



# Creative intention and persistence in educational robotic

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## Abstract

When participants engage twice in the same creative problem-solving task with educational robots, they have the possibility to repeat the same solution, allowing them to complete the task faster, or to show a creative intention and behavior, engaging them in developing a new solution. In this study, we aim to analyze the creative process considering the creative intention and the persistence in the creative process. For this purpose, we engaged 115 adults to perform twice the same problem-solving task using modular robotic cubes without specific instruction concerning the way to solve the task the second time. Creative intention is observed when the participant tests a new solution in the beginning of the second realization of the task, creative persistence behavior is shown when participant stays engaged in a new plan although it requires time and efforts. Results show that participants' effective creative solution is related to their creative intention and the time engaged in the second occurrence of the educational robotic task (assessing the creative behavior persistence). These results suggest that the creative process leading to an effective creative solution in a repeated task requires an initial creative intention, but also a higher creative behavior persistence than engaging in a conservative behavior.

**Keywords** Educational robotic · Creative behavior · Creative intention · Creative behavior persistence · Task repetition

Although the definition of creativity still does not reach a consensus, the increasing importance of creativity as transversal competence to be developed requires us to consider the different educational practices but also the critical understanding of creativity in technology enhanced learning (Henriksen et al., 2021). Creativity is majorly described as the ability to create something new and adapted/ useful (Lubart, 1994; Runco & Jaeger, 2012). For Shalley, creative behavior leads to “identify original and better ways to accomplish some purpose” (1995, p. 483). Creativity can be observed in all fields, from artistic creativity to

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creativity in science, whether it is creating new thoughts, or new tangible objects. From an interactionist approach, creative behavior results from the interaction of the person and the context (Woodman et al., 1993). The dynamic, multifactorial visions of the creative process highlight the importance of the relationship between the creative agent and his environment. To produce a creative behavior requires a willingness to innovate, to find a new response, a new way of doing or thinking, and the ability to act towards a solution. From this point of view, it seems important to consider a person's creative potential (Corazza, 2016).

In this study we aim to explore the creativity process during a repeated educational robotic task. More precisely, we aim to evaluate the way creative behavior is sustained during the task (creative behavior persistence) or is resumed to a more routine behavior at a certain point of the task. The individual differences in creativity have been studied in relation to attitudes and beliefs about creativity but also in relation to the performance in different creativity assessment tasks. We focus on the creative individual differences in the next section before focusing on the task's creativity and repetition.

## Individual differences in creative intention and behavior

Behavior intention, as “a person's subjective probability that he will perform some behavior” (Fishbein & Ajzen, 1975, p. 12) does not always lead to an effective behavior. In the context of creative tasks, the creative intention could engage the participant in a creative behavior or in a more conservative behavior in which the participant will develop an already known solution for a certain task. Creative intention is the initial commitment made for achieving a task in a creative way. Despite an initial creative intention, creative behavior needs to be sustained across the task. Creative behavior persistence refers to the capacity to pursue a creative behavior during a task without adopting a conservative behavior (using an already known solution). A conservative behavior is shown when the participant solves the task using a known solution.

When a subject should repeat a task, he or she can choose to engage in a conservative or creative behavior but also to change his or her cognition, and thus behavior, across the task. Creative persistence from the initial creative intention towards a creative solution might require higher efforts than conservative behaviors. However, creative behavior persistence is often underestimated by participants according to Lucas & Nordgren (2015). Their study, through different types of creative tasks, shows persistence as a critical determinant of creative performance, but this persistence has not been observed in studies considering daily creative problem solving. This might suggest that when the person aims to perform a task rapidly a conservative solution would be privileged instead of engaging and persevering in a creative behavior, probably requiring higher efforts to develop an original solution. Thus, when persons are given the opportunity to be creative or not for solving an existing task, individual differences could lead some individuals to engage in creative behavior even though they can solve the task faster in an already existing approach. Choosing to behave creatively or to perform the fastest possible can be influenced by the individual differences in creativity and in terms of creative potential. Being creative requires more effort than applying an existing conservative solution to the task. Positive affect could also facilitate creative behavior and performance (Hirt et al., 2008; Isen, 1999), which has been observed in divergent thinking tasks (Vosburg, 1998). However, in problem solving tasks, Kaufmann

