encompasses L2, L3 and L4 skills, made comparable through the use of CEFRL-type descriptors and encompassing four different skills. This approach allows us to go beyond the effect of bilingualism. Indeed, additional effects revealed by multiple regression analyses include a positive effect of L3 on idea selection and a positive effect of the total number of reported languages on creative activities and achievements. Though modest, these effects suggest that various forms of multilingualism — and not only bilingualism — are positively correlated to creativity.

The systematic control of experience abroad (partially reflecting multiculturalism) indicates, in congruence with Maddux & Galinsky (2009), that experience of living abroad is positively correlated with creativity. However, this effect was found only for idea generation and creative interests. Unlike Maddux & Galinsky, we find that traveling experience is positively related to one creativity variable (idea generation) – perhaps because our operationalization of traveling abroad encompasses both the quantity *and* the diversity of travel. Though these results generally indicate that experience abroad is conducive to creativity, including it in the models allows us to make sure that multilingualism as such provides a unique contribution to predicting creativity.

Additionally, given that multilingualism and experience abroad are often positively correlated, these results also suggest that multilingualism may be related to creativity in an indirect way. While the direct effects refer to the impact of multilingualism, which remains significant after having controlled for the role of experience abroad, the indirect effects refer to the potential impact of multilingualism through experience abroad (that is, multilingualism enhances multicultural experience which in turns fosters creativity). Of course, it is also possible for experience abroad to favour multilingualism. Either way, multilingualism and

experience abroad combine in positively impacting creativity. Additional considerations regarding causality are discussed below.

This study also reveals three significant interactions involving linguistic skills and experience abroad. Two of them appear between L2 skills and experience of foreign travel, where the impact of L2 skills proves stronger for people with less travel experience. This interactive effect concerns idea generation and the intensity of creative interests. The third interaction involves L2 skills and experience of living abroad. These variables were found to interact when predicting creative activities and achievements, and L2 skills turn out to have a positive impact on creativity for people who have relatively more experience of living abroad. In sum, these interaction effects show that foreign language skills especially foster the creativity of people with less travel experience, and they can boost the creativity of people who have lived abroad.

This paper also proposes a new, multivariate operationalization of creativity approached under different, mutually complementary angles. This type of multivariate approach generates results that differ depending on which operationalization of creativity is considered. Idea generation is predicted by many variables (both linguistic skills and experience abroad variables) while idea selection is predicted by language skills only. This may be explained by higher cognitive control (“executive attention”) typical of bilingual people (Bialystok, 2017). Conversely, creative interests are not predicted by linguistic variables alone, but by experience of living abroad (either alone or in interaction with L2 skills). Finally, creative activities and achievements are mainly predicted by L2 skills (either alone or in interaction with experience abroad).

Before turning to a discussion of the policy-related applications of our results, let us briefly recall the empirical limitations of this study.

First, the measurements used here are based on questionnaires, and respondents are liable to over- or underestimate their language skills as well as their creativity, whether deliberately or not. However, not much is at stake for the participants, and they are therefore unlikely to systematically overestimate their abilities (Silvia et al. 2012). Questionnaires also makes it possible to assess the role of variables that would not be measurable using another methodology. This applies in particular to creative activities and achievements. Nonetheless, it would be useful for future research to expand the investigation with creativity tasks. These may focus on divergent thinking or require more sophisticated procedures where participants are asked to make an actual creative product which is then rated by peers or experts. Future inquiries may also consider in further detail the role of inhibition for both multilingualism and creativity, in line with work by Kharkhurin (e.g., 2011, 2012).

Second, a non-experimental design does not provide sufficient grounds for ruling out the reciprocal possibility that creativity brings about an increase in people's experience of diversity, including learning new languages and expanding their multicultural experience. Alternatively, it is also possible that a third variable, typically a personality variable such as “Openness to experience”, causes both. Though important, this limitation should not be overemphasized. First, openness is a variable so close to creativity that it could actually be considered as a criterion variable (in psychometric research, many openness scales include an item specifically addressing creativity). Second, even it was found that openness predicts creativity *better* than multilingualism does, multilingualism may still cause or enhance openness. This classic limitation, due to the correlational nature of such data, cannot be totally overcome merely by adding control variables. At the same time, the issue at hand is almost impossible to subject to an experimental design: one cannot arbitrarily change the openness and multilingualism scores of participants. An alternative, therefore, would be to design a quasi-experimental longitudinal study where participants are randomly assigned either to a

“treatment” group (in which they learn a new language) or to a control group. Such a design, however, carries considerable costs.

