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Relationships Between Creativity and its Antecedents Before and After Training: The Role of Risk-Taking and Past Creative Experience

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ABSTRACT

This research examined the effects of past creative experience and attitude toward risk-taking on creativity before and after training. College students enrolled in a creativity course participated in the study. Creativity was assessed by independent experts and self-assessed by the participants. Based on the results, an inverted U-shape relationship was proposed between (a) past creative experience and risk-taking, and (b) risk-taking and self-assessed creativity. Risk-taking was related to self-assessed creativity before and after the training, but not expert-assessed creativity. Past creative experience was not related to creativity, self- and expert-assessed, before and after the training.

Creativity is the ability to produce work that is both novel and appropriate (Sternberg & Lubart, 1992). The importance of creativity is undeniable on personal, organizational, national and global levels. A significant research stream has been devoted to understanding how creativity can be developed. To achieve this goal, it is important to know what factors might help enhance creativity. Despite a substantial body of research, there is little consensus about creativity antecedents (e.g., Eisenman, 1987; Dragseth, 2007). Extant studies have produced conflicting evidence as to what antecedents contribute to creativity. Further, no study has examined how creativity training might affect the relationship between creativity and its antecedents. The purpose of this study was to examine creativity antecedents and their effects on creativity before and after training. Two research questions guided this study:

1. What is the relationship between creativity and its antecedents before and after training?
2. How might the relationships between creativity and its antecedents be affected by training?

CREATIVITY AND ITS ANTECEDENTS

In the pursuit for an understanding of creativity, researchers have examined various personal characteristics (including cognitive, connate and emotional), thinking styles, the role of environment, and past experiences (Bandura, 1997; Sternberg & Lubart, 1992). Risk-taking and past creative experience have been frequently investigated in relation to creativity (e.g., Audia & Gancalo, 2007; Dewett, 2006; Eisenman, 1987; Dragseth, 2007; Das & Joshi, 2007; Taylor & Greve, 2006), yet, there has been little consensus in the results. In this study, we examined the role of attitude toward risk-taking and past creative experience as antecedents of creativity in the context of creative training.

Risk-taking

Creativity scholars agree that risk-taking, which refers to a decision-maker's tendency to take or to avoid risks when given a choice (Sitkin & Pablo, 1992), is one of the most important traits that determine creativity (Russ, 1993). Creative people and risk-takers have similar behaviour patterns: they tend to be original and non-conforming (Glover & Gray, 1975). Investment theory suggests that being creative requires a risk-taking personality (Sternberg, O'Hara, & Lubart, 1997). According to the theory, in order to generate truly creative ideas, one must invest in ideas that originally might seem foolish and unpractical and to believe that these new ideas have the potential to rise in value and be accepted by others. To go for promising underappreciated stocks in finance, or novel ideas in creativity, risk-taking is a prerequisite (Sternberg & Lubart, 1992).

In a qualitative study, which used semi-structured interviews of 120 research and development scientists, the result indicated that risk-taking (i.e., being unafraid to take risks) might be a prerequisite for creativity (Amabile & Gryskiewicz, 1987). However, quantitative studies produced inconsistent results. Some researchers reported a positive relationship between willingness to take risks and supervisor-rated creativity (Dewett, 2006), risk-taking and creative attitude (Eisenman, 1987), and risk-taking and creative potential (Eisenman, 1987). In other studies, no relationship was found between risk-taking propensity and process innovativeness (Das & Joshi, 2007), or willingness to take risks and self-reported creativity measured by past awards (Dewett, 2007).

These contradictory results are due to the differences in conceptualizing and operationalizing (measuring) risk-taking and creativity. For example, “willingness to take risks” was defined and measured differently from “risk propensity” (see Dewett, 2007). Similarly, creativity was represented as self-reported attitude (Reiter-Palmon, Kaufman, and Santo,

2012), past recognition (Furnham, Batey, Anand, & Manfield, 2008), or assessed by experts (Beghetto, Kaufman, & Baxter, 2011) in these studies. Therefore, it is important to further investigate the relationship between risk-taking and creativity. This knowledge might be useful for cultivating creativity skills by encouraging people to experiment with taking risks in a learning environment. Based on investment theory, a positive relationship was proposed between risk-taking and creativity before and after training:

H1a: Risk-taking before training is positively related to creativity before training.

H1b: Risk-taking after training is positively related to creativity after training.

H1c: Risk-taking before training is positively related to creativity after training.

Past Creative Experience

Investment theory suggests that experience might be an important antecedent of creativity (Sternberg & Lubart, 1992). It is assumed that creativity is not an innate trait of selected individuals, but an ability that can be developed through practice and experience. Therefore, all individuals have the potential to transform their personal experiences into tangible (drawings, written works, etc.) or intangible (ideas) creative outcomes (Moran & John-Steiner, 2003).

