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Do you believe Red Bull gives wings?

**Do you believe Red Bull gives wings?
When implicit theories of creativity impair creative performance**

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ABSTRACT

Everyone seems to have something to say about creativity, thus participating in the reproduction of persistent myths about creativity that may influence creative behavior. This research explores the influence of Laypeople's Implicit Theories of Creativity (LIToC) regarding the drivers of creativity on creative performance, to ascertain whether having strong convictions about the drivers of creativity either enhances or hinders creative productivity when these convictions align with the actual methods of stimulating creativity. An experiment randomly involved 69 subjects who were invited to drink the exact same fruit juice before performing a creative task. In one condition, they were told this was indeed juice, in the other condition they were told that it was mixed with Red Bull. Analyses showed an interaction effect with the subjects' LIToC, such that among subjects displaying strong LIToC, individual creative performance was lower when they perceived the conditions to stimulate creativity were activated, than otherwise. These results suggest that having strong beliefs in the effects of some creativity drivers might then trigger a complacent attitude and reduce the invested effort in generating creative ideas. This research contributes to rethinking how we use specific drivers to stimulate creativity, as strong LIToCs about those drivers may have a counterproductive effect on creative performance.

KEYWORDS: *creativity, implicit theories, LIToC, stimulating creativity, energy drinks*

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1. INTRODUCTION

Creativity stands as a crucial competency for many organizations, empowering them to navigate their surroundings, maintain competitiveness, and embrace novel realities. First and foremost, a strategic approach to creativity management enables the systematic cultivation of novel ideas, ensuring a continuous stream of innovative solutions to challenges (Martins & Terblanche, 2003). Additionally, the systematic management of creative processes facilitates the identification and harnessing of individual and collective talents, maximizing the organization's intellectual capital (Wang, Bu & Cai, 2021; Crema & Verbano, 2016). Moreover, by instilling a culture that encourages and channels creativity, organizations can enhance employee engagement, job satisfaction, and overall organizational performance (Naranjo- Valencia, Jimenez- Jimenez & Sanz- Valle, 2017). Ultimately, the judicious management of creativity is indispensable for organizations aspiring to adapt to changing market demands, sustain long-term growth, and remain at the forefront of their respective industries.

Operating as a socio-cognitive process fostering the development of novel ideas (Amabile et al., 1996; Mumford et al., 2002), creativity materializes across multiple tiers of the organization: at an individual level, within teams, and at the overarching organizational level (Woodman et al., 1993). Creativity thus emerges from the dynamic interactions among individuals and their engagement with the various facets of their environment, and specific skills and conditions must be present for creativity to occur (Epstein et al., 2013; Amabile, 1983). As a result, many professionals and scholars in the realm of creativity have been motivated to explore optimal approaches for managing creativity (Epstein et al., 2013; Mejia et al., 2021). Understanding how to intentionally foster individual (Egan, 2005; Phelan & Young, 2003) and collective creativity (Zhou & Hoever, 2014; Cirella, 2016), through both direct and subtle means (Stieler & Henike, 2022), has become a pivotal focus in managerial

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strategies. This encompasses a spectrum of strategies, ranging from refining leadership competencies (Ollila, 2000; Bäcklander, 2019) to providing comprehensive employee training (Rampa & Agogué, 2021; Valgeirsdottir & Onarheim, 2017). It extends further to the strategic utilization of objects (Chen et al., 2020) and the deliberate design of physical spaces (Kristensen, 2004; Haner, 2005; Perez Mengual et al., 2023; Haner, 2005), as well as virtual environments (Abi Saad & Agogué, 2023), all aimed at enhancing and magnifying the creative potential within organizational contexts.

However, individuals involved in creative activities are typically not unaware of the nature of creativity and how it can be nurtured. Everyone tends to formulate their own understanding of creativity, shaping layperson's implicit theories of creativity that often draw from commonly held beliefs that might not necessarily be supported by scientific evidence. Such beliefs about the nature and process of creativity significantly interact with individuals' behavior. For instance, the belief that creativity can be developed through training and effort leads to improved problem-solving outcomes and more innovative ideas (O'Connor et al., 2013). The misconception that creative idea generation declines over time harms creative performance (Lucas & Nordgen, 2020). Or those who think that creativity and mental illness are linked tend to perform better in creative tasks (Kaufman et al., 2006). Although organizations and managers strive to control and boost creativity, there has been limited focus on investigating the precise influence of LIToCs related to stimulating creativity on actual creative performance. For instance, in the context of alcohol's impact on creativity, there's a common belief that it has a positive effect on creative output. However, while studies have explored cognitive performance under the influence of alcohol (e.g., Benedek et al., 2021; Lapp et al., 1994; Benson et al., 2019), the specific influence of this belief on creativity has been largely overlooked. In the only study investigating the effect of holding LIToC regarding

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the stimulation of creativity, the focus is on how it impacts decisions about how to manage organizational creativity, and not on creative performance (Baas et al., 2015).