Additional avenues for future research include the investigation of the impact of multilingualism on creativity in teams. Although group creativity still is a recent field of research, some contributions indicate that in general, culturally diverse teams are more creative (e.g. Paulus & Nijstad, 2003). Such effects may also obtain for group multilingualism, where individuals may or may not be multilingual but several languages are represented in the group. This question is connected to the benefits of diversity at a societal level and brings us, by way of conclusion, to a brief discussion of some of the corresponding policy implications.

In general, our results reinforce the case for policies that are strongly supportive of multilingualism. Not everyone is willing to concede that multilingualism is a valuable asset whether in economic life, in academic settings or in political contexts. Therefore, quantitative evidence of a direct link between multilingualism and creativity lends strong credence to policies aimed at protecting and promoting multilingualism (and by extension societal multilingualism).

The resulting policy implications first bear upon language education policy and suggest that foreign language learning through the education system should be encouraged, and that foreign languages should remain (or be reinstated as) compulsory components of school syllabuses. Note that such policies should be aimed not only at children from bilingual families, but also children from unilingual families who may lack any serious opportunities to develop second- or third-language skills.

However, language skills are not exclusively acquired, let alone maintained in formal education systems, and general language policy, which extends beyond language education

policy, must enter the fray. A concern for fostering creativity means that residents should be encouraged to develop, maintain and use second- or third- language skills through a whole range of policies affecting various domains. Some policies are particularly appropriate for bilingual or multilingual countries, but others have broader relevance. Among many examples, let us consider the audiovisual media (where television channels could be encouraged to air foreign films and to offer the option to view subtitled, rather than dubbed versions), or international trade (where legislation on traded goods should more systematically require the use of several languages for labelling, packaging, instructions for use, product composition and safety instructions). Finally, our results may have particular saliency in the emerging field of specialization known as “HELP” (*Higher Education Language Policies*). If research is one of the core missions of the university, and if teaching and research are intimately connected in the practices of universities, fostering individual creativity among students and staff is crucial. Our results suggest that this goal can be better achieved through policies that favour the maintenance of linguistic diversity, for example through incentive schemes rewarding multilingual approaches to teaching and research.

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Tables

Table 1. Descriptive statistics

	Subsample 1 (University students; N=254)	Subsample 2 (General population; N=112)	Subsample 3 (General population; N=56)	Subsample 4 (University students; N=174)	TOTAL
L1, most frequent languages (%)	French (65); German (17.7); Other (17.3)	French (84.8); English (8); Other (7.2)	French (82.1); Other (17.9)	French (69); Italian (9.8); Other (21.2)	French (71.5); German (8.4); Other (20.1)
Age, mean (SD)	24.2 (5.6)	42.5 (14.3)	31.5 (10.1)	22.9 (5.3)	28.01 (11.2)
Gender, % of women	72.4	54.5	50	69	65.9
L2 skills, mean (SD)	5.86 (1.08)	4.15 (1.68)	5.02 (1.65)	5.61 (1.18)	5.39 (1.45)
L3 skills, mean (SD)	5.25 (1.33)	2.31 (1.95)	2.95 (2.22)	4.71 (1.58)	4.32 (2.00)
L4 skills, mean (SD)	3.15 (2.26)	0.50 (1.18)	1.54 (2.07)	2.68 (2.27)	2.36 (2.31)
Tot. N. of Lg., mean (SD)	3.19 (0.85)	1.98 (0.81)	2.61 (1.17)	2.98 (1.01)	2.84 (1.03)
Generation, mean (SD)	3.35 (0.71)	3.26 (0.77)	3.82 (0.70)	3.46 (0.74)	3.41 (0.74)
Selection, mean (SD)	3.53 (0.67)	3.55 (0.72)	3.95 (0.63)	3.52 (0.76)	3.57 (3.57)
C. interests, mean (SD)	1.69 (0.83)	1.79 (0.89)	2.18 (0.84)	1.94 (0.86)	1.83 (0.86)
C. act. & ach., mean (SD)	1.46 (0.88)	1.36 (0.83)	1.93 (1.06)	1.48 (0.82)	1.5 (0.88)