Qualitative research shows that experience is an important prerequisite of creativity (Amabile & Gryskiewicz, 1987). Quantitative studies have produced mixed results. Some researchers have reported a positive relationship between team experience and creative process (Suh, Bae, Zhao, Kim, & Arnold, 2010), individual experience and innovation (Taylor & Greve, 2006), inventing experience and generating patents (Audia & Gancalo, 2007), creative experience and divergent thinking (Furnham, Batey, Anand, & Manfield, 2008), and between creative experience and self-rated creativity (Furnham et al., 2008). Other studies have reported no relationship between team experience and innovation (Taylor & Greve, 2006), team experience and creative outcome (Suh et al., 2010), and inventing experience and divergent work (Audia & Gancalo, 2007). Similar to the risk-taking discussion, these contradictory results may be due to different perspectives and measurements of creativity and past experience. Based on investment theory and extant research, a positive relationship was expected between past creative experience and creativity before and after training:

H2a: Creative experience is positively related to creativity before training.

H2b: Creative experience is positively related to creativity after training.

Past Creative Experience and Risk-Taking

The experiential learning model explains how experience influences a person's decision to take risks (March, 1996). Specifically, if past risk-taking outcomes were unfa-

vourable, people may be less willing to take risks in the future. However, if outcomes of taking a risk were positive, people may be more inclined to take a risk again (Denrell, 2007). The model has been applied to explain risk-taking behaviour in adolescent development studies (e.g., Denrell, 2007) and finance studies (e.g., Graham, 1999; Hong, Kubik, & Solomon, 2000).

In finance research, risk-taking studies have produced contradictory results. Some researchers have reported a positive relationship between experience and risk-taking: experienced forecasters made riskier decisions than inexperienced analysts (Hong et al., 2000). This was thought to be because inexperienced analysts were punished more harshly than experienced ones if their performance was poor. In contrast, a negative relationship was found in other studies. For example, experienced agents took less risk because they were afraid to make mistakes and damage their reputation (Graham, 1999).

These contradictory research findings may be explained by the experiential learning model. In cases where, as a result of risky actions, failure was not harshly punished, experienced analysts were willing to take more risks in the future. In contrast, when risky behaviour led to unfavourable outcomes (e.g., damage of reputation, financial losses), experienced agents were not willing to take more risks. These studies show that risk-taking depends on experience, indicating that experience can either positively or negatively affect risk-taking behaviour, depending on the context and outcomes.

Although many studies have analysed the relationship between experience and risk-taking in decision making and finance areas, very few studies have examined the relationship in the context of creativity. Dewett (2006) argued that creative experience would influence an employee's willingness to take risks. For example, rewards for creative activities have been reported to have encouraged more creative and risky behaviour in the future, while reported negative outcomes for creative acts had resulted in a decreased willingness to take risks (Mumford & Gustafson, 1988). An empirical study indicated that positive feedback given during creative experiences, such as encouragement, increased risk-taking (Dewett, 2006).

In our study, participants were college students who were likely to have been encouraged and rewarded for being involved in early creative experiences such as music, crafts, plays, etc. (Garvis & Pendergast, 2013). The experiential learning model underpins these experiences, stating that when an outcome of a risk-taking activity is positive, people are more willing to take risk (March, 1996; Denrell, 2007). Therefore, we proposed a positive relationship between past creative experience and risk-taking before and after training:

H3a: Creative experience is positively related to risk-taking before training.

H3b: Creative experience is positively related to risk-taking after training.

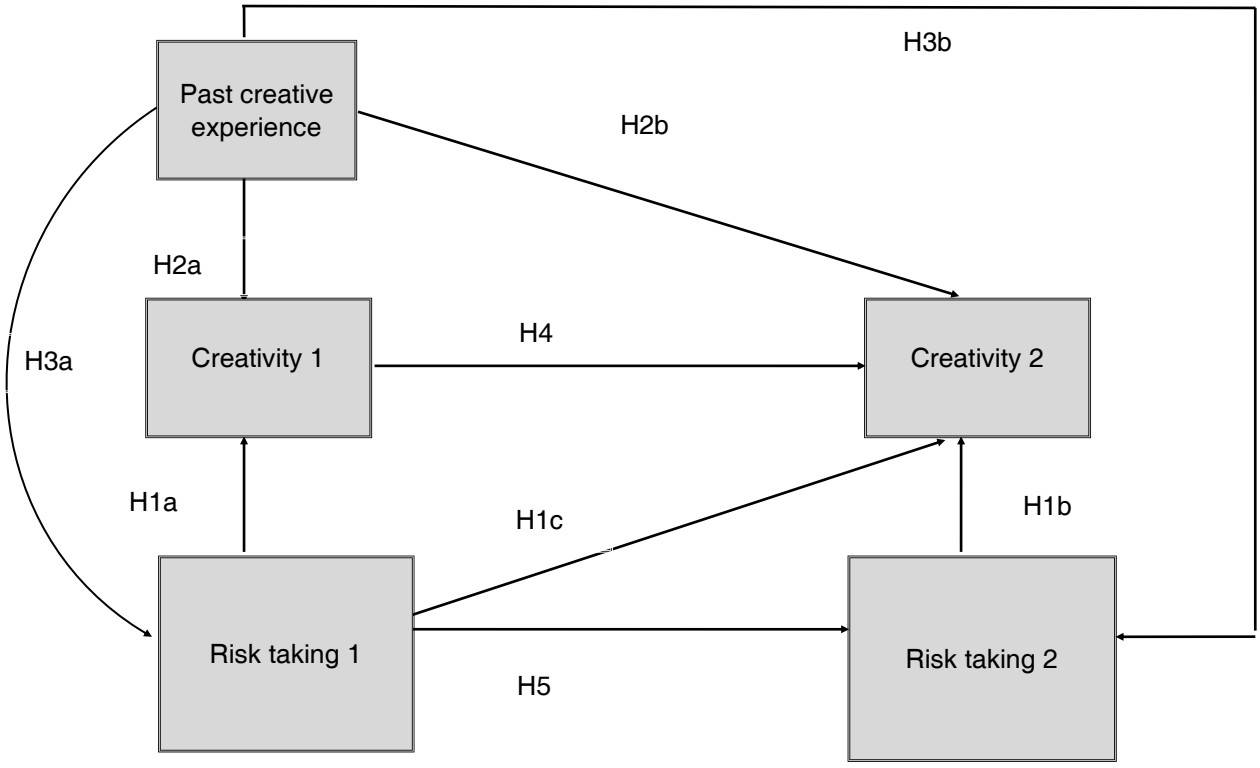
Creativity and Risk-Taking before and after Training