Such gap in our current understanding of implicit theories of creativity poses an issue because if deeply held beliefs about what spurs creativity interact with real creative performance, attempts to oversee creativity within organizations could yield counterproductive outcomes. Consequently, it is imperative to conduct additional research to ascertain whether having strong convictions about the drivers of creativity either enhances or hinders creative productivity when these convictions align with the actual methods of stimulating creativity. This research thus aims to contribute to a deeper comprehension of when and how creativity management strategies might result in either favorable or adverse outcomes.

2. THEORETICAL BACKGROUND

2.1. Laypeople's Implicit Theories of Creativity (LIToC)

Scholars specializing in creativity often find themselves in situations where they share their research findings with various audiences, such as students, practitioners, and even friends. In these interactions, they frequently encounter individuals who harbor strong preconceptions about what creativity entails and how it operates. Some of these preconceived notions align with the findings of scientific research, influenced in part by popular press portrayals of creativity (Rainone et al., 2021), while others delve into more obscure and unconventional interpretations (Baas et al., 2015). Everyone seems to form their personal conception of creativity, which can take the shape of widely held beliefs that sometimes lack scientific support. For example, half the population believes that “*Creative thinking mostly happens in the right hemisphere of the brain*” or that “*Creative accomplishments are usually the result of a sudden inspiration*” (Benedek et al., 2021, p3). These assumptions about

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creativity can differ significantly across different cultural contexts, (Loewenstein & Mueller, 2016), and may also be influenced by the specific professional domains or occupational niches to which individuals belong (Malmelin & Nivari-Lindström, 2017).

In essence, what becomes evident is that many people tend to tailor their understanding of creativity to align with their personal viewpoints, giving rise to a diverse range of beliefs that can occasionally lack firm grounding, coherence, or even internal consistency. Despite these variations, these individual beliefs continue to play a significant role in shaping the broader lay theories of creativity (Ritter & Rietzschel, 2017).

Implicit theories encompass the convictions that individuals harbor about the characteristics of both humans and nonhumans, as well as broader phenomena on a global scale (Furnham & Rees, 1988; Zedelius et al., 2017). *Laypeople's Implicit Theories of Creativity* (LIToC) describe lay beliefs and myths about creativity. Such LIToCs are not necessarily stable and homogeneous, even within the same individual: previous research indeed indicates that people's responses to both specific and open-ended questions about their beliefs regarding creativity were inclined to mirror what they thought was socially desirable. However, when these individuals were prompted to tap into their LIToCs – such as when evaluating profiles of students or employees who could potentially be creative – their approach seemed to shift towards embracing distinct, more grounded interpretations of creativity (Lim & Plucker, 2001; Sternberg, 1985; Plucker, 2022).

The literature identifies four categories of LIToC that concern what creativity is (*Nature*), how creativity occurs (*Process*), who can be creative (*Person*) and what can foster creativity (*Stimulation*) (Benedek et al., 2021). As an illustration, Baas et al. (2015) demonstrate that LIToCs regarding the *Process* of creativity often do not match self-reported processes leading to actual creative behavior. Typically, people generally believe that creativity occurs unexpectedly while they describe past creative behavior as deliberate and conscious work.

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LIToCs about the *Nature* of creativity influence laypeople's ability to judge what is creative and what is not (Pichot et al., 2022; Weisberg et al., 2021). Individuals also hold LIToCs about the creative *Person*, such as the stereotype of the “eccentric poet” (Dumas & Dunbar, 2016; Fisher, 1997) or of the “mad genius” (Kaufman et al., 2006; Prichard, 2002), and use them to discern who they judge as creative (Gralewski & Karwowski, 2016; Paek et al., 2020; Puccio & Chimento, 2001; Runco & Bahleda, 1986; Sternberg, 1985). Regarding stimulating creativity, people tend to believe that people get more creative ideas under the influence of alcohol or marijuana (which is a creativity myth), or that when stuck on a problem, it is helpful to continue working on it after taking a break (which is a creativity fact) (Benedek et al., 2021). The strength of LIToCs varies across individuals, depending in part on individuals' age (Delany et al., 2019; Ho, 2021), cognitive abilities (Saunders Wickes & Ward, 2006), culture (Delany et al., 2019; Paletz & Peng, 2008; Paletz et al., 2011; Seng et al., 2008), education (Konstantinidou et al., 2014), or job (Spiel & von Korff, 1998; Stone, 2015; Tang et al., 2015).

