



Z HITIAN SKYLOR ZHANG 
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Social Environmental Factors and Personal Motivational Factors Associated with Creative Achievement: A Cross-Cultural Perspective

ABSTRACT

Although the theory of the socio-cultural approach to creativity is gaining steam, empirical studies with advanced statistical tools are lagging behind. To address the gap of empirical studies integrating individual, social environmental, and cultural factors, we examined how motivational factors and environmental responsiveness were jointly related to college students' creative achievement in different nations. Participants were university students from eight culturally and geographically diverse regions: Argentina, Austria, Chile, China, Kosovo, Russia, Saudi Arabia, and Turkey. Overall, the results painted a generally positive picture of the relationship between environmental responsiveness, motivational factors, and creative achievement. By employing structural equation modeling (SEM) and multiple-group SEM (MGSEM) methods, results partially supported the mediation role of motivational factors between environmental responsiveness and creative achievement. In addition, we observed more consistent relationships between parental responsiveness and motivational factors or creative achievement, than lecturer. This held in common across all seven countries which fulfilled the requirements for the SEM process, indicating that parents play a potential vital role in supporting students' motivational aspects and creative achievements, whereas lecturers supporting role is relative to the cultural organizational circumstances. As the first large-scale empirical study with a socio-cultural approach, we invited further discussion and proposed future cross-cultural research of this kind. Research implications and practical suggestions were addressed.

Keywords: socio-cultural approach, creativity, motivational factors, parental responsiveness, lecturer responsiveness, creative achievement.

INTRODUCTION

As recently stated by creativity scholars in the "Socio-Cultural Manifesto," the primary challenge of creativity research is to "weave together various dimensions which have historically been studied in isolation or even in opposition to each other" (Glăveanu et al., 2019). The socio-cultural approach to creativity emphasizes the multidimensional nature of creativity phenomenon by incorporating the complex interaction between individual, social, and cultural factors. One way to delve into the socio-cultural nature of creativity with empirical studies is to explore the interplay between individual and social environment factors in certain cultural contexts and pinpoint their similarities and differences by conducting cross-cultural comparisons. The cross-national creativity studies, in particular, help to illustrate a more nuanced picture of the socio-individual interaction by juxtaposing hypotheses among and about different cultures like the

prototypical west versus prototypical east (Niu et al., 2010; Saeki et al., 2001) or individualistic versus collectivist values (Tang et al., 2016; Zha et al., 2006).

In the last decades, both the social psychology of (a review see Amabile & Pillemer, 2012) and the systemic approach to creativity (Mockros & Csikszentmihalyi, 2014) have yielded more insightful empirical studies integrating individual and social environmental variables to explore the plausible mechanisms underlying creative behaviors (e.g., see Choi, 2004; Deng et al., 2016). Nonetheless, the field has yet to encounter a robust, cross-cultural examination by integrating individual and social environmental variables. Most empirical studies integrating individual and social factors rely on intra-national information, with few studies undertaking a cross-cultural exploration between two countries (e.g., Deng et al., 2016), let alone among multiple countries. Arguably, difficulties associated with gathering empirical data across distinct cultures are partly to blame. Additionally, even when the data have been collected, the methodological challenge of measurement equivalence is yet another crucial obstacle to meaningful cross-cultural comparisons concerning the equivalence of measured constructs across cultural groups (Chen, 2008; van de Vijver, 2018).

In the current study—following the socio-cultural approach—we set out to explore the mechanisms underlying creative behaviors by incorporating individual and social environmental factors in a large-scale cross-national context, as shown in Figure 1. In this model, the social environment shapes personal motivation, that may then lead to creative outcomes—all of which are embedded in certain cultural contexts. Here, we identified personal motivational aspects (i.e., creativity motivation, creative mindset, and creative confidence) as a bridge connecting social environmental aspects (i.e., parental responsiveness and lecturer responsiveness) to creative outcomes (i.e., creative achievement). In brief, the present study adopts an international perspective to explore how motivational factors and environmental responsiveness are jointly related to the creative outcomes of college students across different country contexts.

SOCIAL ENVIRONMENTAL FACTORS: PARENTAL RESPONSIVENESS AND LECTURER RESPONSIVENESS

In a social context, the attitudes and behaviors of significant others in the life of the student influence whether the student’s creativity is encouraged or tolerated (Gute et al., 2008). In the present study, we take a closer look at social environmental factors—their degree of responsiveness, in particular. Responsiveness, regarded as warmth or support, depicts the extent to which significant others from a student’s social environment intentionally foster individuality, self-regulation, and self-assertion by being attuned, supportive, and acquiescent to special needs and demands (Baumrind, 1991). For university students, parents and teachers (or lectures in the university context) potentially influence personal development and contribute to social-environmental resources for creating in family and academic context, respectively. Previous research hints at the significance of parental and lecturer responsiveness on the development of an individual’s motivational aspects and creative outcomes.

Parental responsiveness

Family plays a central role to facilitate the development of creative persons across the lifespan (Gute et al., 2008). A supportive family environment that is comprised of harmony help and care facilitates

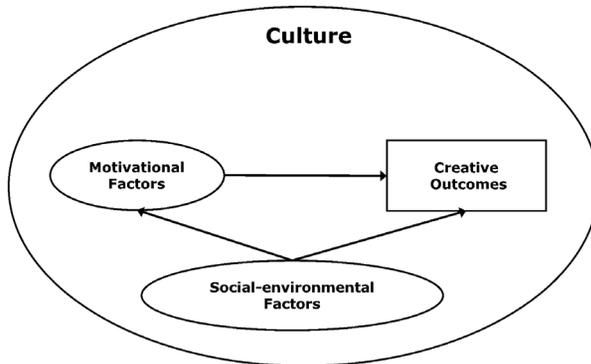


FIGURE 1. A graphical representation of the present study.

children's character and creativity during their development (Gute et al., 2008). Kwaśniewska and colleagues (2018) indicated that parents can help boost creativity by encouraging children to fantasize or imagine, as well as pursue novel and varied experiences, which is a crucial element of the climate for creativity in the parent-child relationship. Previous studies that examined the key characteristics of family environment on child development of creativity uncovered a connection between creativity and parenting style (Lee & Donna, 1997; Lim & Smith, 2008; Miller et al., 2012). Here, parenting style refers to the child-rearing practices and interactive behaviors developed and implemented by parents (Si et al., 2018). Moreover, Baumrind (1978) has positioned parenting styles according to their degree of responsiveness and demandingness. For example, parenting styles with high responsiveness include authoritative and permissive approaches; parenting styles with low responsiveness include authoritarian and indifferent approaches. There is a growing body of scientific evidence highlighting the crucial role that supportive parents (authoritative and permissive rearing) play in meeting children's needs to be creative (Jankowska & Karwowski, 2019; Lim & Smith, 2008; Mehrinejad et al., 2015; Miller et al., 2012; Si et al., 2018); however, the underlying mechanisms that link parental responsiveness and creative outcomes in particular are not yet known. For instance, Jankowska and Karwowski (2019) considered that parenting style may directly and indirectly influence children's creativity development through the ways in which family life is organized, and via parental interaction and engagement, respectfully. Moreover, Lim and Smith (2008) examined that parental support characterized by acceptance has been positively associated with children's creative personality and creative potential. Overall, these studies bring credence to theories that explore the role of parental responsiveness in various motivational aspects of children's creative behaviors including the allowance of independent and nonconformist attitudes that strengthen perseverance in the performance of creative tasks.

Lecturer responsiveness

Lecturers assume a dominant role within university classrooms as they set the culture through which students experience the social environment. To some extent, the lecturer determines whether student creativity will be supported, tolerated, or suppressed in class. To optimize a supportive classroom environment, teacher behavior should lean toward fostering creativity by, among other things, encouraging students to take sensible risks and to act independently, or by advocating for flexible thinking and promoting self-confidence (Gajda et al., 2017). A responsive lecturing style, characterized by supportive and encouraging behaviors, is a crucial element of the classroom environment that lends itself to creativity (Torrance & Myers, 1970). Consider that students often underestimate their own creative ability (Beghetto et al., 2011); without responsiveness in the classroom, students may grow "afraid to take risks, afraid to explore new ideas, and afraid to fail" (Kawenski, 1991, p. 263).

Lecturers may directly and positively signal to students that their creative attributes, behaviors, and efforts are acceptable. Lecturers may also indirectly influence students by creating a supportive social environment in which instructors lead by example through both classroom rhetoric and action (Soh, 2017). Indeed, a responsive teaching style promotes student confidence as it encourages risk-taking in the process of sharing perspectives and ideas in the classroom (Gajda et al., 2017). Yet, in classrooms where creative ideas and expressions are *killed softly* (Beghetto, 2013), student confidence, self-efficacy, and motivation suffer in the process. It then becomes difficult to develop and sustain students' creative behaviors. While cognitive aspects of creativity like creative thinking skills, intelligence, and knowledge remain relatively stable over the student learning process, the emergence and sustainability of creativity in the classroom largely depends on the extent to which students are or can be motivated to acknowledge, apply, and eventually develop existing talent toward creative achievement. In other words, lecturer responsiveness—the presence or absence thereof—can be linked to motivational aspects of creativity.

Considering social environmental factors, namely parental and lecturer responsiveness, are crucial to the creative development of the individual, we hypothesize that environmental responsiveness, or the degree of parental and lecturer responsiveness imbued, will have a positive relationship with both motivational factors of creativity and creative achievement itself.

Hypothesis 1: Environmental responsiveness—parental responsiveness (1a) and lecturer responsiveness (1b)—has a positive relationship with motivational factors

Hypothesis 2: Environmental responsiveness—parental responsiveness (2a) and lecturer responsiveness (2b)—has a positive relationship with creative achievement

MOTIVATIONAL FACTORS: CREATIVITY MOTIVATION; CREATIVE CONFIDENCE; GROWTH-MINDSET

According to theories derived from empirical studies, our understanding of the motivational aspects of creativity diverge. On the one hand, *motivational theory* attempts to provide both a personal and a contextual explanation as to why individuals appear or do not appear to behave creatively through dominant theories of self-determination, intrinsic, and extrinsic motivation (for a review see Hennessey, 2010). And on the other, as summarized by Karwowski and Kaufman (2017), *motivational self-belief theory* refers to the creative personal identity, self-concept, and associated mindsets. In our study, we incorporate representative motivational factors from both afore-mentioned aspects. Specifically, we consider the motivational self-belief theory as falling on the spectrum of motivational factors because it functions as motivators in the process of creative activities. As informed by the Creative Behavior as Agentic Action (CBAA) model (Karwowski & Beghetto, 2019), creative potential alone does not yield creative achievements. Rather, it is necessary to convert creative potential into creative behavior through the function of creative self-beliefs. Moreover, core agentic aspects about the creative self such as creative confidence and creative mindset have the potential to influence people's actions, strategies, and decisions regarding creativity (Karwowski & Beghetto, 2019). Without crucial motivational sources like "value" (as an example from Karwowski & Beghetto, 2019), creative potential and self-confidence do not necessarily translate into creative activity or accomplishment (Karwowski & Beghetto, 2019). In this sense, different aspects of creative beliefs do more than work in conjunction with each other in shaping agentic action (Karwowski, Lebeda, et al., 2019); they also require the consolidation of vital motivational sources like value, high-quality experience, and instrumental purpose (Zhang et al., 2018). On their own, motivational sources and self-belief conditionally influence creative behavior. Together, they lead to creative behaviors and contribute to creative outcomes. In the present study, we rely on creative confidence and growth-mindset where creative self-beliefs are concerned, and we employ the concept of creativity motivation as a stand-in for motivational sources.