& Vosburg (1997) observe higher creativity in a negative mood, when the subject is in a problematic situation, he tries to solve it by generating different ideas. When a subject is satisfied (positive mood) with one of the solutions he found, he will be less creative. Considering these contrasting results, Zenasni & Lubart (2011) analyze the creative performance in relation to the pleasantness of two different tasks: an story writing task and the “unusual uses of a box test” from the *Torrance Tests of Creative Thinking* (Torrance, 1976), a divergent thinking task. The perceived pleasantness of the task was related to the fluency in the “box” divergent thinking task, while the story writing task showed an increasing pleasantness over time. Persistence in the creative process has been studied as a regulatory process. Lam & Chiu (2002) applies the Regulatory Focus Theory to study the creative process to “focus on achieving positive outcomes (have a promotion focus) or avoiding negative ones (have a prevention focus) when they pursue their goals”. In a repeated task, a prevention focus will choose a more conservative behavior and repeat the existing solution, while a promotion focus will choose to behave in a more divergent way generating new ideas.

We should consider creative behavior across the task in concurrence to more conservative behavior appearing when the participant finds a satisfying less creative solution (Kaufmann & Vosburg, 1997) or has a prevention focus aiming to avoid negative outcomes (Lam & Chiu, 2002). The willingness to pursue a creative behavior despite the difficulties is considered under the term *creative persistence* by Hoffmann et al., (2016). For Amabile (1996), creative persistence requires intrinsic motivation for the task, while creative achievement is related to extrinsic motivators. In problem-solving, Kaufmann & Vosburg (1997) observe creative persistence when the subject is not satisfied enough with the intermediate solutions he develops through the creative process, but once they feel satisfied, they behave less creatively.

We thus can expect creative persistence in repeated tasks to be challenged by the efforts required by creative behavior when a good enough solution is known from prior task experiences. In a repeated task, creative behavior could be a concurrent goal to the temporal task performance. If the participant aims to engage in a creative solution in a repeated task, the creative intention should be sustained as a persistent creative behavior through the task. Thereby, even when the participant is engaged in a creative behavior, sustaining this behavior across the task requires a regulatory effort to overcome the obstacles or efforts required to sustain this creative behavior. Persistence in the face of obstacles has been pointed to be important in the creative pursuit (Amabile, 1990; Lucas & Nordgren, 2015; Lubart & Sternberg, 1995) even if the participant underutilized persistence in everyday creative problem solving (Lucas & Nordgren, 2015).

### **Dual process model for conservative and creative intentions and behavior**

The conservative and creative intentions and behavior is based on the dual process models in which two cognitive systems are opposed (Houdé & Borst, 2014; Kahneman, 2011). The first system allows a fast, automatic, intuitive processing, mainly based on prior knowledge, although the second system is a more deliberate, effortful, controlled processing system. In this study conservative intention would rely on the first system, participants have found a way to resolve the task thus when we asked them to repeat the task the easier, effortless way to resolve it is to build with this new knowledge. Creative intention, in contrast, requires inhibiting the first system and thus the fixation on the new knowledge to activate the second

system and to actively search for a new way to resolve the task (for a review on the inhibition process on problem solving and creativity see Cassotti et al., 2016).

We propose a model describing the creative process, based on the dual process models, in which two stages are required to achieve a creative solution (see Fig. 1). The persistent creative process is thus effortful, time consuming. A creative solution should start by inhibiting the conservative intention to solve a task with an already known solution, but also requires persisting in the inhibition of the familiar associations (a successful way to assemble the cubes) to achieve a creative solution. Being creative is an effortful choice which requires a regulatory process from the creative intention to the creative solution.