No study has examined what effect creative training might have on the relationship between creativity and its antecedents. To explore the effect, the research constructs (i.e., creativity and risk-taking) were measured before and after the training. Because the same constructs were measured twice, a positive relationship was expected.

H4: Creativity before training is positively related to creativity after training.

H5: Risk-taking before training is positively related to risk-taking after training.

Figure 1 displays a proposed research model to examine the relationships between creativity and its antecedents, risk-taking and creative experience, before and after the training.



Note: Variables measured before the training are labelled with '1'; variables measured after training are labelled with '2'.

Figure 1. Proposed research model.

METHOD

Creativity Course

Participants in this study were undergraduate students enrolled in a semester-long, three-credit creativity course offered at a large land-grant Midwestern University in the United States. The course focused on application of creative thinking strategies to view things from different perspectives, becoming more comfortable in taking risks, identifying unique opportunities, generating multiple ideas for solving various problems, and evaluating these ideas. The course consisted of 14 individual creative mini projects and three team-

based large-scale projects. Students completed multiple individual and group-based creativity exercises during class periods. For example, to encourage students to step out of their comfort zones, during the first class period students were asked to draw a random image from a pile of images cut from magazines (household objects, nature, etc.) and perform a dancing charade in front of the class so other students could guess what the image was. To help students recognize and challenge assumptions, teams of 5-6 people were asked to build the tallest possible structure using their own shoes (Michalko, 2006). In addition, students were required to reflect on their learning in weekly online journals. All course learning activities, including projects, reflections and in-class exercises were required to be completed and were graded based on student performance. The course instructor was one of the authors of this study.

Participants

Students enrolled in the creativity course were recruited to participate in the study. The research data were collected over two semesters, resulting in two samples, Sample 1 and Sample 2. In both semesters, the creativity course had the same learning objectives, assignments and grading system.

Sample 1. The paired data (pre- and post-test) sample size was 40. Student age ranged from 18 to 23, with an average age of 20.48 years (*SD* = 1.34). All participants were female (*n* = 40; 100%), largely Caucasian (*n* = 34, 85%), and most majored either in apparel (*n* = 27; 67.5%), or event management (*n* = 10; 25%).

Sample 2. The paired data sample size was 46. Participant age ranged from 18 to 25, with an average age of 20.60 years (*SD* = 1.8). All students were undergraduates, except for one participant, who was a graduate student. Most were female (*n* = 41; 91%), largely Caucasian (*n* = 38, 84 %), and most majored either in event management (*n* = 31; 68.9%), or apparel (*n* = 9; 20%).

Measurements

Creativity is one of the most complex and difficult phenomena to measure (Amabile, 1982). To better capture the complex phenomenon of creativity (Karwowski, 2015), the construct was operationalized in two ways: (1) assessed by independent trained experts and (2) self-assessed, where participants themselves evaluated their creativity. Given the two measurements of creativity used, two of the proposed research models (Figure 1) were tested:

- the first model was based on creativity assessed by experts,
- the second model was based on self-assessed creativity.

Self-assessed creativity: A seven-point Likert scale was used to measure self-assessed creativity. Ten items were adapted from previous research (e.g., Tierney & Farmer, 2002). Example items were: "I am a creative individual," "I am good at coming up with unique ideas," and "I use my creative abilities when faced with challenges." As a result of Principal Component Analysis with Promax rotation, all ten items loaded as one factor, with a high reliability measured by Cronbach's alpha (α = .95).

Expert-assessed creativity: The figural format of the Torrance Test of Creative Thinking (TTCT) was used to measure creativity assessed by independent experts (Torrance, 2008). The authors chose the figural format of the TTCT because (1) it has been the most widely used in previous research (e.g., Kim, Cramond, & Bandalos, 2006; Saeki, Fan, & Dusen, 2001); and (2) several students in the course were international students, who might have had a disadvantage if the verbal format of the TTCT had been used. Form A of the test was used for the pre-test at the beginning of the course, and form B was used for the post-test administered at the end of the course. Completed TTCT booklets were mailed to the Scholastic Testing Services, the publisher of the test, for scoring by trained experts. The reported inter-rater reliability ranged from .90 to .97 (Cropley, 2000).