Table 2. Correlation between language and creativity variables

	L2 skills	L3 skills	L4 skills	Total number of languages
Idea generation	.162***	.090*	.091*	.110**
Idea selection	.102*	0.047	0.021	0.027
Creative interests	0.074 [†]	0.051	.086*	.086*
Creative activity (yes/no)	.105*	.095*	0.031	0.076 [†]
Creative activity and achievement (N=491)	.136**	0.071	.091*	.147**

Note. Significance level of correlations: “[†]”: $p < 0.10$; “*”: $p < 0.05$; “**”: $p < 0.01$; “***”: $p < 0.001$.

Table 3. Multiple regression results for idea generation.

	Step 1		Step 2		Step 3	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Intercept	3.252	<.001	3.186	<.001	3.327	<.001
Basic controls						
Gender	-0.086	0.184	-0.131	0.046	-0.129	0.047
Age	0.004	0.227	0.005	0.161	0.001	0.792
Education	-0.015	0.809	-0.07	0.272	-0.09	0.161
Prof. Activity	0.149	0.018	0.115	0.069	0.106	0.086
Sample 2	-0.217	0.043	0.057	0.644	0.208	0.098
Sample 3	0.379	0.001	0.566	<.001	0.646	<.001
Sample 4	0.122	0.094	0.169	0.02	0.174	0.017
Linguistic skills						
L2			0.081	0.001	0.055	0.032
L3			0.031	0.15	0.021	0.346
L4			0.012	0.552	0.014	0.478
Ltot.			0.012	0.805	-0.002	0.968
Experience abroad						
Travel					0.034	0.005
Living abroad					0.033	0.013
Travel x L2					-0.016	0.038
Living abroad x L2					0.004	0.682
R ² (Δ R ²)	0.056		0.093 (+0.037)		0.13 (+0.037)	

Note. Gender: 0=male, 1=female; Education 0=high school degree or below, 1=university degree; Prof. Activity 0=no professional activity, 1=full- or part-time. L2, L3 and L4 variables are the mean score across four competences (understanding, speaking, reading, and writing). Ltot is the total number of languages known.

Table 4. Multiple regression results for idea selection.

	Step 1		Step 2		Step 3	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Intercept	3.397	<.001	3.45	<.001	3.495	<.001
Basic controls						
Gender	0.046	0.464	0.024	0.705	0.025	0.694
Age	0.002	0.608	0.003	0.424	0.002	0.54
Education	0.066	0.282	0.03	0.635	0.019	0.766
Prof. Activity	0.093	0.127	0.08	0.19	0.081	0.186
Sample 2	-0.047	0.651	0.116	0.331	0.145	0.244
Sample 3	0.35	0.002	0.477	<.001	0.495	<.001
Sample 4	-0.015	0.834	0.017	0.812	0.007	0.919
Linguistic skills						
L2			0.059	0.016	0.049	0.053
L3			0.037	0.079	0.034	0.118
L4			0.003	0.894	0.004	0.845
Ltot			-0.034	0.459	-0.039	0.398
Experience abroad						
Travel					0.001	0.924
Living abroad					0.009	0.468
Travel x L2					-0.009	0.214
Living abroad x L2					-0.004	0.646
R ² (ΔR^2)	0.037		0.057 (+0.02)		0.062 (+0.005)	

Note. Gender: 0=male, 1=female; Education 0=high school degree or below, 1=university degree; Prof. Activity 0=no professional activity, 1=full- or part-time. L2, L3 and L4 variables are the mean score across four competences (understanding, speaking, reading, and writing). Ltot is the total number of languages known.

Table 5. Multiple regression results for intensity of creative interests.