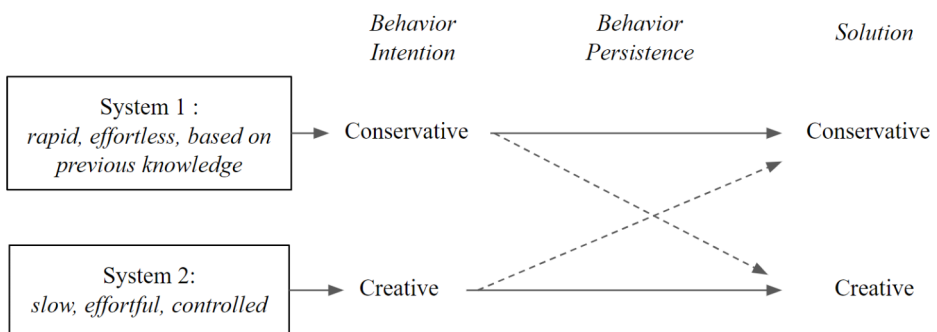
The creative process based on the dual process models would require not only to consider the current task with educational robots but also to engage on other creative tasks to observe if the results of the creative process applies to other tasks.

### Task difficulty and repetition

From an interactionist approach of creative behavior (Woodman et al., 1993), the cognitive and conative traits of an individual are in relation to the task context and characteristics. A participant can have a certain potential to be original in generating ideas and evaluating these ideas in relation to a certain context. Despite this potential, creative intention and creative behavior persistence should be considered in the context of a task. Among the characteristics of the task, the creative instructions of the task, the level of difficulty and the prior experience on the task can influence the way the person engages and perseveres along a task (Lam & Chiu, 2002).

The creative instructions have an influence in the way the person engages in a task. On brainstorming, having task instructions inviting a higher quantitative number of answers, instead of quality, leads to more creativity (Paulus et al., 2011). When the task has not clearly creative instructions, the creative behavior of the person relies on these creative personal traits but also on his prior experience in the task.

The person requires a certain prior experience in the task domain to combine ideas in an original way and evaluate these ideas in relation to the task. According to Chua & Iyengar (2008) creative outcomes necessarily require having a strong experience on the task, or on



**Fig. 1** Representation of the creative process based on the dual process models. Here the inhibitory control required to inhibit the first system is necessary during two stages to achieve a creative solution

the concerning domain, and to have an explicit instruction asking to be creative. If these two points (task experience and explicit instruction) are not present fewer creative outcomes would be generated.

When the person has prior experience in a task, the repetition of the task is influenced by the difficulty experienced. A task experienced as difficult can lead to a more conservative behavior, preventing the participant from avoiding difficulties in engaging in novel creative processes or solutions. According to Csíkszentmihályi (1975), it is necessary to be aware of our own skills and to evaluate them regarding the level of the task to elaborate in a better way how to resolve a challenge, with which steps. In repeated tasks, we expect the prior experience of the task difficulty to affect the way the person engages in creative intention and effective behavior. Prior difficulties in the task can induce a conservative behavior due to a focus on avoiding negative outcomes, which is referred to as a prevention focus by Lam & Chiu (2002).

## This study

This study aims to identify the factors leading to a creative intention and creative behavior considering the prior experience in an educational robotic repeated task. For this purpose, we proposed to participants to resolve the same task twice without specifying if they must solve the two occurrences of the task (activity 1 and activity 2) in the same way (conservative behavior) or in a different way (creative behavior).

We thus aim to understand at which point the creative intention and the creative behavior persistence, in terms of task duration allocated for the completion of the first activity, influences the creative solution in the second activity.

## Method

### Research design

The experimentation protocol is a between-subjects design where participants must resolve twice the same task (Activity 1 and Activity 2) named CreaCube (Romero, David & Lille, 2018). This specific task is a creative problem-solving activity using four modular robotic cubes to be assembled to form a vehicle and make it move. The CreaCube task allows participants to engage in creative behavior and can be solved in a few different ways. The observation of the task allows us to evaluate the creative intention of the participant when engaging in the second occurrence of the task, but also the persistence of the creative behavior across the second occurrence of the task, operationalized by the different duration of engagement in each occurrence of the task.