Risk-taking: A seven-point Likert scale was used to assess risk-taking. Four items were adapted from Sitkin and Pablo (1992). Example items were: "I take risks with my ideas" and "I am comfortable taking risks". Using Principal Component Analysis with Promax rotation, all items loaded as one factor. The reliability of the scale revealed α = .80.

Creative experience – Sample 1: To measure a participant's past creative experience, a scale including nine activities (painting/drawing, singing, dancing, poetry/writing, theatre, playing a musical instrument, photography, and other creative activities) was adapted from Hocevar (1981). Participants indicated whether or not they had engaged in any of these activities in the past. All activities were summed up to represent the participant's past creative experience. The scale reliability (α) was .71.

Creative experience – Sample 2: To obtain a richer understanding of a participant's creative experience, the Biographical Inventory of Creative Behaviours (BICB) scale was used with the second sample (Batey, 2007). From a list of 34 activities (e.g., drawing, dancing, design, music, etc.), participants marked activities they had performed in the past 12 months. All marked activities were summed up to represent the participant's past creative experience (α = .74).

Data Collection

Paper format questionnaires were used to collect the data. Data were collected from the students enrolled in the creativity course taught in two consecutive semesters, result-

ing in two samples. All students voluntarily gave consent to include their responses in the study, which was approved by the university's Institutional Review Board. The data was collected at the beginning and at the end of the course. The pre-test was completed during the first week of the semester. The post-test was completed during the last week of the semester. Past creative experience and demographic data were collected only during the pre-test. Creativity and risk-taking measures were administered during both, pre- and post-tests. The TTCT was administered according to the guidelines provided by the Scholastic Testing Services (Torrance, 2008).

All students were expected to complete creativity and risk-taking measurements as part of the course activities. When completing the consent form, they could indicate if they would allow their responses to be included in the study. The response rate for both samples was 100%. However, several students only completed the pre-test, but not the post-test; whereas other students completed only the post-test but not the pre-test. Therefore, the final response rates were: 85% for Sample 1 and 70% for Sample 2.

Data Analyses

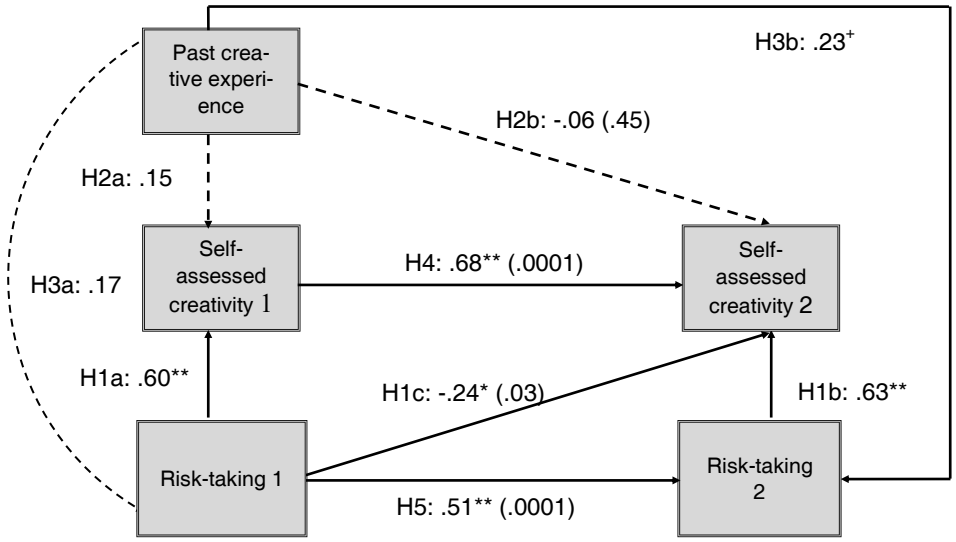
For analysis, pre-test data were paired with post-test data for each participant. Descriptive statistics were computed using SPSS 20. Factor analysis was used for data reduction and to check construct reliability. Model fitting and hypotheses testing were completed using Mplus 6.0 and structural equation modelling (Bentler & Bonnet, 1980). Because the size of both samples was relatively small (n_1 = 40, n_2 = 46), a p value of .10, which is referred to as marginally significant, was reported (Guadagno, 2010).