Creativity motivation

The field of creativity studies provides ample evidence for the motivational sources behind creative behavioral dispositions (for a review, see Hennessey, 2010). While most theories focus on explaining *why* creative behaviors emerge, there is a lack of insight clarifying *what* creative behaviors are referenced when we talk about creativity. The concept of creativity and emergence of creative behavior is so broad and loosely defined that it would appear the terms act as placeholders for arbitrary behavioral terms (Zhang et al., 2018). Given that creative processes are complex, dynamic, and comprised of different stages (Lubart, 2001), the act of creating (such as the act of painting and writing) is only one of the many behaviors embedded in the execution of creative activity. If we can clarify creative behaviors, we can better understand significant motivational sources that contribute to said behaviors. In fact, Zhang and colleagues (2018) were able to illustrate the creativity motivation concept wherein the motivational sources before, during, and after *creating* come together. More specifically, according to the two-dimensional creativity motivation structure, creativity motivation joins several identifiable and crucial actions that are, arguably, closely related to creative behavior with the motivational reasons underlying those actions. Dimensions of creative behavior refer to the disposition of learning, doing, and accomplishing new things. Motivational sources are defined by high-quality experiences, instrumental purpose, and value. Thus, creativity motivation is the tendency to perform creativity-related behaviors—that is, to do, to learn, and to accomplish new things—as a result of high-quality experience, instrumental purpose, and value (Zhang et al., 2018). Although these two dimensions are far from exhaustive, they represent real-life creative behaviors and motivational sources. Here, the creativity motivation concept is particularly applicable to this study because the creative self-beliefs works in conjunction with motivational sources in the agentic action model. Compare to other motivational theories, the concept of creativity motivation can be combined with other motivational aspects of creativity-related behaviors. Finally, given that creativity motivation was the first motivational scale supported by a large cross-cultural study (Zhang et al., 2018), it makes for a more than adequate substitute for the motivational theory of creativity.

Creative confidence

Creative confidence has roots in self-efficacy theory (Bandura, 1999, 2012) and refers to personal beliefs about one's ability to think or act creatively (Karwowski & Beghetto, 2019; Karwowski, Han, et al., 2019; Karwowski, Lebeda, et al., 2019). Although self-efficacy is closer related to the perceived confidence in the

creative performance of a given task, in a specific context, and at a particular level (Beghetto et al., 2011), creative confidence tends to be more stable and refers to the general holistic cognitive and affective judgments of one's creative ability (Karwowski, Han, et al., 2019).

Existing research indicates that creative confidence may have motivational functions and may play a crucial role in transforming creative potential into creative activity (Karwowski, Han, et al., 2019). For instance, creative self-efficacy, as a kind of creative confidence beliefs, was found positively associated with numerous motivational factors (Farmer & Tierney, 2017), such as intrinsic motivation (Choi, 2004; Malik et al., 2015; Zhou et al., 2012), mastery orientation (Beghetto, 2006; Bui & Baruch, 2012; Gong et al., 2009; Li & Wu, 2011), performance orientation (Beghetto, 2006), and task interests (Beghetto, 2009). In addition, given that creative confidence comes from the social environment via Bandura's efficacy-building process and is contingent upon social cues (Farmer & Tierney, 2017), an ever growing number of studies now examine the influence of social environmental factors to explain the emergence of creative confidence. Prior studies have shown that supportive and responsive environments including teacher support in a classroom context (Beghetto, 2006, 2009), or leadership support in a working context (Bui & Baruch, 2012; Choi, 2004; Chong & Ma, 2010; Hon & Chan, 2013; Mathisen & Einarsen, 2004; Shin & Zhou, 2007; Tierney & Farmer, 2004), may act as antecedents of creative confidence. Individuals in a supportive environment are more likely to gain creative confidence and thus are encouraged and motivated to act on creative behaviors that lead to creative achievements. In other words, there is ample evidence supporting the mediating role of creative self-efficacy between environmental factors and creative outcomes (for a review see Farmer & Tierney, 2017; or Tang et al., 2017). As a result, this study attempts to understand creative confidence's mediating role in environmental responsiveness and creative achievement through a close examination of the relationship between creative confidence, creative behavior, motivational, and environmental factors.

Creative growth-mindset

The creative mindset refers to individual beliefs concerning the nature of creativity itself, and whether creativity is fixed, incremental (Karwowski, 2014), or both (Karwowski, Lebeda, et al., 2019). Generally speaking, individuals that perceive creativity as a skill that can be developed hold a growth-mindset, whereas individuals that believe creativity is innate and difficult to change hold a fixed-mindset (Karwowski, Royston, et al., 2019).

From a personal approach, individuals may hold four different types of mindset configurations, that is, high fixed-high growth, high fixed-low growth, low fixed-high growth, low fixed-low growth (Karwowski, Royston, et al., 2019). From a variable approach, comparing the relative consequence of growth-mindset or fixed-mindset, previous studies showed a consistent and positive relationship between growth-mindset and vital elements of creativity including creative self-efficacy (Hass et al., 2016; Pretz & Nelson, 2017), creative confidence (Hass et al., 2016; Karwowski, 2014; O'Connor et al., 2013; Puente-Díaz & Cavazos-Arroyo, 2017), and creative personal identity (Pretz & Nelson, 2017), as well as numerous creative outcomes as performance and behaviors (O'Connor et al., 2013; Puente-Díaz & Cavazos-Arroyo, 2017).

Previous studies devoted to the growth-mindset of intelligence discovered that incremental theorists could predict whether students lost or maintained levels of intrinsic motivation over the course of a single academic year (Haimovitz et al., 2011). In the case of creativity, researchers also found that the growth-mindset of creativity can serve as a motivator for individuals. For example, Puente-Díaz and Cavazos-Arroyo (2017) showed that a creative growth-mindset was associated with goal attainment and satisfaction. O'Connor and colleagues (2013) demonstrated that malleable beliefs regarding creativity influence effort and engagement in creative tasks and in the development of creative skill. Hence, creative mindset has the potential to provoke creative behavior because it facilitates persistence in the face of creative failure. Persons with a creative growth-mindset likely keep a relatively high motivational disposition because they believe that they can improve their creative ability with time and effort (Karwowski, 2014; Puente-Díaz & Cavazos-Arroyo, 2017). In the context of the current study, therefore, the creative mindset, particularly the growth-mindset, is included in the motivational aspects of creative achievement. The study also considers that creative mindset may be the connection between environmental responsiveness and creative achievement.

Thus, the creative mindset, specifically the growth-mindset, will be included in the motivational aspects and potentially link environmental responsiveness and creative achievement.

Bearing in mind the three crucial motivational factors to creative outcomes: creativity motivation, creative confidence and growth-mindset, we hypothesized that:

Hypothesis 3: Motivational factors have a positive relationship with creative achievement

As mentioned earlier, motivational factors of creativity do not arise from a vacuum. To a certain degree, a person's motivation and motivational beliefs are shaped by the social environment. Previous studies have tested the mechanisms that explain how a supportive social environment may contribute to creative behaviors by influencing personal motivational aspects. Some of these studies have confirmed the mediating role of motivational aspects like self-efficacy (for a review see Tang et al., 2017) and intrinsic motivation (Paramitha & Indarti, 2014; Shin & Zhou, 2003). For example, Paramitha and Indarti (2014) tested the influence that work (support from supervisors and co-workers) and non-work environmental support (support from family) have on employee creativity. Result showed that intrinsic motivation partially mediates the relationship between employee creativity and work support. Shin and Zhou (2003) found that intrinsic motivation mediated the significance of the interaction of transformational leadership and conservation, and partially mediated the contribution of transformational leadership to creativity. Although motivation and motivational beliefs are assumed to function jointly to drive creative behaviors, from a cross-cultural perspective, studies have yet to juxtapose the relationship between environmental factors and creative behaviors with these motivational aspects. The present study takes the latter into account; we tested the mediation role of motivational factors on environmental responsiveness and made the following hypothesis:

Hypothesis 4: Motivational factors mediate the relationship between environmental responsiveness—parental responsiveness (4a) and lecturer responsiveness (4b)—and creative achievement

Since creativity is embedded in a socio-culture context (Glăveanu, 2010), we will examine these hypotheses internationally, as the mechanisms that underly creativity may differ relative to cultural context. By ensuring the construct comparability across cultural groups—it is possible to perform rigorous tests of measurement invariance in different cultural or ethnic groups (Chen, 2008)—this study can provide insights concerning the similarities and differences inherent in both the relationships described in our hypotheses and in the theoretical models of different country contexts.

METHOD

PARTICIPANTS

Participants of this study were college students across a total of eight geographically diverse countries in Asia, Europe, and South America: Argentina ($N = 400$), Austria ($N = 981$), Chile ($N = 411$), China ($N = 489$), Kosovo ($N = 379$), Russia ($N = 398$), Saudi Arabia ($N = 377$), and Turkey ($N = 373$); the total number of participants is 3808¹. These eight countries were also representative of diverse cultural indicators related to creativity (Tang et al., 2016; Yuan & Zhou, 2015) such as individualism (e.g., Austria and China are examples of countries with high individualism and low individualism, respectively) and power distance (e.g., Saudi Arabia and Austria are examples of countries with a high power distance and a low power distance, respectively). We used convenience samples of participants from each country. Almost all participants were enrolled in an education major, with only participants in Argentina enrolled in a psychology major.

The birth years recorded for the original sample fall within the 1954 to 2001 range. In order to keep the sample ages as homogeneous as possible, we only selected participants born between 1990 and 2000 as the representative college student sample, thereby restricting the age range from 17 to 27 years at the point of study. In addition, by performing a data cleanse before the actual data analysis took place, we corrected for data error (e.g., unreasonable data input outside of the Likert scale range), missing data (e.g., a greater than 25% discrepancy; missing data appears in a non-random fashion, such as an overlooked row in a series of questions), and disengaged responses (e.g., response uniformity for more than 90% of all items).

After the data cleanse, we excluded 419 participants from the country pool. As a result, there were 3389 remaining participants. The final sample had an age range of 17 to 27, with a mean age of 21.16 years ($SD = 1.91$ years). Males comprised 24.90% of the sample; females 74.90% of the sample, with 0.30% of the sample electing to withhold gender information. Participants' country-specific, demographic information, including gender, age, and semester enrollment details, is captured in Table 1. With the exception of Saudi Arabia which provided mostly male participants, seven of the eight countries involved in this study provided a mostly female student sample that had been enrolled in school for less than four semesters. Saudi Arabian participants were mostly male students enrolled between the 4th and 7th semesters.

¹ A previous study was conducted to test the validity of one scale, that is, the Creativity Motivation Scale (CMS). Citation: Zhang et al. (2018). The remaining data were not used in any other publication.

MEASURES

All of the items from the following mentioned questionnaires: creativity motivation, creative confidence, creative growth-mindset, parental responsiveness, and lecturer responsiveness—were constructed as six-point, Likert-type responses (1 = strongly disagree; 2 = disagree; 3 = slightly disagree; 4 = slightly agree; 5 = agree; 6 = strongly agree). Participants were asked to read each statement on the scale and mark how strongly they agreed or disagreed with those statements.