Creative intention can be observed in the CreaCube task when the participant tries to build a different vehicle in the second activity, without repeating the successful solution they proposed in the first activity. Then, we explore if the creative intention and the creative behavior persistence (assessed with the time required to finish the second activity) influence the creative solution (assessed by the novelty of the vehicle created in the second activity compared to the one of the first activity). Considering, on one hand, the creative intention

and on the other hand the creative solution permits to identify four different participants' profiles: the creatives, the conservatives, the non-intentional creatives and the non-intentional conservatives (see Fig. 2).

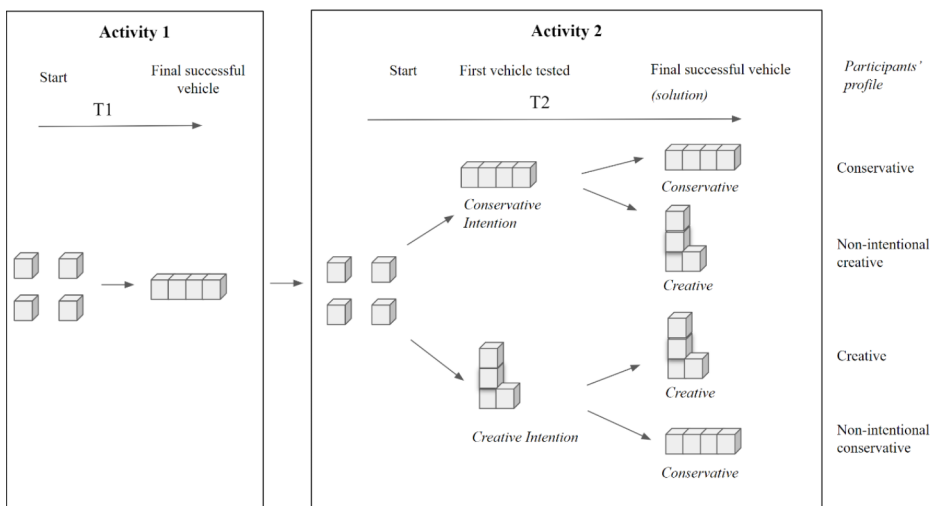
The originality of this study is to analyze the creative process from an interactionist approach, in which the participant profile and prior experience are evaluated in relation to the creative intention and creative behavior persistence in a repeated task. After succeeding at the first occurrence of the task (activity 1), the participants engage in a second activity in which we can observe the creative intention, creative behavior persistence and creative solution during the second occurrence of the task. This study is based on qualitative and quantitative approaches supported by video analysis of activity 1 and 2.

## Participants

One hundred and fifteen adults (aged  $M=27.7$  years old;  $SD=5.8$ ; 86 females) gave their informed consent and voluntarily participated in this study. This study was approved by the ethics committee of the Université Côte d'Azur<sup>1</sup>.

## Task and instruments

*The CreaCube task.* CreaCube (Romero, David & Lille, 2018) is a manipulative robotic cube task, in which participants must build, with four cubes, a vehicle that moves independently between two points. The four cubes have been chosen from the Cubelets Modular Robotic set (<https://www.modrobotics.com/cubelets/>) in relation to different technological



**Fig. 2** Schematic representation of the CreaCube task protocol for the analysis of creative intention and persistence along the two occurrences of the task

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and object affordances. Cubes have metallic points to allow electromagnetic connectivity between them, they all have a different color and different characteristics. The white cube has black wheels and thus serve for the movement, the blue cube is a battery cube with an on/off button, the black cube is a sensor cube with two “eyes” for the detection and the red cube is an inverse cube without any visual affordance.