	Step 1		Step 2		Step 3	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Intercept	1.342	<.001	1.308	<.001	1.426	<.001
Basic controls						
Gender	0.128	0.089	0.08	0.297	0.075	0.329
Age	0.007	0.119	0.007	0.104	0.004	0.385
Education	0.138	0.063	0.104	0.165	0.082	0.281
Prof. Activity	0.101	0.166	0.068	0.357	0.066	0.367
Sample 2	-0.039	0.752	0.194	0.177	0.298	0.046
Sample 3	0.386	0.004	0.549	<.001	0.61	<.001
Sample 4	0.26	0.002	0.3	<.001	0.285	0.001
Linguistic skills						
L2			0.035	0.231	0.014	0.641
L3			0.032	0.205	0.023	0.371
L4			0.027	0.245	0.028	0.227
Ltot			0.006	0.92	-0.003	0.957
Experience abroad						
Travel					0.014	0.326
Living abroad					0.033	0.036
Travel x L2					-0.017	0.053
Living abroad x L2					0.005	0.652
R ² (ΔR^2)	0.053		0.07 (+0.017)		0.088 (+0.018)	

Note. Gender: 0=male, 1=female; Education 0=high school degree or below, 1=university degree; Prof. Activity 0=no professional activity, 1=full- or part-time. L2, L3 and L4 variables are the mean score across four competences (understanding, speaking, reading, and writing). Ltot is the total number of languages known.

Table 6. Multiple regression results for creative activity and achievements.

	Step 1		Step 2		Step 3	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Intercept	0.896	<.001	0.594	0.007	0.618	0.006
Basic controls						
Gender	0.233	0.006	0.196	0.022	0.177	0.039
Age	0.014	0.003	0.014	0.004	0.012	0.013
Education	0.085	0.305	0.034	0.688	0.034	0.691
Prof. Activity	0.09	0.271	0.051	0.533	0.055	0.504
Sample 2	-0.356	0.011	-0.106	0.507	-0.097	0.559
Sample 3	0.372	0.014	0.516	0.001	0.535	0.001
Sample 4	0.026	0.781	0.064	0.500	0.047	0.626
Linguistic skills						
L2			0.074	0.024	0.077	0.022
L3			0.007	0.814	0.009	0.752
L4			-0.014	0.591	-0.017	0.522
Ltot			0.105	0.091	0.108	0.084
Experience abroad						
Travel					-0.001	0.954
Living abroad					0.011	0.527
Travel x L2					-0.01	0.307
Living abroad x L2					0.03	0.014
R ² (ΔR^2)	0.068		0.093 (+0.025)		0.108 (+0.015)	

Note. Gender: 0=male, 1=female; Education 0=high school degree or below, 1=university degree; Prof. Activity 0=no professional activity, 1=full- or part-time. L2, L3 and L4 variables are the mean score across four competences (understanding, speaking, reading, and writing). Ltot is the total number of languages known.

Figures

Figure 1. Interaction between L2 skills and travel experience predicting *Idea generation*

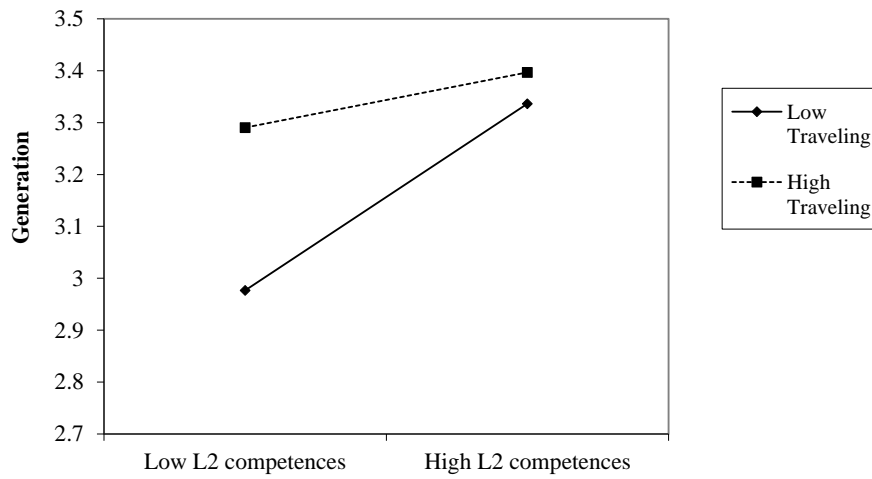


Figure 2. Interaction between L2 skills and travel experience predicting creative activities and achievements