The original questionnaires were in English. For this study, a back-translation was conducted to create versions in each country's native language (Argentina: Spanish; Austria: German; Chile: Spanish; China: Mandarin; Kosovo: Albanian; Russia: Russian; Saudi Arabia: Arabic; Turkey: Turkish). Bilingual individuals hailing from the participating countries translated the English-language scales into the appropriate vernacular. A different set of bilingual individuals that had not been privy to the original scales translated these seven versions back into English. To obtain the version of the questionnaires ultimately used in this study, disagreements were resolved through discussion.

Creative achievement

Creative achievement was assessed by the Biographical Inventory of Creative Behaviors (BICB), developed by Batey (2007). The BICB scale features 34 items; each item is an everyday, creative activity across a broad range of domains including coaching, leadership, and writing. Participants were required to indicate whether they had been involved in these activities over the past 12 months via a forced-choice, yes/no response format yielding a binary 1/0 score for each item. The total score of the BICB was obtained by adding the score of each item. The introductory question read as follows: "Which of the following acts have you undertaken in the past 12 months?" Sample items included: "wrote a short story," "wrote a novel," "organized an event," "made a collage," and so on and so forth. Among the eight countries in this study, the BICB's Cronbach's alpha ranked from sufficient to adequate, ranging from 0.76 in Russia to 0.83 in Saudi Arabia and Turkey.

Creativity motivation

The Creativity Motivation Scale (CMS) is a nine-item self-report questionnaire developed by Zhang et al., (2018). Each item was developed as a combination of three types of motivational sources: high-quality experience, value, and instrumental purpose, as well as three types of creativity-related behaviors: to do, to learn, and to accomplish new things. For instance, an item categorized as both a *high-quality experience* and as an attempt *to learn new things* would be: "I experience pleasure when I discover new things that I have never seen before." The combination of *value* and *to accomplish new things* would yield the following item: "It's important to do things in my own original way." A detailed description of nine items of CMS can be

TABLE 1. Participants in Participating Countries

Country	N	Gender (%)		Age			Enrolled Semester (%)							
		Male	Female	range	M	SD	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	≥8 th
Argentina	291	8.9	91.1	19–27	22.85	2.25	36.6	23.4	21.3	11.0	4.8	1.4	0.3	1.0
Austria	851	26.6	73.4	18–27	21.13	1.84	95.3	0.4	2.5	0.1	0.8	-	0.8	0.1
Chile	382	22.1	77.9	19–27	21.69	1.91	3.6	42.5	1.8	35.0	1.0	5.6	1.5	9.0
China	461	10.6	89.4	18–25	19.80	1.01	75.6	0.9	23.5	-	-	-	-	-
Kosovo	381	18.5	81.5	18–27	20.51	1.34	29.7	1.0	63.5	0.5	5.2	-	-	-
Russia	375	18.5	81.5	17–25	19.18	1.37	28.2	10.6	33.3	6.2	14.9	1.9	4.6	0.3
Saudi Arabia	274	75.5	24.5	18–26	21.53	1.55	3.0	7.7	8.9	17.7	11.4	24.0	26.9	0.4
Turkey	374	73.2	26.8	18–27	20.46	1.52	60.4	0.3	14.4	-	13.1	-	11.8	-

found in the Appendix 1. Among the countries in this study, the CMS's Cronbach's alpha values were sufficient to adequate, ranging from 0.70 in Austria to 0.88 in Turkey.

Creative growth-mindset

There are two ways to measure an individual's growth-mindset that are either informed by self-theory or by a general theory, regarding creativity or intelligence. The self-theory explores whether the individual believes that he or she has power over *his* or *her own* abilities. The latter, or general theory, is concerned with whether that ability can be changed at all. The juxtaposition of the self-theory and the general theory, take intelligence as an example, suggests that self-theory (e.g., "I believe I can always substantially improve on my intelligence"), rather than the general construct (e.g., "You can always substantially change how intelligent you are"), is a better predictor of achievement, motivation, etc (Castella & Byrne, 2015). Similarly to how we measure intelligence, self-theory "endorses[es] incremental beliefs more or less depending on whether [individuals] are appraising their own abilities" (Castella & Byrne, 2015, p. 246). As a result, instead of using items from Karwowski's (2014) creativity mindset in this study—items that are presented in general terms (e.g. "Everyone can create something great at some point if he or she is given appropriate conditions"), we adapted four intelligence mindset items from Castella and Byrnes' (2015) instrument and changed the keyword "intelligence" to "creativity." The four modified items read as follows: "I believe I have the ability to change my basic creativity level considerably over time," "Regardless of my current creativity level, I think I have the capacity to change it quite a bit," "I believe I can always substantially improve my creativity," and "With enough time and effort, I think I could significantly improve my creativity level." Among the countries in this study, the creative growth-mindset's Cronbach's alpha values were sufficient, ranging from 0.62 in Russia to 0.88 in Chile.

Creative confidence

The creative confidence scale is comprised of 12 items from Phelan and Young's (2003) work based on the self-efficacy theory. Previous studies confirmed its reliability and construct validity, which indicated a one factor structure for the 12 items (Phelan & Young, 2003). Two example items are as follows: "I feel confident in my ability to solve problems," "I feel confident in my ability to get my ideas implemented." Among the countries in this study, the Cronbach's alpha values of the creative confidence scale were sufficient to good, ranging from 0.78 in Kosovo to 0.90 in Chile.

Parental responsiveness

We used five parental responsiveness items from Vargas (2010), including two reversed items: "My most influential parent doesn't really like me to tell them my trouble," and "My most influential parent hardly ever praises me for doing well," and three progressive items: "My most influential parent spends time just talking to me," "My most influential parent and I do things together that are fun," and "I can count on my most influential parent to help me out if I have a problem." The Cronbach's alpha of the parental responsiveness scale in Turkey was low (0.01); in Kosovo, it was 0.56 and insufficient. After removing one problematic item from the scale in Kosovo, this scale's Cronbach's alpha was improved to 0.60. In the other six countries, the parental responsiveness scale's Cronbach's alpha values were sufficient, ranging from 0.63 in China to 0.77 in Austria.

Lecturer responsiveness

We adapted teaching style scale from Chang's (2010), originally applied to junior high school students, and selected items representative of responsiveness. We selected five items from high-responsiveness subscales that indicated the extent to which lectures react to student needs positively with support and warmth (showing care): "My lecturers comfort me when I do not perform well," "My lecturers compliment me on my good manners," "My lecturers truly care about me," "My lecturers talk to me about my daily life beyond class time," "My lecturers join me to participate in extracurricular activities, such as playing basketball." In this study, the lecturer responsiveness scale's Cronbach's alpha values were sufficient, ranging from 0.62 in Saudi Arabia to 0.83 in Chile.

DATA ANALYTIC STRATEGY

Overview of variable characteristics

Among the tested variables, only gender was categorical (1 = female; 2 = male); all other variables were numerical variables that include age, creative achievement, creative confidence, creative growth-mindset,

creativity motivation, parental responsiveness, and lecturer supportiveness. We reached new, item-specific values by measuring creative achievement as the sum of “yes” items; the raw sum score ranged from 0 to 34, given that each “yes” counted for 1 point. Data regarding creativity motivation, creative confidence, creative growth-mindset, parental responsiveness, and lecturer responsiveness were measured using the mean of the sub-items’ raw sum scores. The motivational factor was the latent variable of creativity motivation, creative confidence, and creative growth-mindset.

Before structural equation modeling (SEM)

Scale’s reliability

Test scale quality associated with each participating country was necessary because model construction is meaningful only if the quality of each country’s specific scale is good. We first examined the Cronbach’s alpha of each scale in each country. For multivariate assumptions and next steps in data analyses, we expressly used country-specific data with an acceptable degree of reliability.

Multivariate assumptions (or linearity)

We tested the non-linearity of the independent variables (creative confidence, creative growth-mindset, and creativity motivation, parent responsiveness, lecture responsiveness) where tolerance should be below 0.2, and VIF (variance influence factor) should be below 5 (Menard, 2002).

SEM and multiple-group SEM (MGSEM) estimation procedure

Overview of the theoretical model

Our hypothesized SEM is captured in Figure 2. Figure 2 is a categorically and partially latent structural regression model because one of the variables—motivational factors—is a latent variable, whereas other variables are observed variables. Therefore, the full structural equation model is composed of the measurement model and the structural model. In the measurement model part, motivational factors are the latent variable of three measured variables: creative confidence, creativity motivation, and growth-mindset. In the structural model, we hypothesize that parental responsiveness and lecturer responsiveness are related to creative achievement directly and indirectly through motivational factors. Gender and age were controlled variables in our model.

Model estimation procedure

The procedure of model estimation followed three consecutive steps: testing SEM model fit of the theoretical model in each country; among the countries producing good model fit indices, conducting multiple-group SEM (MGSEM); if the measurement invariance was established in the MGSEM step, then estimating parameters of SEM model in each country.

The first step listed involves an evaluation of the model fit of the theoretical model in each separate country. Following the one-step procedure², both the measurement and structure parts were estimated simultaneously (Hayduk, 1996). The second step—MGSEM—was performed to ensure that the measures are comparable across country groups, which is particularly crucial for cross-cultural studies (for a review see Chen, 2008). This can be achieved by conducting measurement invariance tests at different restraint levels. Measurement invariance (equivalence) concerns whether scores from the operationalization of a construct have the same meaning under different conditions (Kline, 2016). Compared to the most commonly used multi-group confirmatory factor analysis, which focuses on measurement model across samples, MGSEM additionally incorporates structural modeling (Büchi, 2016).

To illustrate, we first established the baseline model by combining different country groups and allowing the factor loadings to be freely estimated across multiple groups. Then, the measurement invariance test could be performed from the bottom-up approach: starting from the least constrained model and then proceeded by introducing more constraints to the model (van der Veld & Saris, 2011). The least restrictive level of

² As comparing different model estimation approaches is beyond the scope of the current study, a full explication of relative merits of various approaches was not provided (for a review, please see Hayduk & Glaser, 2000). Here, we followed the one-step approach because our main purpose is to test the overall fitness of the model, in which the estimation of measurement model and structural model are not independent from each other. This means that the association between latent variable (e.g., motivational factors) and its indicators (i.e., creative confidence; creativity motivation; and growth-mindset) also depend on the nature of the structural effects, which may vary in different country sample (Hayduk, 1996, Chapter 2). Considering our sample is consisted of multi-cultural groups, we followed the one-step approach in the current study.