We consider as different figures of a vehicle the assemblages of different cubes. For example, a participant can succeed in the CreaCube task by making a “train”, i.e., by assembling the different cubes in a line. If, during the second activity, he reproduces a train by only swapping two cubes, he will be considered to have made the same figure for both activities. On the other hand, if he proposes a train in the first activity and assembles the four cubes in a square for the second activity, then he will have made a different figure between the two activities. Eighteen figures can be created by assembling the four cubes (Romero, David & Lille, 2018), twelve of them allowed to successfully complete the task if the cubes are assembled in a correct way. Unsuccessful figures are mainly due to the position of the cubes that influence their technological characteristic, the rotation of the wheels or the balance of the structure. For each participant, we code all the figures testing during all the task processes, the successful figures for the first and the second activity, and the time required to finish each of the activities. Considering the successful figure for the first activity and the first figure tested in the beginning of the second activity allowed us to infer the intention of the participant. Indeed, if the first figure tested for the second activity is the same as the successful one for the first activity, we consider that the participant’s intention was to repeat the same solution, thus that this participant presented a conservative intention. Conversely, if the participant tries a new figure, we will consider that he has a creative intention (see Fig. 2). Then we evaluate the final effective realization as conservative if the successful final figure in A2 is the same as the one in A1 and we consider as a creative behavior if the successful figure in A2 is different from the successful figure in A1.

## Procedure

Before starting the activity, participants gave their informed consent, the examiner having explained to them that their hand will be video recording during the CreaCube task.

The participant sits in a calm environment in front of a desk on which a cover hides the cubes. The examiner gave him a recorder with the instructions for the first activity (A1) - “to build an autonomous vehicle that moves from a starting red point to a finishing black point”, - the recorder allowed the participant to listen as many times as he wanted the instructions again. Then the four cubes were revealed by lifting the cover, with the same initial presentation for all the participants: the particular affordance of the cubes were not visible directly thus, the participant must explore and manipulate them to discover the affordances and features of each cube (e.g., detection of the wheels and the on/off button). The participants can try as many figures and combinations of the four cubes as they want to resolve the activity. There was no time constraint.

When the participant finished the A1, thus having succeeded to create a vehicle with the four cubes that move independently between the two points, the examiner gave him a second recorder for the instructions of the second activity (A2). The instructions are the same as the instruction of the first activity and neither precision was given to the participant concerning if he needs to resolve this activity differently or with the same figure as in the first

activity. The four cubes are put in the same position as in the beginning of the first activity and the participant can start when he wants to try to resolve this second activity.

## Data analysis

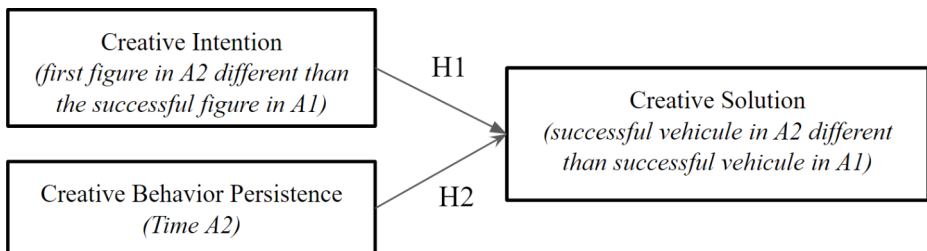
To analyze the creative process, we first divided the participants according to the *creative intention* (see Fig. 2), which corresponds to the initial behavior in the repeated task. Based on this initial behavior, participants are divided into two groups considering if the first vehicle created in A2 was the same or a different than the final vehicle created to finish A1. Behavior intention has two modalities: creative intention (i.e., the first vehicle in A2 is different from the last vehicle in A1, suggesting that the participant would like to create a new vehicle) and conservative intention (the vehicles are the same suggesting that the participant is conservative, means that he wants to resolve in the same way activity one and two).

Then, the creative solution in the repeated task is considered in relation to the behavior intention and the persistence of this behavior. Therefore, we divided the participant according to the creative solution they proposed, that means if the successful vehicle in the repeated task (A2) is the same (conservative solution) or a different (creative solution) that the one in first occurrence of the task (A1).