RESULTS

Because there were two different measures of creativity in each sample, and creative experiences were scored differently in the two samples, there were four versions of the proposed model. Figures 2, 3, 4, and 5 illustrate the structural relationships among the research constructs, which tested the proposed models for:

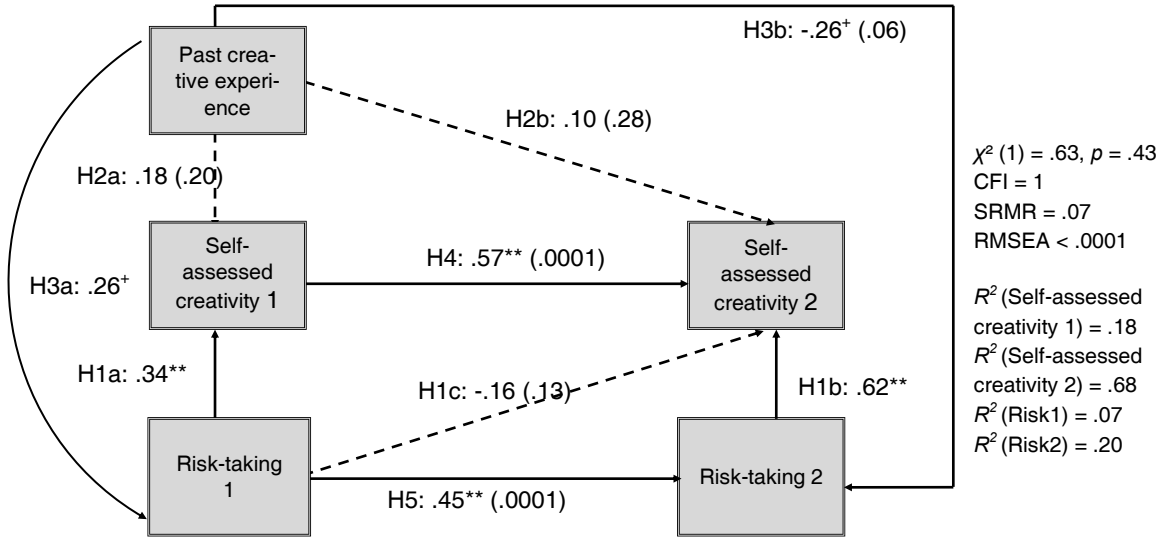
- self-assessed creativity for Sample 1 (Figure 2),
- self-assessed creativity for Sample 2 (Figure 3),
- expert-assessed creativity for Sample 1 (Figures 4),
- expert-assessed creativity for Sample 2 (Figure 5).

The standard coefficients and p values for each path are provided in each figure. The fit-indices were very good for the self-assessed creativity model in Sample 1 ($\chi^2_{(1)}$ = .48, p = .49, CFI = 1, SRMR = .04, RMSEA < .0001) and Sample 2 ($\chi^2_{(1)}$ = .63, p = 0.43, CFI = 1, SRMR = .07, RMSEA < .0001), as well as for expert-assessed creativity in Sample 1 ($\chi^2_{(1)}$ = .56, p = .46, CFI = 1, SRMR = .03, RMSEA < .0001) and Sample 2 ($\chi^2_{(1)}$ = .20, p = .66, CFI = 1, SRMR = .01, RMSEA < .0001).



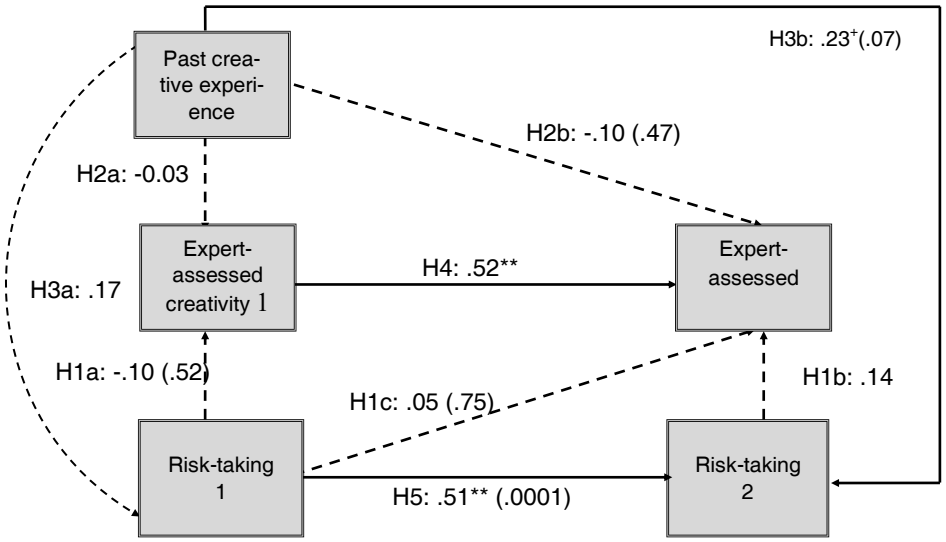
Notes: $^{+}p = .10$, $^{*}p = .05$, $^{**}p = .001$.

Figure 2. Self-assessed creativity, Sample 1.