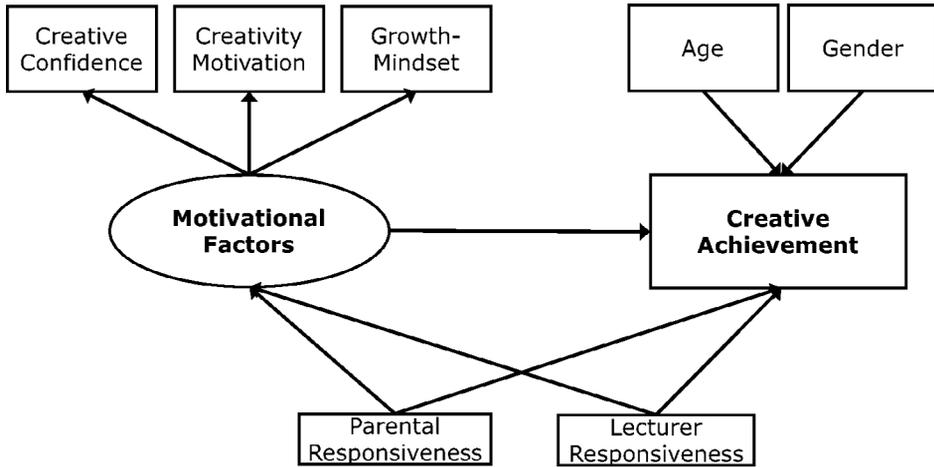


FIGURE 2. Theoretical model.

measurement invariance is *configural invariance*, which tests whether similar—but not identical—factors are measured across groups (Chen, 2008; Widaman & Reise, 1997). The current study is concerned with whether motivational factors, as a latent factor, are measured by the same constructs of creativity motivation, creative confidence, and creative growth-mindset across different country groups. Configural invariance is imperative here because it allows the exploration of the basic structure of the measurement model cross-nationality (Büchi, 2016). If the measurement models are ensured to have similar patterns across groups, the next restriction level is *metric invariance*. It concerns whether the unstandardized factor loadings of each indicator are equal across groups (Kline, 2016). If the equal factor loading examination is supported across groups, then we can conclude that the constructs of motivational factors are manifested the same way in each country group. As the research questions in the current study mainly focus on the structural relationship between factors, it was necessary that the metric invariance is supported. Only so, researchers can attribute the potential difference in the model parameters of structural coefficients (in the next data analysis step) to the theoretical interests, rather than the measurement structural non-equivalency (Koufteros & Marcoulides, 2006). In addition to factor loadings, further restriction can be added such as factor variances and covariances. The highest restriction level is *scalar equivalence*, which requires the item intercepts to be equal across groups. It tests whether the means of the latent construct (i.e., factor means of motivational factors) are equivalent across countries. Since our research questions did not approach the country-mean level, the scalar invariance is not necessary. A full description of the measurement invariance test can be found in van de Vijver (2011).

After establishing the measurement equivalence at least at a partial metric invariance (i.e., factor loadings are equivalent), we could make meaningful comparison across countries. Finally, the last step was to estimate the SEM parameters (direct and indirect effects³) in each country group and compare predictive relationships among investigated variables across those country groups.

Moreover, because of the abnormal distribution of data (Byrne, 2012), all models including SEM and MGSEM were derived using the robust maximum likelihood estimator or MLM (specifically, maximum likelihood estimation with robust standard errors and a Satorra-Bentler scaled test statistic) (Oberski, 2015). Missing values were accounted for using listwise deletion. The model fit was examined using widely used practical indices, including the root mean square error of approximation (RMSEA), the comparative fit index (CFI), Tucker–Lewis index (TLI), and the standardized root mean square residual (SRMR). Based on Per Hu and Bentlers’ (1999) as well as MacCallum, Brownes, and Sugawaras’ (1996) work, we defined an acceptable model fit through the following criteria: $RMSEA \leq 0.90$, $SRMR \leq 0.08$, $CFI \geq 0.90$, and $TLI \geq 0.90$.

³ Considering that “direct effect” and “indirect effect” are widely used statistical terms in SEM literatures, in the current article, we employed them when we report the results. Here, they are synonymous with “direct relationship” and “indirect relationship”, which do not necessarily imply causality between variables as *effect* might indicate.

We used SPSS software to estimate basic statistics like computing new variables and calculating the Pearson correlation and Cronbach's alpha. We used R package lavaan (Rosseel, 2012) to perform SEM and MGSEM.

RESULTS

INTERNAL CONSISTENCY RELIABILITIES ACROSS SAMPLES OF EIGHT COUNTRIES

Scales' Cronbach's alpha in Argentina, Austria, Chile, China, Russia, and Saudi Arabia was above 0.6 across the board and could therefore be used for subsequent data analysis (Table 2). Because of the reversed item, "*My most influential parent hardly ever praises me for doing well,*" in Kosovo, the parental responsiveness scale Cronbach's alpha was 0.56. After removing the item, this scale's Cronbach's alpha was improved to 0.60 and could be accounted for in the following data analyses process. As a result, the variable associated with parental responsiveness data in Kosovo was computed as the mean score of the remaining four items, instead of the original five items. Moreover, due to the low Cronbach's alpha of one scale (parental responsiveness) and failing to improve it by detecting and deleting any problematic items, the data from Turkey were excluded from the SEM data analysis process. In other words, the final SEM data analysis included data from seven, rather than eight, countries: Argentina, Austria, Chile, China, Kosovo, Russia, and Saudi Arabia.

CORRELATION AMONG TESTED VARIABLES IN SEVEN COUNTRIES

A correlation table with means and standard deviations across seven countries is shown in the supplementary file (Table S1.1 to Table S1.7).

Overall, creativity motivation, creative confidence, and creative growth-mindset were significantly positively correlated to creative achievement (r ranged from 0.05, $p \geq .05$ to 0.27, $p < .01$). The positive medium correlations among each two indicators imply discriminant validity, as well as an underlying, and general motivational factor (r ranged from 0.31, $p < .01$ to 0.77, $p < .01$). Parental responsiveness and lecturer responsiveness were positively correlated to creativity motivation, creative confidence, and creative growth-mindset (r ranged from 0.00, $p \geq .05$ to 0.43, $p < .01$).

Age and gender as controlled variables were generally not significantly related to creative achievement in most countries. However, in Austria, age was negatively correlated to both creative achievement ($r = -0.11$, $p < .01$) and gender ($r = -0.10$, $p < .01$). In China, age was negatively correlated to creative achievement ($r = -0.10$, $p < .05$). In Kosovo, age was positively correlated to creative achievement ($r = 0.16$, $p < .01$).

In summary, these correlations supported the theoretical prediction of the positive relationship between environmental responsiveness, motivational factors and creative achievement in these countries.

EVALUATION OF THE HYPOTHESIZED STRUCTURAL MODEL FIT IN EACH COUNTRY

Indices of model fit across participating countries are listed in Table 3. The result indicates that the hypothesized model appeared to be a good fit according to the observed data from seven country samples since all fit indices fell within the recommended range. Standardized and differentiated or unstandardized parameter estimates, variance, and standardized estimates for measurement error (proportions of unexplained variance) across the seven countries are listed as a supplementary file (Table S2).

TABLE 2. Internal Consistency Reliabilities (Cronbach's α) Across Samples of Nine Countries

Country	CreAch	CreMo	CreGro	CreCon	ParRes	LecRes
Argentina	0.81	0.73	0.74	0.82	0.70	0.70
Austria	0.77	0.70	0.86	0.81	0.77	0.77
Chile	0.82	0.85	0.88	0.90	0.76	0.83
China	0.82	0.79	0.82	0.87	0.63	0.80
Kosovo	0.79	0.78	0.65	0.78	0.56	0.70
Russia	0.76	0.80	0.62	0.86	0.75	0.79
Saudi Arabia	0.83	0.78	0.76	0.87	0.64	0.62
Turkey	0.83	0.88	0.83	0.89	0.01	0.78

Note. CreAch, creative achievement; CreMo, creativity motivation; CreCon, creative confidence; CreGro, growth-mindset; ParRes, parental responsiveness; LecRes, lecturer responsiveness

Multiple-group SEM results

MGSEM results are shown as a supplementary file (Table S3) to better understand whether the measurement model of motivational factors was equivalent across the seven country samples. According to the good model fit indices of model B (CFI), and in accordance to the Δ CFI limits within 0.01 (Sass, 2011), model B with constrained factor loadings did not fare significantly worse relative to the model without constraints. This indicates that the measurement model of motivational factors was equivalent across the seven country samples at the construct level, facilitating a meaningful comparison of other result indices in the structural model.

Moreover, model C, which constrains factor variances, was significantly worse than model B. This indicates that factor variances are not equivalent across country groups. As the less restrict invariance test (i.e., factor loading and variances equivalence) was not fulfilled, more restricted invariance tests (i.e., factor loading, variances and covariances equivalence) were not performed, nor were there testing performed for the most restricted scalar invariance. In summary, the MGSEM established the partial matrix invariance of the measurement model, allowing for the meaningful comparison of the relationships in the structural model across countries. As the scalar invariance was not supported, the factor means difference of the latent motivational factors could not be compared across countries.

SEM estimation results in seven countries

Measurement model

We used the measurement model to characterize the pattern of observed variables, that is, creativity motivation, creative confidence, creative growth-mindset, for the latent construct of motivational factors in the hypothesized model. We can see from Figure 3, the covariances of three observed variables were significant in all seven countries. Overall, the unstandardized factor loadings ranged from 0.36 ($p < .001$) (creativity motivation variable in Austrian sample) to 0.75 ($p < .001$) (growth-mindset variable in Chile sample). The relative value of factor loadings was nation-specific. This indicates a different composition of motivational factors in different countries. In most countries, including Argentina, Austria, China, Chile, the factor loading of growth-mindset was the largest, followed by creative confidence and creativity motivation. In Kosovo specifically, creativity motivation’s factor loading was the largest, followed by growth-mindset, then confidence. In Russia, creative confidence was the largest, followed by creative confidence, and then growth-mindset.

Structural model

Estimates for the structural model in each country are presented in Figure 3. The dashed lines depict the direct effects that are not significant. The summary of the direct effects of environmental—parental and lecturer—responsiveness on creative achievement, as well as the indirect effects mediated by motivational factors are listed in the supplementary file (Table S2).

Mediation effect

As shown in the supplementary file (Table S2), the hypothesized mediation effect of motivational factors between parental responsiveness and creative achievement was statistically significant in Argentina, Austria,

TABLE 3. SEM model fit indices across samples in seven countries

Country	df	χ^2	χ^2/df	CFI	TLI	RMSEA	SRMR
Argentina	12	9.48	0.79	1.00	1.01	0.000	0.028
Austria	12	42.65	3.55	0.95	0.90	0.056	0.030
Chile	12	25.03	2.08	0.98	0.96	0.053	0.026
China	12	18.00	1.50	0.99	0.98	0.035	0.036
Kosovo	12	24.28	2.02	0.96	0.93	0.058	0.037
Russia	12	27.96	2.33	0.97	0.95	0.062	0.027
Saudi Arabia	12	19.41	1.61	0.98	0.96	0.051	0.031

Notes: RMSEA = the root mean square error of approximation; SRMR = the standardized root mean square residual; CFI = the comparative fit index; TLI = Tucker–Lewis index.

China, Russia, with an unstandardized path coefficient of 0.48 ($p < .01$), 0.37 ($p < .001$), 0.17 ($p < .05$), and 0.75 ($p < .001$), respectively. Moreover, as direct effects of parental responsiveness on creative achievement were not entirely significant in four countries, these results supported the hypothesis that the relationship between parental responsiveness and creative achievement was completely mediated through motivational factors in Argentina, Austria, China, and Russia, even if the total effects were not significant. Nonetheless, these effects were not significant in Chile, Kosovo, and Saudi Arabia. In Chile, the negative direct effect and total effect of parental responsiveness on creative achievement were significant. In Kosovo and Saudi Arabia, the direct, indirect, and total effects of parental responsiveness on creative achievement were insignificant.