Our experimental approach therefore starts from the observable behavior to study which factors could allow to anticipate the creative behavior, as described in our hypotheses, namely: how the creative intention and the creative behavior persistence influences the creative solution (see Fig. 3).

## Hypothesis

We consider the creative solution when the vehicle created in A2 is different from the one in A1. We expected that the participant with creative intention would be the one that would effectively achieve a creative solution (H1). We also hypothesize that achieving a creative solution requires as much effort in both activities; in these cases, the participant that creates a different figure in A2 than the figure in A1 might spend more time in A2 than the participant that will repeat the same solution as in A1 (H2).



**Fig. 3** Schematic representation of the two hypotheses of this study. The first (H1) and the second (H2) hypothesis evaluate the factors that may influence the creative solution (see hypothesis section for further details)



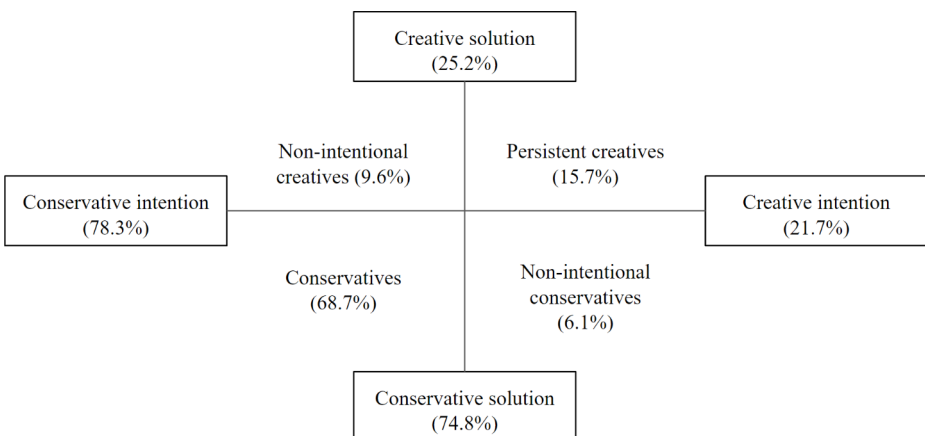
## Results

### Descriptive and qualitative data

The observation of the videos brings out different profiles among the participants, allowing us to classify the participants according to two axes: the axis of the creative intention (the willingness to remake the same vehicle in A2 as in A1 or to do differently) and the axis of solution (see Fig. 4).

Not all the participants initially engaged in a creative intention, persist in this behavior. We notice 6.1% of the participants changing their creative intention into a conservative behavior, when encountering difficulties in solving the task in a novel manner.

It is also important to observe the changing behavior of part of those behaving initially as conservatives but becoming non-intentionally creative (15.7%) which could be observed when participants fail to reproduce the initial solution on activity 1 into activity 2 despite their intentions and engages in a different solution to overcome their unsuccessful intention of reproducing the solution. In these cases, creativity is not intentional, creative behavior is observed when the participant fails to reproduce the prior solution during the second occurrence of the task. The observation of the video of the “non-intentional” behavior (i.e., participants who want to be creatives but fail to create a new vehicle or in the opposite the participants that wanted to reproduce the same vehicle but created a new) highlight in the majority of cases a problem with the material (e.g., the wheels, the sensor or the inverter not oriented in the good way) which leads to a change in the behavior despite the initial behavioral intention. When in trouble with the material, creative intentions can be resumed into conservative behaviors, but also conservative intentions to perform faster can turn into creative behavior when the participants fail to reproduce the prior solution.



**Fig. 4** Distribution of the participants' profile considering their creative or conservative intention and their creative or conservative effective solution. Percentage of the repartition of the participants into the different profiles are in comparison of the total of the participants

### Quantitative data

All the statistical analyses were run, and the graphics were made, on Jamovi (version 1.1.9), an open-source statistical analysis program.