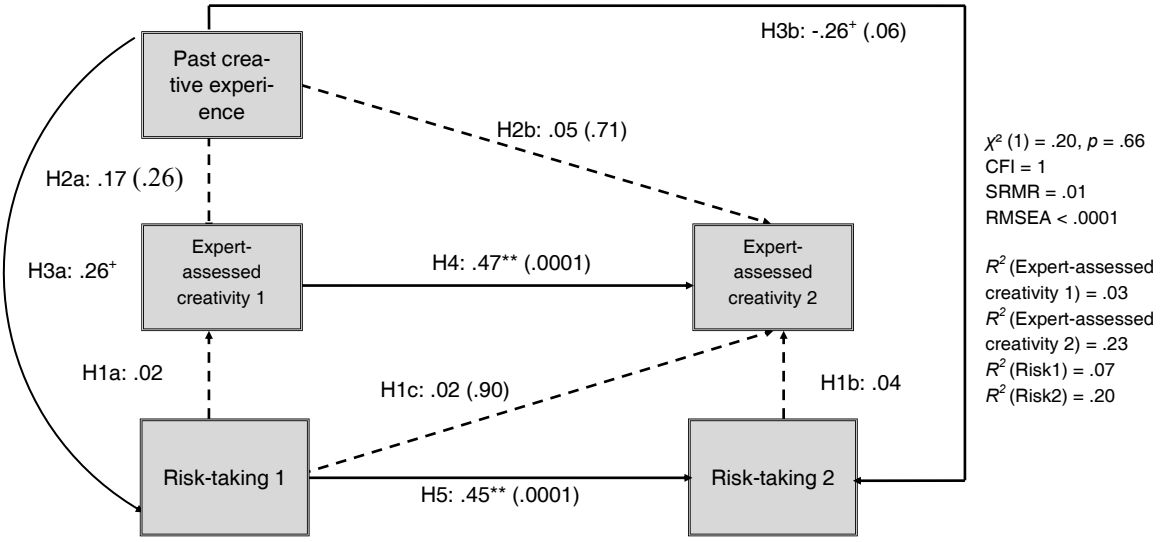
N*otes*: $^{+}p = .10$, $^{*}p = .05$, $^{**}p = .001$.

Figure 3. Self-assessed creativity, Sample 2.



Note: $^{+}p = .10$, $^{*}p = .05$, $^{**}p = .001$.

Figure 4. Expert-assessed creativity, Sample 1.



Note: ^{+}p = .10, $^{*}p$ = .05, $^{**}p$ = .001.

Figure 5. Expert-assessed creativity, Sample 2.

Creativity and Its Antecedents

Hypotheses H1a, H1b, and H1c tested the relationship between risk-taking and creativity, measured as expert-assessed creativity and self-assessed creativity, before and after the training.

Risk-taking and self-assessed creativity. Risk-taking was positively related to self-assessed creativity before and after the training in both samples (Figures 2 and 3): before the training in Sample 1 (β = .60, p <.0001) and Sample 2 (β = .34, p =.009); after the training in Sample 1 (β = .63, p <.0001) and Sample 2 (β = .62, p <.0001). The results supported hypotheses H1a and H1b for both samples. Risk-taking was positively related to self-assessed creativity, when both were measured before the training (during the pre-test). Similarly, risk-taking was positively related to self-assessed creativity, when both were measured after the training (during the post-test).

However, a different relationship was discovered between risk-taking measured before the training (pre-test) and self-assessed creativity measured after the training (post-test). Pre-test risk-taking was significantly negatively related to post-test self-assessed creativity in Sample 1 (β = -.24, p =.03) and insignificantly negatively related to the post-test self-assessed creativity in Sample 2 (β = -.16, p =.13). Hypothesis H1c was rejected in both samples.

Although the pre-test risk-taking was positively related to the pre-test self-assessed creativity in both samples, it was negatively related to the post-test self-assessed creativity in both samples. These results might possibly be explained by a non-linear relationship between risk-taking and self-assessed creativity. The finding appears to suggest there might be an inverted U-shape relationship between risk-taking and self-

assessed creativity. Risk-taking positively contributes to creativity until it reaches a certain level, after which the relationship becomes negative.

Risk-taking and expert-assessed creativity. Risk-taking had no effect on expert- assessed creativity, as measured by the TTCT. No significant relationship was found either before, or after the training in both samples (Figures 4 and 5). Hypotheses H1a, H1b, and H1c were rejected for both samples. The finding suggests that risk-taking did not predict creativity as measured by the TTCT.

Past creative experience and creativity. Past creative experience was not related to creativity, regardless of whether it was self-assessed or expert-assessed. Creative experience did not contribute to creativity before or after the training in both samples (Figures 2, 3, 4, and 5). Consequently, hypotheses H2a and H2b were rejected.

Despite theoretical support and some empirical evidence (e.g., Suh et al., 2010; Taylor & Greve, 2006), it is questionable whether past *artistic* experiences are related to creativity, where creativity is defined as an ability to generate original and useful ideas. In our study, past creative experience was measured by self-reported activities related to various forms of artistic expression (past experience with painting, music, dance, etc.). When engaged in these artistic activities during their childhood or teenage years, participants were likely to have been merely learning/mastering how to play a musical instrument or to paint, rather than creating original music or painting. Another possible explanation for a lack of a relationship between past artistic experience and creativity is the domain specificity in creativity: artistic creativity might not be related to other types of creativity, such as creative problem solving (Baer, 1998).

Past Creative Experience and Risk-Taking

Hypotheses H3a and H3b tested the relationship between past creative experience and risk-taking, with risk-taking measured twice, before (pre-test) and after (post-test) the training.