In the case of lecturer responsiveness, the mediation effect of motivational factors was statistically significant in Argentina, China, and Russia, with an unstandardized path coefficient of 0.35 ($p < .05$), 0.29 ($p < .01$), and 0.77 ($p < .001$), respectively. Moreover, as was the case with parental responsiveness, the direct associations between lecturer responsiveness and creative achievement were insignificant across Argentina,

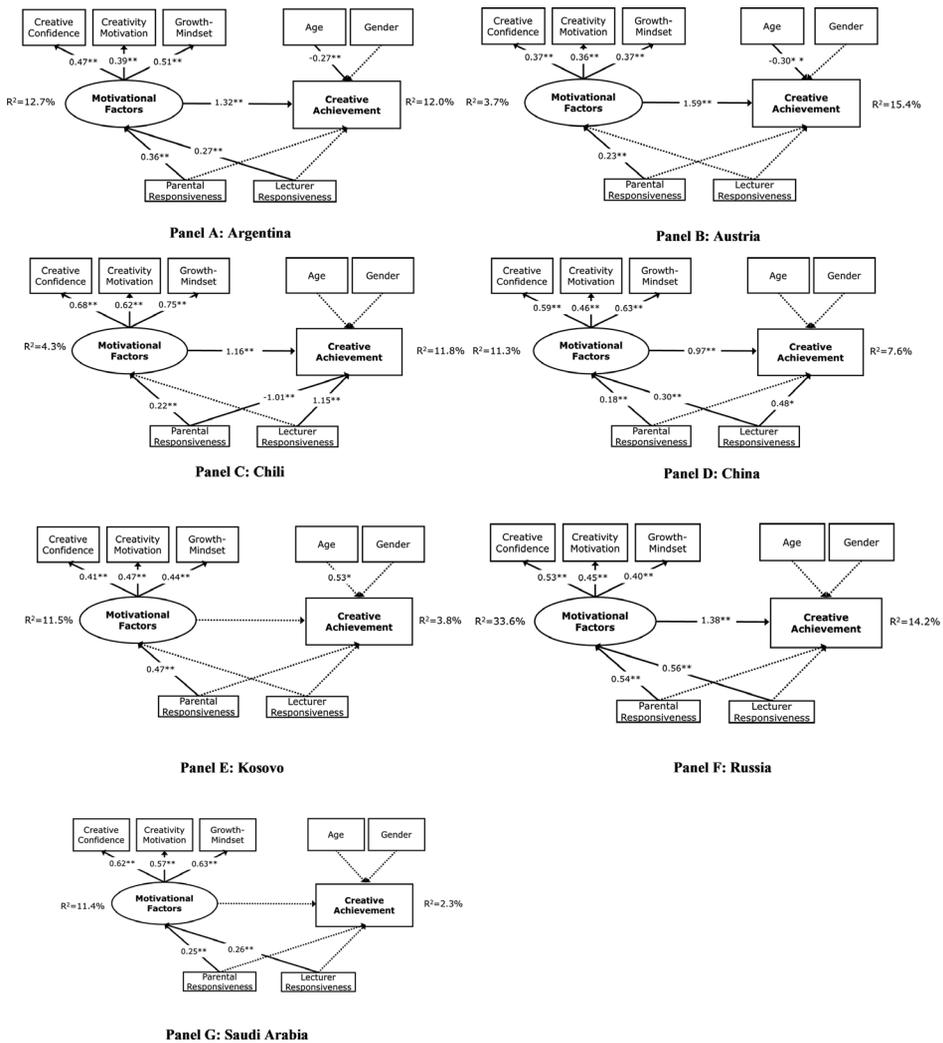


FIGURE 3. SEM results.

China, and Russia. These results supported the hypothesis that the relationship between lecturer responsiveness and creative achievement was completely mediated through motivational factors in the three countries (Argentina, China, Russia), with significant total effects. The latter observation did not apply to Austria, Chile, Kosovo, and Saudi Arabia. In Chile, the direct positive effect and total effect were significant. In Austria, only the total effect was significant. In Kosovo and Saudi Arabia, direct, indirect, and total effects were insignificant.

Controlled variables

As shown in Figure 3, in Argentina and Austria, age had a significant negative association with creative achievement, with a coefficient of -0.27 ($p < .01$) and -0.30 ($p < .01$), respectively. In Kosovo, age had a significant positive association with creative achievement with a coefficient of 0.53 ($p < .05$). In the other four countries, age did not show significant association with creative achievement. Moreover, across the seven countries that underwent data analyses, gender was not significantly related to creative achievement.

In conclusion, Table 4 gives an overview of this study’s hypotheses relative to participating country.

DISCUSSION

From a large-scale cross-cultural perspective, the present study examined how environmental responsiveness and motivational factors are jointly related to college students’ creative achievement. Structural equation modeling (SEM) and multiple-group SEM (MGSEM) methods enabled us to properly analyze measurement quality and equivalence among participating countries, which resulted in a relatively unbiased comparison of the results. In the following section, we will discuss the results regarding the proposed hypotheses in the seven participating countries.

THE POSITIVE RELATIONSHIP BETWEEN ENVIRONMENTAL RESPONSIVENESS AND MOTIVATIONAL FACTORS (HYPOTHESIS 1A AND 1B)

Overall, aligned with previous theories and empirical studies indicating the motivating function of supportive social environments (Amabile, 1990; Amabile & Pillemer, 2012; Csikszentmihalyi & Wolfe, 2014), the results painted a generally positive picture of the association between environmental responsiveness and motivational factors. Perhaps most notably, and in support of hypothesis 1a, we were able to spot a positive, direct relationship between parental responsiveness and motivational factors across the countries featured in this study. Regardless of country of origin, this finding underscored the potential crucial role that parental

TABLE 4. Hypotheses supported or not supported in seven countries

Hypothesis	Supported Country	Unsupported Country
1a. Parental responsiveness has a positive relationship with motivational factors.	Argentina, Austria, Chile, China, Kosovo, Russia, Saudi Arabia	/
1b. Lecturer responsiveness has a positive relationship with motivational factors.	Argentina, China, Russia, Saudi Arabia	Austria, Chile, Kosovo
2a. Parental responsiveness has a positive relationship with creative achievement.	/	Argentina, Austria, China, Kosovo, Russia, Saudi Arabia, Chile (negative)
2b. Lecturer responsiveness has a positive relationship with creative achievement.	Chile, China	Argentina, Austria, Kosovo, Russia, Saudi Arabia
3. Motivational factors have a positive relationship with creative achievement.	Argentina, Austria, Chile, China, Russia	Kosovo, Saudi Arabia
4a. Motivational factors mediate the relationship between parental responsiveness and creative achievement.	Argentina, Austria, China, Russia	Chile, Kosovo, Saudi Arabia
4b. Motivational factors mediate the relationship between lecturer responsiveness and creative achievement.	Argentina, China, Russia	Austria, Chile, Kosovo, Saudi Arabia

responsiveness plays on college students' motivational aspects toward creative activities, including creativity motivation, growth-mindset and creative confidence, as captured by previous studies conducted in specific cultural contexts (e.g., Gute et al., 2008; Jankowska & Karwowski, 2019; Lim & Smith, 2008).

In comparison, the positive relationship between lecturer responsiveness and motivational factors (hypothesis 1b) was only supported by four countries: Argentina, China, Russia, and Saudi Arabia. This result was not surprising since the association between lecturer responsiveness and motivational factors can be distinctive in different nations, which led to more inconsistent results than those of the association with parental responsiveness.

THE POSITIVE RELATIONSHIP BETWEEN ENVIRONMENTAL RESPONSIVENESS WITH CREATIVE ACHIEVEMENT (HYPOTHESIS 2A AND 2B)

In brief, the results of this study partially supported the positive relationship between environmental responsiveness and creative achievement. In the case of parental responsiveness, we observed that it is positively correlated to creative achievement in Russia and China, with negative correlations in Chile, and insignificant correlations in the remaining four countries of Argentina, Austria, Kosovo, and Saudi Arabia. After imputing motivational factors in the SEM model, the direct relationship between parental responsiveness and creative achievement was no longer significant in Russia and China. In Chile, the negative relationship between parental responsiveness and creative achievement was sustained. This suggests that there was a generally mild but positive association between parental responsiveness and creative achievement. In rare cases like that of Chile, both the correlation and direct relationship between parental responsiveness and creative achievement were negative. As indicated by insignificant correlations, the positive relationship of parental responsiveness and creative achievement was insignificant for the remaining four countries. We did not find evidence that parental responsiveness has a direct positive association with creative achievement across the nations surveyed in this study. In other words, our data did not support hypothesis 2a. The missing link between parental responsiveness and creative achievements can be interpreted from at least from two angles. The first perspective implies that parental responsiveness alone might not be sufficient enough to result in actual creative behaviors and achievements. Indeed, conforming to the Creative Behavior as Agentic Action (CBAA) theory (Karwowski & Beghetto, 2019), even when environmental factors are supportive of an individual's decision to behave creatively, if the individual has little to no creative confidence and perceived value of creativity, creative behaviors might still fail to emerge. Moreover, the measures of creative outcomes might be responsible to the variation in the creativity-parental responsiveness link. For instance, former studies that underpinned the link of parenting style and creativity included various ways of measuring creative outcome such as with a creativity test (e.g., Si et al., 2018), self-report creativity (e.g., Miller et al., 2012), and the real-life creative achievements (Gute et al., 2008). Since we employed various measures of creativity, it is expected that results from this and relevant studies would converge or diverge.

By comparison, the positive relationship between lecturer responsiveness and creative achievement (hypothesis 2b) was supported by two countries, whereas no country data supported the claims made regarding parental responsiveness. This result makes sense given that our samples consisted of college students that tended to live on or in the campus environment and were less likely to spend time with their parents. Given the affordance theory of creativity (Glăveanu, 2012), creative activity depends simultaneously on the agent's abilities and the features of the material and social world. Compared to parents, teachers and lecturers are directly involved in students' social and material environment for creating. Consequently, we anticipated that lecturer responsiveness would be related to creative achievement directly. From this perspective, students' creative achievements might be more linked to the significant others that are directly involved in their creative activities within a given context.

THE POSITIVE RELATIONSHIP BETWEEN MOTIVATIONAL FACTORS AND CREATIVE ACHIEVEMENT (HYPOTHESIS 3)

In all participating countries, motivational factors and creative achievement were positively correlated. The SEM results revealed a positive direct relationship between motivational factors and creative achievement across most countries, with the exception of Kosovo and Saudi Arabia. Therefore, generally aligned with a plethora of research (Amabile, 1993; Hennessey, 2010; Karwowski & Beghetto, 2019; Karwowski & Kaufman, 2017), motivational factors did contribute to creative outcomes. However, per the motivation-creativity-culture connection explained by Hennessey (2016), the motivation model might differ relative to cultural context.

THE RELATIONSHIP BETWEEN ENVIRONMENTAL RESPONSIVENESS AND CREATIVE ACHIEVEMENT IS MEDIATED BY MOTIVATIONAL FACTORS (HYPOTHESIS 4A AND 4B)

Our results partially supported the mediating role of motivational factors between environmental responsiveness and creative achievement. Regarding parental responsiveness, the results revealed a complete mediation model in Argentina, Austria, China, and Russia, which means that the association between parental responsiveness and creative achievement was completely mediated by the boost of motivational factors. In Chile, the association between environmental responsiveness and creative achievement was partly mediated by motivational factors. This is interesting because as mentioned before, although the direct effect of parental responsiveness was negative, the indirect effect through motivational factors was positive. This implies that, in the case of Chile, it is feasible for parental responsiveness to aid creativity.

In Kosovo and Saudi Arabia, the mediation effect from parental responsiveness to creative achievement was not significant. This result is not surprising because the total explanatory power per country is rather small (R square equals 2.3% and 4.0% accordingly). One possible explanation could be that in Kosovo and Saudi Arabia, creative achievement, as was measured in this study, may not be virtually related to parental responsiveness and motivational factors. This harkens back to the measurement issue of creativity in the undertaking of cross-cultural creativity studies. Thus, hypothesis 4a was partially supported.