First, with a Shapiro-Wilk test we checked if our dependent variables (time required to resolve the second activity and creative intention) are distributed normally, it was not the case for all the measures (all  $p \leq 0.0001$ , see Table 1). We therefore used non-parametric tests.

### Analyzing the creative solution

We run a Kruskal-Wallis test with the Creative solution as fixed factor and the Creative Intention and the Creative Behavior Persistence as the dependent variables (see Table 2). This test aims to evaluate the hypothesis that the creative intention (H1) or the creative behavior persistence (H2) would influence the creative solution leading to create the same or a different solution (vehicle) in the second activity compared to the first.

**H1:** creative solution is influenced by the creative intention.

In this task, we found that creative intention is a good predictor of a creative solution. In fact, results showed a significant effect on these variables,  $\chi^2(1,114)=36.8; p < 0.001$ ,

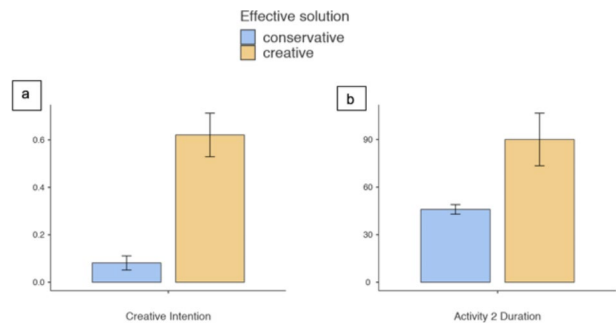
**Table 1** Descriptive data and analyze the distribution of the dependent variables considering the behavior intention

	Activity 2 Duration	Creative Intention
Mean (in seconds)	57.1	0.217
Standard deviation	53.9	0.414
Shapiro-Wilk p	<0.001	<0.001

**Table 2** Descriptive data and analysis of the distribution of the dependent variables considering the effective behavior

	$\chi^2$	df	p
Creative Intention	36.8	1	<0.001
Creative Behavior Persistence (time in A2)	10.9	1	<0.001

**Fig. 5** Representation of (a) the mean average score on the creative intention and (b) on the persistence behavior (assessed by activity 2 duration in seconds), considering the effective solution of the participant



as 62% of the participants producing a creative solution are more prone to start having a creative intention, although only 8.1% of the conservative participants have presented a creative intention (see Fig. 5).

**H2:** exploring if the creative solution is influenced by the creative behavior persistence.

We also found that the creative behavior persistence might be a good predictor of the creative solution ( $\chi^2(1,114)=10.9$ ;  $p<0.001$ ). This result agrees with our second hypothesis (H2), the conservative participants spend less time to succeed in the second activity (46 s in average +/- 28) compared to the creative participants (90 s in average +/- 89, see Fig. 4). By adopting a conservative behavior, they build the same vehicle again in the repeated task and perform the second activity. On the other hand, to create a new vehicle in the second activity, creative participants require a similar amount of time as for the first activity to explore and try again to solve the activity in an original manner.

## Discussion

In this study we have proposed to adult's participants to solve the same activity two times, with the same instructions for the first and for the second activity, therefore participants were free to decide if they will show a creative intention and behavior in the second occurrence or adopt a more conservative way of solving the second activity. Being creative in the repeated task, engages them to solve the second activity in a different way than the first occurrence of the task. In this study, we operationalized a way to understand the creative process through a repeated task and aimed to identify the factors that are related to the creative intention and the creative solution. We start discussing the results in relation to the study of the creative behavior and permitting to identify four different creative profiles, then the factors in relation to the creative intention and finally the factors in relation to the creative solution.

### Creative behavior

This study contributes to a better understanding of the factors related to the creative solution. Creative solutions can be observed among participants engaging in the second activity with a creative intention (H1) and is related to creative behavior persistence (H2). We can observe that participants behaving and performing the task creatively are able to overcome the prior task difficulties and maintain the creative pursuit despite the obstacles in the second activity. This persistence has been pointed out by Amabile (1990) and Lubart & Sternberg (1995) as an important behavior in the creative pursuit.