Sample 1. Creative experience was not related to pre-test risk-taking (β = .17, p = .27), but there was a marginally significant positive relationship between creative experience and post-test risk-taking (β = .23, p =.07) (Figures 2 and 4). Hypothesis H3a was rejected, and hypothesis H3b was marginally supported. A possible explanation for the lack of a relationship between creative experience and risk-taking at the beginning of the class and a positive relationship between creative experience and risk-taking at the end of the class might be that before the class students did not know how to utilize their past creative experience to help them take risks with their creative ideas. Therefore, creative experience did not contribute to risk-taking at the beginning of the course. The creativity course might have helped participants better utilize their creative experiences. For exam-

ple, to be able to transfer a creative experience from one field to a different field, the creativity course encouraged students to take risks, such as stepping out of their comfort zone and think outside the box. After practicing, students were more comfortable taking greater risks when utilizing their past experiences when developing new ideas, which resulted in a marginally significant relationship between creative experience and risk-taking at the end of the course.

Sample 2: There was a marginally significant positive relationship between creative experience and risk-taking before the course (β = .26, p = .06), but a marginally significant negative relationship between creative experience and risk-taking after the course (β = -.26, p = .06). Hypothesis H3a was supported (Figure 3). Hypothesis H3b was rejected (Figure 5). Sample 2 results suggests that the training had changed a positive relationship between creative experience and risk-taking into a negative relationship. Similar to the relationship between risk-taking and self-assessed creativity, this finding indicated an inverted U-shape relationship between creative experience and risk-taking. This is in line with the inverted U-shape relationship between experience and creativity proposed by Sternberg and Lubart (1992).

The relationship between creative experience and risk-taking was inconsistent between the two samples, which was likely to have been due to the two different scales used to measure past creative experience. In Sample 1, creative experience was measured with nine items (Hocevar, 1981), whereas a 34-item creative behaviour inventory was used in Sample 2 (Batey, 2007). As a result, much lower creative experience values were recorded in Sample 1, and higher values were reported in Sample 2. Based on an inverted U-shape relationship, it appears that low to intermediate levels of creative experience in Sample 1 contributed positively to risk-taking at the end of the course. At the same time, higher creative experience values in Sample 2 resulted in a negative contribution to risk-taking at the end of the course. The result implies that up to a certain level, creative experience positively contributes to a person's willingness to take risks with their ideas. However, a substantial past creative experience might negatively contribute to risk-taking attitude.

CREATIVITY AND RISK-TAKING BEFORE AND AFTER TRAINING

Hypothesis H4 tested the relationship between creativity measured before and after the training. Hypothesis H5 tested the relationship between risk-taking measured before and after the training. In both models, the pre-test constructs were positively related to the post-test constructs (Figures 2-5).

The pre-test self-assessed creativity was positively related to the post-test self-assessed creativity in Sample 1 (β = .68, p <.0001) and Sample 2 (β = .57, p < .0001).

The pre-test expert-assessed creativity was positively related to the post-test expert-assessed creativity in Sample 1 (β = .52, p <.0001) and Sample 2 (β = .47, p < .0001). Similarly, the pre-test risk-taking was positively related to the post-test risk-taking in Sample 1 (β = .51, p < .0001) and Sample 2 (β = .45, p < .0001). Hypotheses H4 and H5 were supported for both models in the two samples. The results suggest that the initial level of creativity and risk-taking significantly contributed to creativity and risk-taking at the end of the course, respectively.

Self-assessed creativity after the training. In Sample 1, the pre-test self-assessed creativity was the strongest contributor (β = .68) to the post-test self-assessed creativity, when compared with the pre- (β = -.24) and post-test risk-taking (β = .63) (Figures 2). However, in Sample 2, the post-test risk-taking (β = .62) was the major determinant of the post-test self-assessed creativity, when compared with the pre-test self-assessed creativity (β = .57) and the pre-test risk-taking (β = -.16) (Figure 3). Together, the pre-test self-assessed creativity and the pre- and post-test risk-taking explained 79 percent of the variance in the post-test self-assessed creativity in Sample 1, and 68 percent in Sample 2. The results indicate that the post-test self-assessed creativity was primarily determined by the initial self-assessed creativity and the post-test risk-taking. Interestingly, the pre-test risk-taking had no (or a negative) impact on the post-test self-assessed creativity.

Expert-assessed creativity after training. Only the pre-test expert-assessed creativity contributed to the post-test expert-assessed creativity in both samples (Figures 4 and 5). Twenty-nine percent and 23 percent of the variance in the post-test expert-assessed creativity measured after the training was explained by the pre-test expert-assessed creativity in Samples 1 and 2, respectively. Neither past creative experience nor risk-taking contributed to the expert-assessed creativity measured at the end of the course.

Risk-taking after the training. In Sample 1, the post-test risk-taking was explained by the pre-test risk-taking (β = .51) and past creative experience (β = .23) (Figures 2 or 4). In Sample 2, the post-test risk-taking was explained by the pre-test risk-taking (β = .45) and creative experience (β = -.26) (Figures 3 or 5). Thirty-five percent of the variance in the post-test risk-taking in Sample 1 and 20 percent of the variance in Sample 2 were accounted for by the pre-test risk-taking and creative experience. The results indicate that although creative experience contributed to the post-test risk-taking, the contribution was not very much.