In addition, we found that in Argentina and Russia, the relationship between lecturer responsiveness and creative achievement was completely mediated through the mediation of motivational factors; in China, partially. We did not find this mediation effect in other countries. Therefore, our results partially supported 4b.

Overall, our results suggest that the mediation role of motivational factors between environmental responsiveness and creative achievement is partially supported within the seven countries that qualified for data analyses in this study.

As for the controlled variable, we did not observe that gender plays a role based on the data generated from our participants. The result of age, however, was more complex. For example, in Austria and Argentina, age had a significant negative relationship with creative achievement. In Kosovo, age had a significant positive relationship with creative achievement. In the remaining four countries, age did not make a difference. The mixed result of age was foreseeable since the relationship between age and creative outcome can vary by numerous factors and in certain conditions. Creative achievement can be both beneficial to how one experiences age—that is, gaining expertise (Baer, 2015)—and depending on the individual, context, and creative task at hand, harmful for creativity due to the decline of openness (Donnellan & Lucas, 2008; Hornberg & Reiter-Palmon, 2017).

INTERPRETING CROSS-CULTURAL STUDIES IN THE FIELD OF CREATIVITY

Our results showed a consistency across nations for the associations between parental responsiveness (rather than lecturer responsiveness) and either motivational factors or creative achievement. For clarity, two hypotheses related to parental responsiveness, 1a and 2a, were supported and not supported by all participating countries respectively, whereas the hypotheses related to lecturer responsiveness (1b and 2b) were more country-specific, only supported or not supported by three or four countries. The results depicted a plausible pattern held in common: Regardless of nationality, parents play a seemingly vital role in supporting students' motivation and contributing to creative achievements, whereas lecturers, or teachers for that matter, play their supporting role relative to cultural organizational circumstances. In order to avoid potential cultural bias, it is imperative that we account for observed differences genuinely; the burden falls on the researchers to explain the cultural validity of their assessments (Byrne & van de Vijver, 2010; Karwowski, 2016). By painting a broader picture accounting for information from seven countries—rather than from the typical two—we have intentionally called attention to the issue of interpreting multicultural creativity studies.

As Lubart (2012, Page 271) stated, while comparing differences of creativity across different cultures,

“... it is important that the two contrasting cultural groups do not differ on age, socioeconomic status, education level, access to technology, and other variables. If these potential confounds are controlled, the remaining differences observed stem, it is argued, from cultural characteristics.”

This kind of control is rare nowadays, if not absent, in the field of creativity research that relies on international data, especially if comparisons are made across more than two countries. Although we tried to control for age, education level, and academic major of participants in the present study, our methodology was still far from adequate to produce truly informed cultural extrapolations from our data.

For most cross-culture studies in the field of creativity, it is common that the researchers conduct studies that compare two, generally contrasting countries. The conclusions drawn from these two countries tend to make radical generalizations about an entire culture. For example, suppose we only had data from China (a typical eastern country) and Austria (a typical western country); as creativity researchers, we are likely to attribute observed differences to culture (say Asia and Europe) or some facets of it (for instance, individualism and collectivism). However, when we have a large-scale sample of participants from seven countries, it is less likely that we will be able to draw cultural conclusions applicable across the board. Instead, we did find a consistent pattern among participating countries, like the relationship between parental responsiveness, motivational factors and creative achievement; and inconsistent results, particularly from the lecturer responsiveness aspect.

In order to avoid misinterpreting results, other factors like participant selection and the batteries with which we measured data should be taken into consideration. For instance, applied creative achievement was explained by measured variables ranging from 2.3% (in Saudi Arabia) to 15.4% (in Austria). It is necessary to consider the contextual validity of measurement instruments while applying them across multiple cultures in order to justify and increase the power of explanation in this and in future cross-cultural studies.

IMPLICATIONS

Our study reveals several implications, particularly for those who are in the creativity research field or individuals that plan to conduct a cross-cultural study among several countries.

First, from a methodological point of view, it is necessary to capture bias while conducting a cross-cultural study. The internal consistency and fit indices of SEM and MGSEM as in the current study should be examined to ensure a justified and meaningful comparison among different countries for the advancement of cross-cultural theorizing (van de Vijver, 2011).

Second, researchers should consider what kinds of measurement instruments or batteries are necessary for and suitable to a cross-cultural study. It is common that instruments used in the study of creativity are not examined by different cultures in advance of a new inquiry. It is necessary to consider the contextual validity of different measurement instruments (Karwowski, 2016), especially when measuring creativity outcomes since the definition and measurement of creativity differs (e.g., Niu et al., 2010; Paletz & Peng, 2008).

Third, although international cross-cultural studies allow us to better understand culturally related creativity differences and similarities, further tests about the role of “culture” are warranted to make corresponding conclusions. Failing to do so might lead researchers astray by inadvertent, radical cultural generalization. After all, even at a national level, different social cultural patterns might coexist, depending on the participating sample in the empirical study. For instance, although China has been regarded as the prototypical collectivist country, there is a tendency for rising individualism through the path of modernization (Yan, 2010). Thus, if we want to explore culturally related creativity theories, it is imperative to define what we mean—what cultural traits are we referring to and how do we measure them—when we talk about culture. In future studies that attribute differences to specific cultural variables like the individualism typical of western countries, researchers should collect more data on more cultural variables that inform the *culture* in question.

Finally, beyond the methodology considerations, this study implies practical suggestions for supporting and nurturing creativity through motivation. Parental responsiveness is potentially vital to creativity, as indicated by the previous research and results informing in this study. Moreover, parental responsiveness was mostly related to creative achievement through the mediating effect of motivational factors. Evidence partially supported the relationship between lecturer responsiveness and creative achievement. Both the direct effect on creative achievement (like in China, Chile) and the mediated effect (like in Argentina, China, Russia) emphasized the significance of lecturer responsiveness to creative achievement, as measured in this study. It is important that in their responsiveness, parents and educators alike acknowledge the potential vital role that motivation plays in creative behaviors and achievements.

LIMITATIONS AND FUTURE RESEARCH

Several limitations to this study should be kept in mind while interpreting our results and conclusions.

First, the data collected from the participating countries apply only to undergraduate students that, for the most part, majored in education; participants from Argentina majored in psychology. As a result, one should be cautious when extrapolating our findings to different groups.

Second, we used one instrument to measure creative achievement: the Biographical Inventory of Creative Behaviors (BICB) (Batey, 2007). In other words, our results exclusively apply to creative achievement as measured in this study. As mentioned earlier, the relationships between endogenous and exogenous factors and creative outcome might differ depending on how we define and measure creative outcomes. Although we remain interested in creative achievement, future studies would benefit from incorporating different ways of measuring creative outcomes. In this way, we can develop a clearer idea of our work's range of application and explanation.

Third, our study found that students' responses on the implemented scales vary across countries, resulting in lower internal consistency in some cases, such as the parental responsiveness scale in Kosovo and Turkey. One reason is that most available scales nowadays were designed and implemented using a "Western framework" (Glăveanu, 2010), posing a challenge to cross-cultural examinations of creativity. Especially for exogenous factors such as parenting and lecturer responsiveness, it is plausible that some items or scales are more appropriate for one group than another for gender, age, and country, among others. For instance, we applied five items from Vargas's (2010) work to measure parental responsiveness. Although we tried to balance the various dynamic family structures from culturally and contextually different scenarios by encouraging participants to pick one "most influential parent" (Vargas, 2010), it is doubtful whether presuppositions that "one parent is more influential than others" hold across groups. In addition, some items from the lecturer responsiveness assessments such as, "my lecturers compliment me on my good manners," might be more appropriate for younger students than older (given that in this study, student ages ranged from 17 to 27), or perhaps, more appropriate for students in the large power distance countries like China, where traditionally, the education is more teacher centric (Hofstede, 2001), than in lower distance countries like Austria. So, in order to make cross-cultural comparisons more meaningful, future research should consider initial examinations of relevant scales' reliability and validity per country groups, as well as either establishing greater measurement invariance such as scalar invariance, or detecting potential measurement of non-invariance such as differential item functioning (DIF) (Mellenbergh, 1989).

Fourth, the social environmental variables (i.e., parental responsiveness and lecturer responsiveness) included in the present study aimed at representative, however, are far from exhaustive. Other factors that could potentially contribute to students' creative outcome were not examined. For instance, peer influence is vital to undergraduate students' creativity (Choi, 2004; Han et al., 2013; Karwowski, 2015). Although it is not a focal point of this study, future explorations will benefit from examining other potential factors that are related to university student creativity.

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REFERENCES

- Amabile, T.M. (1990). Within you, without you: The social psychology of creativity, and beyond. In M.A., Runco & R.S., Albert (Eds.), *Theories of Creativity*, Los Angeles, CA: Sage Publications.
- Amabile, T.M. (1993). Motivational synergy: Toward new conceptualizations of intrinsic and extrinsic motivation in the workplace. *Human Resource Management Review*, 3, 185–201. [https://doi.org/10.1016/1053-4822\(93\)90012-S](https://doi.org/10.1016/1053-4822(93)90012-S)
- Amabile, T.M., & Pillemer, J. (2012). Perspectives on the social psychology of creativity. *Journal of Creative Behavior*, 46, 3–15. <https://doi.org/10.1002/jocb.001>
- Baer, J. (2015). The importance of domain-specific expertise in creativity. *Roeper Review*, 37, 165–178. <https://doi.org/10.1080/02783193.2015.1047480>
- Bandura, A. (1999). A social cognitive theory of personality. L. A. , Pervin & O.P., John, *Handbook of personality: Theory and research*, 2nd ed. New York, NY: The Guilford Press, , 154–196. [https://doi.org/10.1016/0749-5978\(91\)90022-L](https://doi.org/10.1016/0749-5978(91)90022-L)
- Bandura, A. (2012). On the functional properties of perceived self-efficacy revisited. *Journal of Management*, 38, 9–44. <https://doi.org/10.1177/0149206311410606>.
- Batey, M. (2007). *Biographical inventory of creative behaviours*. Unpublished Doctoral Thesis. University College, London.
- Baumrind, D. (1978). Parental disciplinary patterns and social competence in children. *Youth and Society*, 9, 239–267. <https://doi.org/10.1177/0044118X7800900302>.
- Baumrind, D. (1991). The influence of parenting style on adolescent competence and substance use. *The Journal of Early Adolescence*, 11, 56–95. <https://doi.org/10.1177/0272431691111004>.
- Beghetto, R.A. (2006). Creative self-efficacy: Correlates in middle and secondary students. *Creativity Research Journal*, 18, 447–457. https://doi.org/10.1207/s15326934crj1804_4