Creative participants show a capacity to regulate their prior experiences in the task and inhibit their prior knowledge on the way to proceed to solve the task in a faster and conservative way. Creative participants show their capacity to inhibit their prior difficulties when engaging and persisting in their creative behavior in the second activity, despite requiring the same effort to complete the repeated task in a novel way.

These results are coherent with the dual process model which has been introduced in the theoretical framework. In this study we observe the creative process may depend on inhibi-

tory control (Ezzat et al., 2017; Radel et al., 2015) and our analysis suggests that inhibitory control may influence the two stages of the creative process: the creative intention and the creative behavior persistence.

### **Cognitive processing underlying conservatives and creatives profiles**

In this study we identified four different creative profiles according to the creative intention and creative solution (Fig. 4). Above all, this study shows that the creative intention and the creative behavior are less common than the conservative ones. In fact, only around a quarter of the participants succeeded in a creative solution, and among them only half were intending to be creative from the start of the second activity. Therefore, 9.6% are non-intentional creatives, they had the intention to be conservative but failed to reproduce a second time their first solution and adopt a creative behavior after encountering problems in reproducing the existing solution. A slightly large amount (15.7%) is behaving persistently in a creative way from the initial intention towards the creative solution. In this task, most of the participants behave in a conservative way when engaging in the second repeated activity (78.3% of conservative intention). Behaving in a conservative way requires less effort and allows the subjects to solve the task faster than engaging in creative behavior when a solution has already been found for the same task. The predominant conservative behavior might be explained by a classical vision of the performance in which a successful solution is the fastest way to resolve the problem based on prior experience and the capacity to memorize the solution already performed to reproduce it the fastest possible. In fact, we found that conservative people were faster when solving the second activity compared to the creative people. On the other hand, creative participants required nearly the same amount of time to solve the first and the second activity, showing an important creative effort in both activities. Therefore, being creative requires an intentional effort, which is observed only among a minority of participants (15.7%).

To conclude, based on these findings we should consider the importance of the creative regulatory process among participants succeeding in their persistent creative behavior to develop a creative solution in a repeated task. Generating novel ideas is not enough in creative problem-solving tasks but requires a creative intention and the regulation of creative behavior ensuring the pursuit of creative solutions (Amabile, 1990; Lubart & Sternberg, 1995). Based on these findings, we should then explore how we can overcome the social representation of creativity as genius-based Eureka moment into a more effortful and persistent behavior requiring participants to inhibit their conservative intentions and behaviors (allowing a faster solution based on their prior successful solution in the task) to persist and overcome obstacles to achieve a creative solution. In this study, we address the importance not only of initiating the problem-solving activity with a creative intention but the challenge to maintain and regulate the creative behavior during the problem-solving process until reaching a creative solution. Achieving a creative solution is not just the product of a genius-based Eureka moment, but the creative behavior perseverance initiated with a creative intention and sustained as a creative behavior in which the subject should inhibit the conservative solutions to achieve a creative solution. Therefore, creative solutions are effortful in terms of creative intention and creative behavior regulation. The difficulty of sustaining a creative behavior should be considered when engaging adults in the development of creative problem-solving activities. Moreover, considering the materiality of edu-

educational robotics further studies should consider the technology acceptance in relation to the creative problem-solving task using educational robotics to identify how perceived usefulness, perceived ease of use has an impact on the intention to use and the actual use. User representations and digital technology self-efficacy could also be considered to go further in the study of creative intentions and behavior in relation to educational robotic technologies. The use of a specific set of modular robotics material (Cubelets) requires also considering the need for further studies using other interactive technologies to transfer these results to similar tasks engaging the participants with other technologies.

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**Ethical approval** All procedures performed in studies involving human participants were in accordance with the ethical committee of Université Côte d'Azur (*Comité d'Ethique pour les Recherches Non Interventionnelles*, CERNI, 2019-6). Informed consent was obtained from all individual participants included in the study.

**Disclosure statement** No potential conflict of interest was reported by the authors.

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