CONCLUSIONS AND IMPLICATIONS

This research examined the effects of two creativity antecedents, risk-taking and past creative experience, on creativity at the beginning and at the end of a semester-long cre-

ativity course. The relationships were investigated using two samples of undergraduate students enrolled in the course. Two research models were tested for creativity measured as (a) creativity assessed by experts and (b) self-assessed creativity.

Creativity and Its Antecedents

Risk-taking and creativity. In both samples, risk-taking contributed to self-assessed creativity. However, risk-taking did not contribute to expert-assessed creativity as measured by the Torrance Test of Creative Thinking (TTCT). The finding confirms extant research that, depending on how creativity is conceptualized and measured, risk-taking may or may not be considered its antecedent. Creativity is a multidimensional construct, and the way it is operationalized affects what characteristics can be used to explain it (Carpenter, Pollock, & Leary, 2003). Based on the results of this study, we proposed an inverted U-shape relationship between risk-taking and creativity, similar to the hypothesized inverted U-shape relationship between experience and creativity (Sternberg & Lubart, 1992). In our study, we proposed that the relationship between risk-taking and creativity might be nonlinear, and specifically, might follow an inverted U-shape. Theoretically, this might explain why previous research has reported inconsistent results between risk-taking and creativity. Practically, trainers and educators should not expect risk-taking to endlessly contribute to increases in creativity. Yet, it is important to encourage people on the lower-end of the creativity spectrum to practice taking risk by sharing and expressing their ideas.

Past creative experience and creativity. In our study, creative experience did not contribute to creativity, regardless of how it was measured (self-assessed or expert-assessed creativity). Even though extant research has produced contradictory findings (e.g., Suh et al., 2010; Taylor & Greve, 2006), scholars believe that creative experience positively contributes to one's creativity (Sternberg & Lubart, 1992). One reason for the contradictory results might be the definition and measurement of both constructs. For example, Taylor and Greve (2006) reported a positive relationship between individual experience and individual innovation, but no relationship between a team member's experiences and the overall team's innovation.

The results of our study as well as extant research raise the question of whether past *artistic* experiences can be used to explain and predict general, or everyday creativity (non- art-related). Confidence in and ability to generate novel ideas might have little to do with learning how to play musical instruments, starring in a school play, or mastering crafts. Participants engaged in these activities, especially young participants, are more likely to be learning basic skills rather than producing original artefacts. Experience in creating original ideas may need to be emphasized when measuring past creative

experience in future studies. Scholars may need to reconsider how creative experience is operationalized and measured in creativity research in general.

Past Creative Experience and Risk-Taking

Because two different scales were used in this study to assess past creative experience in Sample 1 and Sample 2, the relationship between creative experience and risk-taking was not consistent between the two samples. In Sample 1, creative experience was not related to risk-taking before the training, but positively related to risk-taking after the training. In Sample 2, creative experience was positively related to risk-taking before the training, but negatively related to risk-taking after the training.

The results might be explained by a complex, nonlinear relationship between creative experience and risk-taking: lack of experience does not contribute to risk-taking; an intermediate level of creative experience positively contributes to risk-taking; and a high level of creative experience might negatively contribute to risk-taking. People with substantial creative experiences might prefer to work with familiar things rather than explore new ideas; therefore, they might be less inclined to take risks (Audia & Gancalo, 2007). Trainers and educators should not expect that creative experiences might endlessly contribute to increasing risk-taking.

Creativity and Risk-Taking Before and After Training

Both, self-assessed and expert-assessed creativity before the training was positively related to creativity measured after the training. Similarly, risk-taking before the training positively contributed to risk-taking after the training. In most cases, creativity and risk-taking after the training were explained more by the initial level of the construct rather than the other variables in the model (Figures 2 – 5). In other words, although training can increase a participant's creativity (e.g., Karpova, Marcketti, Barker, 2011) and their attitude toward risk-taking (e.g., Dewett & Gruys, 2007), both constructs are mostly determined by the participant's initial level of creativity and risk-taking.

Limitations and Future Research

Because creative experience was measured with two different scales in Samples 1 and 2, it is unclear how the scales might have contributed to the reported discrepancies between the two samples. A relatively small size of paired data samples restricted how many creativity antecedents could be examined in this study. Also, this resulted in several marginally significant relationships. Future studies may consider recruiting a larger number of participants and investigating a greater number of creativity antecedents, such as personality characteristics, motivation, thinking style, etc. None of the two antecedents in this study, neither risk-taking, nor past creative experience, contributed to expert-assessed creativity

as measured by the TTCT. Future research may examine what factors might explain this construct (TTCT antecedents).

In the current study, the experimental group alone was used to examine relationships between creativity and its antecedents before and after the training. In the future, it is recommended to include a control group. Furthermore, the current study's conclusions are based on the figural format of the TTCT and self-assessed creativity. Future research might employ other creativity measures, such as the consensual assessment technique, for example (Amabile, 1996). Finally, the present study only investigated creativity from a person-centred approach. Future studies may examine how creativity is influenced by situational, environmental, and individual factors combined (Cropley, 2000).

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