- Beghetto, R.A. (2009). Correlates of intellectual risk taking in elementary school science. *Journal of Research in Science Teaching*, 46, 210–223. <https://doi.org/10.1002/tea.20270>
- Beghetto, R.A. (2013). *Killing ideas softly? The promise and perils of creativity in the classroom*. IAP Information Age Publishing. Available from: <http://search.ebscohost.com/login.aspx?direct=true&db=psych&AN=2013-44310-000&site=ehost-live>
- Beghetto, R.A., Kaufman, J.C., & Baxter, J. (2011). Answering the unexpected questions: Exploring the relationship between students' creative self-efficacy and teacher ratings of creativity. *Psychology of Aesthetics, Creativity, and the Arts*, 5, 342–349. <https://doi.org/10.1037/a0022834>
- Büchi, M. (2016). Measurement invariance in comparative Internet use research. *Studies in Communication Sciences*, 16, 61–69. <https://doi.org/10.1016/j.scoms.2016.03.003>
- Bui, H.T.M., & Baruch, Y. (2012). Learning organizations in higher education: An empirical evaluation within an international context. *Management Learning*, 43, 515–544. <https://doi.org/10.1177/1350507611431212>
- Byrne, B.M. (2012). *Structural equation modeling with Mplus: Basic concepts, applications, and programming*. Multivariate applications series. <https://doi.org/10.4324/9780203807644>
- Byrne, B.M., & van de Vijver, F.J.R. (2010). Testing for measurement and structural equivalence in large-scale cross-cultural studies: Addressing the issue of nonequivalence. *International Journal of Testing*, 10, 107–132. <https://doi.org/10.1080/15305051003637306>
- Castella, K.De, & Byrne, D. (2015). My intelligence may be more malleable than yours: The implicit theories self-form is a better predictor of achievement and motivation. *The European Journal of the Psychology of Education*, 30, 1–28. <https://doi.org/10.1007/s10212-015-0244-y>
- Chang, Y.C. (2010). Students' perceptions of teaching styles and use of learning strategies. Master's Thesis, University of Tennessee, 1–75. Available from: http://trace.tennessee.edu/utk_gradthes/782
- Chen, F.F. (2008). What happens if we compare chopsticks with forks? The impact of making inappropriate comparisons in cross-cultural research. *Journal of Personality and Social Psychology*, 95, 1005–1018. <https://doi.org/10.1037/a0013193>
- Choi, J.N. (2004). Individual and contextual predictors of creative performance: The mediating role of psychological processes. *Creativity Research Journal*, 16, 187–199. <https://doi.org/10.1080/10400419.2004.9651452>
- Chong, E., & Ma, X. (2010). The influence of individual factors, supervision and work environment on creative self-efficacy. *Creativity and Innovation Management*, 19, 233–247. <https://doi.org/10.1111/j.1467-8691.2010.00557.x>
- Csikszentmihalyi, M., & Wolfe, R. (2014). New conceptions and research approaches to creativity: implications of a systems perspective for creativity in education. *The Systems Model of Creativity*, (pp. 161–184). Dordrecht: Springer. https://doi.org/10.1007/978-94-017-9085-7_10
- Deng, L., Wang, L., & Zhao, Y. (2016). How creativity was affected by environmental factors and individual characteristics: A cross-cultural comparison perspective. *Creativity Research Journal*, 28, 357–366. <https://doi.org/10.1080/10400419.2016.1195615>
- Donnellan, M.B., & Lucas, R.E. (2008). Age differences in the big five across the life span: Evidence from two national samples. *Psychology and Aging*, 23, 558–566. <https://doi.org/10.1037/a0012897>
- Farmer, S.M., & Tierney, P. (2017). Considering creative self-efficacy: Its current state and ideas for future inquiry. In M. Karwowski & J.C. Kaufman (Eds.), *The creative self: Effect of beliefs, self-efficacy, mindset, and identity* (pp. 23–47). London, UK: Elsevier Academic Press. <https://doi.org/10.1016/B978-0-12-809790-8.00002-9>
- Gajda Aleksandra, Beghetto Ronald A., Karwowski Maciej (2017) Exploring creative learning in the classroom: A multi-method approach. *Thinking Skills and Creativity*, 24 250–267. <http://dx.doi.org/10.1016/j.tsc.2017.04.002>
- Glăveanu, V.P. (2010). Principles for a cultural psychology of creativity. *Culture and Psychology*, 16, 147–163. <https://doi.org/10.1177/1354067X10361394>
- Glăveanu, V.P. (2010). Principles for a cultural psychology of creativity. *Culture & Psychology*, 16, 147–163. <https://doi.org/10.1177/1354067X10361394>
- Glăveanu, V.P. (2012). What can be done with an egg? Creativity, material objects, and the theory of affordances. *Journal of Creative Behavior*, 46, 192–208. <https://doi.org/10.1002/jocb.13>
- Glăveanu, V.P., Hanchett Hanson, M., Baer, J., Barbot, B., Clapp, E.P., Corazza, G.E., . . . & Sternberg, R.J. (2019). Advancing creativity theory and research: A socio-cultural manifesto. *The Journal of Creative Behavior*. <https://doi.org/10.1002/jocb.395>
- Gong, Y., Huang, J.-C., & Farh, J.-L. (2009). Employee learning orientation, transformational leadership, and employee creativity: The mediating role of employee creative self-efficacy. *Academy of Management Journal*, 52, 765–778. <https://doi.org/10.5465/amj.2009.43670890>
- Gute, G., Gute, D.S., Nakamura, J., & Csikszentmihályi, M. (2008). The early lives of highly creative persons: The influence of the complex family. *Creativity Research Journal*, 20, 343–357. <https://doi.org/10.1080/10400410802391207>
- Haimovitz, K., Wormington, S.V., & Corpus, J.H. (2011). Dangerous mindsets: How beliefs about intelligence predict motivational change. *Learning and Individual Differences*, 21, 747–752. <https://doi.org/10.1016/j.lindif.2011.09.002>
- Han, Q., Hu, W., Liu, J., Jia, X., & Adey, P. (2013). The Influence of Peer Interaction on Students' Creative Problem-Finding Ability. *Creativity Research Journal*, 25, 248–258. <https://doi.org/10.1080/10400419.2013.813754>
- Hass, R.W., Katz-Buonincontro, J., & Reiter-Palmon, R. (2016). Disentangling creative mindsets from creative self-efficacy and creative identity: Do people hold fixed and growth theories of creativity. *Psychology of Aesthetics, Creativity, and the Arts*, 10, 436–446. <https://doi.org/10.1037/aca0000081>
- Hayduk, L.A. (1996). *LISREL: Issues, debates, and strategies*. Maryland: Johns Hopkins University.
- Hayduk, L.A., & Glaser, D.N. (2000). Jiving the four-step, waltzing around factor analysis, and other serious fun. *Structural Equation Modeling: A Multidisciplinary Journal*, 7, 1–35. https://doi.org/10.1207/S15328007SEM0701_01

- Hennessey, B.A. (2010). The creativity-motivation connection. In *The Cambridge handbook of creativity* (pp. 342–365). <https://doi.org/10.1017/CBO9780511763205.022>
- Hennessey, B.A. (2016) The Creativity–Motivation–Culture Connection. In V.P. Glăveanu (ed.), *The Palgrave Handbook of Creativity and Culture Research*. Palgrave Studies in Creativity and Culture (PASCC) (pp. 125–158). London, UK: Palgrave Macmillan . http://.1057/978-1-137-46344-9_7
- Hofstede, G. (2001). Culture’s consequences: Comparing values, behaviors, institutions and organizations across nations.
- Hon, A.H.Y., & Chan, W.W.H. (2013). Team creative performance: The roles of empowering leadership, creative-related motivation, and task interdependence. *Cornell Hospitality Quarterly*, 54, 199–210. <https://doi.org/10.1177/1938965512455859>
- Hornberg, J., & Reiter-Palmon, R. (2017). Creativity and the big five personality traits: Is the relationship dependent on the creativity measure? In G.J. Feist, R. Reiter-Palmon, & J.C. Kaufman (Eds.), *The Cambridge handbook of creativity and personality research* (pp. 275–293). London, UK: Cambridge University Press. <https://doi.org/10.1017/9781316228036.015>
- Hu, L.-T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1–55. <https://doi.org/10.1080/10705519909540118>
- Jankowska, D.M., & Karwowski, M. (2019). Family factors and development of creative thinking. *Personality and Individual Differences*, 142(Febuary), 202–206. <https://doi.org/10.1016/j.paid.2018.07.030>
- Karwowski, M. (2014). Creative mindsets: Measurement, correlates, consequences. *Psychology of Aesthetics, Creativity, and the Arts*, 8, 62–70. <https://doi.org/10.1037/a0034898>
- Karwowski, M. (2015). Peer effect on students’ creative self-concept. *Journal of Creative Behavior*, 49, 211–225. <https://doi.org/10.1002/job.102>
- Karwowski, M. (2016). Culture and psychometric studies of creativity BT. In V.P. Glăveanu (Ed.), *The Palgrave handbook of creativity and culture research* (pp. 159–186). London, UK: Palgrave Macmillan . https://doi.org/10.1057/978-1-137-46344-9_8
- Karwowski, M., & Beghetto, R.A. (2019). Creative behavior as agentic action. *Psychology of Aesthetics, Creativity, and the Arts*, 13, 402–415. <https://doi.org/10.1037/aca0000190>
- Karwowski, M., Han, M.-H., & Beghetto, R.A. (2019). Toward dynamizing the measurement of creative confidence beliefs. *Psychology of Aesthetics, Creativity, and the Arts*, 13, 193–202. <https://doi.org/10.1037/aca0000229>
- Karwowski, M., & Kaufman, J.C. (2017). *The creative self: Effect of beliefs, self-efficacy, mindset, and identity*. Explorations in creativity research. London, UK: Elsevier Academic Press.
- Karwowski, M., Lebuda, I., & Beghetto, R.A. (2019). Creative self-beliefs. In J. C. , Kaufman & R. J. , Sternberg (Eds.), *The Cambridge handbook of creativity* (pp. 396–418), (2nd edn), London, UK: Cambridge University Press. <https://doi.org/10.1017/9781316979839.021>
- Karwowski, M., Royston, R.P., & Reiter-Palmon, R. (2019). Exploring creative mindsets: Variable and person-centered approaches. *Psychology of Aesthetics, Creativity, and the Arts*, 13, 36–48. <https://doi.org/10.1037/aca0000170>
- Kawenski, M. (1991). Encouraging creativity in design. *The Journal of Creative Behavior*, 25, 263–266. <https://doi.org/10.1002/j.2162-6057.1991.tb01379.x>
- R.B., Kline (2016). *Principles and practice of structural equation modeling*, (4th edn). New York, NY: Guilford Press.
- Koufteros, X., & Marcoulides, G.A. (2006). Product development practices and performance: A structural equation modeling-based multi-group analysis. *International Journal of Production Economics*, 103, 286–307. <https://doi.org/10.1016/j.ijpe.2005.08.004>
- Kwaśniewska, J.M., Gralewski, J., Witkowska, E.M., Kostrzewska, M., & Lebuda, I. (2018). Mothers’ personality traits and the climate for creativity they build with their children. *Thinking Skills and Creativity*, 27, 13–24. <https://doi.org/10.1016/j.tsc.2017.11.002>
- Lee, T., & Donna, B. (1997). Creativity: What does it mean in the family context? *Journal of Australian Research in Early Childhood Education*, 1(September), 91–104.
- Li, C.H., & Wu, J.J. (2011). The structural relationships between optimism and innovative behavior: Understanding potential antecedents and mediating effects. *Creativity Research Journal*, 23, 119–128. <https://doi.org/10.1080/10400419.2011.571184>
- Lim, S., & Smith, J. (2008). The structural relationships of parenting style, creative personality, and loneliness. *Creativity Research Journal*, 20, 412–419. <https://doi.org/10.1080/10400410802391868>
- Lubart, T.I. (2001). Models of the creative process: Past, present and future. *Creativity Research Journal*, 13, 295–308. https://doi.org/10.1207/S15326934CRJ1334_07
- Lubart, T.I. (2012). Cross-cultural perspectives on creativity. *The Cambridge Handbook of Creativity*, (pp. 265–278). London, UK: Cambridge University Press. <https://doi.org/10.1017/cbo9780511763205.017>
- MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, 1(2), 130–149. <https://doi.org/10.1037/1082-989X.1.2.130>
- Malik, M.A.R., Butt, A.N., & Choi, J.N. (2015). Rewards and employee creative performance: Moderating effects of creative self-efficacy, reward importance, and locus of control. *Journal of Organizational Behavior*, 36, 59–74. <https://doi.org/10.1002/job.1943>
- Mathisen, G.E., & Einarsen, S. (2004). A review of instruments assessing creative and innovative environments within organizations. *Creativity Research Journal*, 16, 119–140. https://doi.org/10.1207/s15326934crj1601_12
- Mehrinejad, S.A., Rajabimoghadam, S., & Tarsafi, M. (2015). The relationship between parenting styles and creativity and the predictability of creativity by parenting styles. *Procedia - Social and Behavioral Sciences*, 205, 56–60. <https://doi.org/10.1016/j.sbspro.2015.09.014>
- Mellenbergh, G.J. (1989). Item bias and item response theory. *International Journal of Educational Research*, 13, 127–143. [https://doi.org/10.1016/0883-0355\(89\)90002-5](https://doi.org/10.1016/0883-0355(89)90002-5)

- Menard, S. (2002). *Applied logistic regression analysis* (p. 111). Thousand Oaks, CA: Sage Publications Inc.
- Miller, A.L., Lambert, A.D., & Neumeister, K.L.S. (2012). Parenting style, perfectionism, and creativity in high-ability and high-achieving young adults. *Journal for the Education of the Gifted*, 35, 344–365. <https://doi.org/10.1177/0162353212459257>.
- Mockros, C.A., & Csikszentmihalyi, M. (2014). The social construction of creative lives. *The systems model of creativity* (Eds.), (pp. 127–160). Dordrecht: Springer. https://doi.org/10.1007/978-94-017-9085-7_9
- Niu, W., Sternberg, R.J., & Haven, N. (2010). Cultural influences on artistic creativity and its evaluation cultural influences on artistic creativity and its evaluation. *International Journal of Psychology* 36, 225–241. <https://doi.org/10.1080/0020759014300003>
- O'Connor, A.J., Nemeth, C.J., & Akutsu, S. (2013). Consequences of beliefs about the malleability of creativity. *Creativity Research Journal*, 25, 155–162. <https://doi.org/10.1080/10400419.2013.783739>
- Oberski, D. (2015). lavaan.survey: An R package for complex survey analysis of structural equation models. *Journal of Statistical Software*, 57(1). <https://doi.org/10.18637/jss.v057.i01>
- Paletz, S.B.F., & Peng, K. (2008). Implicit theories of creativity across cultures: Novelty and appropriateness in two product domains. *Journal of Cross-Cultural Psychology*, 39, 286–302. <https://doi.org/10.1177/0022022108315112>
- Paramitha, A., & Indarti, N. (2014). Impact of the environment support on creativity: Assessing the mediating role of intrinsic motivation. *Procedia - Social and Behavioral Sciences*, 115, 102–114. <https://doi.org/10.1016/j.sbspro.2014.02.419>
- Phelan, S., & Young, A.M. (2003). Understanding creativity in the workplace: An examination of individual styles and training in relation to creative confidence and creative self-leadership. *Journal of Creative Behavior*, 37, 266–281. <https://doi.org/10.1002/j.2162-6057.2003.tb00994.x>
- Pretz, J.E., & Nelson, D. (2017). Creativity is influenced by domain, creative self-efficacy, mindset, self-efficacy, and self-esteem. In M., Karwowski & J. C., Kaufman, (Eds.), *The creative self: Effect of beliefs, self-efficacy, mindset, and identity*. In Explorations in Creativity Research, (pp. 155–170). London, UK: Elsevier Academic Press. <https://doi.org/10.1016/B978-0-12-809790-8.00009-1>
- Puente-Díaz, R., & Cavazos-Arroyo, J. (2017). The influence of creative mindsets on achievement goals, enjoyment, creative self-efficacy and performance among business students. *Thinking Skills and Creativity*, 24, 1–11. <https://doi.org/10.1016/j.tsc.2017.02.007>
- Rosseel, Y. (2012). lavaan: An R package for structural equation. *Journal of Statistical Software*, 48, 1–36. <https://doi.org/10.18637/jss.v048.i02>
- Saeki, N., Fan, X., & Van Dusen, L. (2001). A comparative study of creative thinking of American and Japanese college students. *Journal of Creative Behavior*, 35, 24–36. <https://doi.org/10.1002/j.2162-6057.2001.tb01219.x>
- Sass, D.A. (2011). Testing measurement invariance and comparing latent factor means within a confirmatory factor analysis framework. *Journal of Psychoeducational Assessment*, 29, 347–363. <https://doi.org/10.1177/0734282911406661>
- Shin, S.J., & Zhou, J. (2003). Transformational leadership, conservation, and creativity: Evidence from Korea. *Academy of Management Journal*, 46, 703–714. <https://doi.org/10.2307/30040662>
- Shin, S.J., & Zhou, J. (2007). When is educational specialization heterogeneity related to creativity in research and development teams? Transformational leadership as a moderator. *Journal of Applied Psychology*, 92, 1709–1721. <https://doi.org/10.1037/0021-9010.92.6.1709>
- Si, S., Zhang, S., Yu, Q., & Zhang, J. (2018). The interaction of DRD2 and parenting style in predicting creativity. *Thinking Skills and Creativity*, 27, 64–77. <https://doi.org/10.1016/j.tsc.2017.11.001>
- Soh, K. (2017). Fostering student creativity through teacher behaviors. *Thinking Skills and Creativity*, 23, 58–66. <https://doi.org/10.1016/j.tsc.2016.11.002>
- Tang, M., Hu, W., & Zhang, H. (2017). Creative self-efficacy from the Chinese perspective: Review of studies in mainland China, Hong Kong, Taiwan, and Singapore. *The creative self: Effect of beliefs, self-efficacy, mindset, and identity*. Explorations in creativity research (pp. 237–259). London, UK: Elsevier Academic Press. <https://doi.org/10.1016/B978-0-12-809790-8.00013-3>
- Tang, M., Werner, C., & Karwowski, M. (2016). Differences in creative mindset between Germany and Poland: The mediating effect of individualism and collectivism. *Thinking Skills and Creativity*, 21, 31–40. <https://doi.org/10.1016/j.tsc.2016.05.004>
- Tierney, P., & Farmer, S.M. (2004). The Pygmalion process and employee creativity. *Journal of Management*, 30, 413–432. <https://doi.org/10.1016/j.jm.2002.12.001>
- Torrance, E.P., & Myers, R.E. (1970). *Creative learning and teaching*. New York, NY: Dodd, Mead & Company.
- van de Vijver, F.J.R. (2011). Capturing bias in structural equation modeling. In E. Davidov, P. Schmidt & J. Billiet (Eds.), *Cross-cultural analysis. Methods and applications* (pp. 3–34). New York, NY: Routledge.
- van de Vijver, F.J.R. (2018). Capturing bias in structural equation modeling. In E. Davidov, P. Schmidt, J. Billiet & B. Meuleman (Eds.), *Cross-Cultural Analysis (Issue January)* (pp. 3–43). New York, NY: Routledge. <https://doi.org/10.4324/9781315537078-1>
- van der Veld, W.M., & Saris, W.E. (2011). Causes of generalized social trust. In E. Davidov, P. Schmidt & J. Billiet (Eds.), *Cross-cultural analysis: Methods and applications* (pp. 207–247). New York, NY: Routledge/Taylor & Francis Group.
- Vargas, C. (2010). Perceived parenting styles influence on contraceptive use among adolescents. University of Florida, (pp. 1–97).
- Widaman, K.F., & Reise, S.P. (1997). Exploring the measurement invariance of psychological instruments: Applications in the substance use domain. In K.J. Bryant, M. Windle & S.G. West (Eds.), *The science of prevention: Methodological advances from alcohol and substance abuse research* (pp. 281–324). Washington, DC: American Psychological Association. <https://doi.org/10.1037/10222-009>
- Yan, Y. (2010). The Chinese path to individualization. *British Journal of Sociology*, 61, 489–512. <https://doi.org/10.1111/j.1468-4446.2010.01323.x>

Yuan, F., & Zhou, J. (2015). Effects of cultural power distance on group creativity and individual group member creativity. *Journal of Organizational Behavior*, 36, 990–1007. <https://doi.org/10.1002/job.2022>

Zha, P., Walczyk, J.J., Griffith-Ross, D.A., Tobacyk, J.J., & Walczyk, D.F. (2006). The impact of culture and individualism-collectivism on the creative potential and achievement of American and Chinese adults. *Creativity Research Journal*, 18, 355–366. https://doi.org/10.1207/s15326934crj1803_10

Zhang, Z., Hoxha, L., Aljughaiman, A., Gomez-arizaga, M.P., Gucyeter, S., Ponomareva, I., ... & Ziegler, A. (2018). Creativity motivation construct development and cross-cultural validation. *Psychological Test and Assessment modeling* 60, 517–530. https://www.psychologie-aktuell.com/fileadmin/Redaktion/Journale/ptam-2018-4/06_PTAM_Q4_Zhang.pdf

Zhou, Q., Hirst, G., & Shipton, H. (2012). Promoting creativity at work: The role of problem-solving demand. *Applied Psychology: An International Review*, 61, 56–80.

Zhitian Skylor Zhang, University of Erlangen-Nuremberg

Linda Hoxha, University of Prishtina

Abdullah Aljughaiman, King Faisal University

Aliriza Arënliu, University of Prishtina

Maria P. Gomez-Arizaga, Universidad de los Andes (Chile)

Sule Gucyeter, Usak University

Irina Ponomareva, Chelyabinsk State University

Jiannong Shi, Chinese Academy of Sciences

Paula Irueste, National University of Cordoba

Silke Rogl, University of Education Salzburg

Miguelina Nunez, Albert Ziegler, University of Erlangen-Nuremberg

Correspondence concerning this article should be address to Zhitian Skylor Zhang, Educational Psychology and Research on Excellence, University of Erlangen-Nuremberg, Dutzendteichstraße 24, 90478, Nuremberg, Bavaria, Germany. E-mail: zhitian.zhang@fau.de

APPENDIX 1 CREATIVITY MOTIVATION SCALE (ZHANG ET AL., 2018)

Dimension 1 Creativity-related behaviors	Dimension 2 Motivational sources	Items
Learn new things	Value	1. I like to be curious and try to understand all sort of things.
	High-quality experience	2. I experience pleasure when I discover new things ever seen before.
	Instrumental purpose	3. I need to learn new things because they could be useful in my later life.
Do new things	Value	4. It is important to do things in my own original way.
	High-quality experience	5. I feel good when I am totally immersed in creating new things.
	Instrumental purpose	6. If I want to move forward, I must do something new.
Accomplish new things	Value	7. I feel the things that I create are valuable.
	High-quality experience	8. I feel satisfaction and pleasure when I come up with new ideas.
	Instrumental purpose	9. I need to produce something new if I want to achieve something.

SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Table S1.1 Argentina.

Table S1.2 Austria.

Table S1.3 Chile.

Table S1.4 China.

Table S1.5 Kosovo.

Table S1.6 Russia.

Table S1.7 Saudi Arabia.

Table S2 Parameter Estimates for the theoretical model across samples of seven countries.

Table S3 Model fit: MGSEM with different levels of constraints across samples from seven countries.