2.2. Influence of LIToCs on creative performance

LIToCs about the *Nature* and *Process* of creativity can have a direct impact on people's behaviour. For instance, O'Connor, Nemeth, and Akutsu (2013) showed that the belief that creativity is malleable (i.e., that creativity can be trained and requires effort to manifest) produces better problem-solving outcomes and more innovative ideas, a relationship mediated by creativity motivation (Li et al., 2021). As an addition, Lucas and Nordgen (2020) demonstrated that people mistakenly believe that creative idea generation decreases over time and showed that this belief negatively influences actual creative performance. Thus, LIToCs can have a direct impact on creative performance. Other research has shown that different beliefs about creativity will guide individuals to socialize and organise differently (Ho, 2021; Paletz et al., 2011; Simmons & Ren, 2009). If you believe that creativity is based on internal

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traits, you will focus on thinking, writing, designing, whereas beliefs about external traits will promote social interactions, building, sports performance, etc. LIToCs about the creative *Person* is related to creative performance as well: individuals believing in the stereotype of the mad genius, i.e., that creativity and mental illness are connected, perform better on a creative task (Kaufman et al., 2006).

Managers deploy great efforts in organizations to manage creativity and stimulate creative performance (Tan, 1998 ; Isaksen & Ekvall, 2010). Yet, the specific influence of LIToCs about creativity *Stimulation* on creative performance has been relatively ignored. For instance, while there is a general belief that alcohol produces favorable effects on creative output, and various studies have examined performance on many cognitive tasks while either sober or under the influence of alcoholic beverages (e.g., Benedek et al., 2021; Benson et al., 2019; Lapp et al., 1994), the effect of the specific belief regarding the link between alcohol and creativity is completely overlooked. Baas and colleagues (2015) are the only ones who studied the effects of LIToCs regarding creativity drivers. They show that holding such LIToCs influences decisions about how to manage organizational creativity: for instance, people who believe that creativity is enhanced by positive activating moods tend to choose a stimulating room over a relaxing one to manage creativity. However, they do not further investigate the influence of LIToCs on creative performance *per se*. Given that individuals and collectives make choices and invest considerable efforts in creating conditions that foster creativity (e.g. Chaoji & Martinsuo, 2022 ; Epstein et al, 2013 ; Lenfle, Le Masson & Weil, 2016), it is crucial to assess the influence of LIToCs regarding these drivers on creative performance.

2.3. Conceptual model

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In many domains, laypeople's implicit theories influence perceptions, efforts, beliefs, goals, and affects (Zedelius et al., 2017). They create the framework of meaning within which attributions occur and are important for understanding motivation and coping strategies (Hong et al., 1999). As such, laypeople's implicit theories could ultimately shape individuals' outcomes, such as performance (Rattan & Ozgumus, 2019).

Strictly speaking, the effect of a LIToC about what can foster creativity should be conceptualized as the effect of holding beliefs about the drivers of creativity while precisely not activating those drivers. This echoes the phenomenon of the placebo effect, which can be defined as the therapeutic effect produced by a substance or procedure that has no specific activity for the *condition* being treated, but an effect that would not have occurred without the administration of said placebo (Kienle & Kiene, 1997; Moerman & Jonas, 2002). When applied to the context of stimulating creativity, this implies to suggest that a creativity driver is activated while not activating it. In such a context, if individuals hold the belief that the driver can enhance their creative abilities, receiving a placebo (perceiving that the driver is activated) could augment their self-assurance in their ability to perform, thereby increasing creative self-efficacy beliefs (Tierney & Farmer, 2002; Puente-Diaz, 2016; Shaw et al., 2021) defined as beliefs in one's capability to successfully complete a creative task. Conversely, if individuals do not hold the belief that the driver can enhance their creative abilities, their creative self-efficacy will remain unaffected. This is because these individuals will not experience any psychological mechanisms being triggered when that specific driver is activated. In essence, the absence of belief in the efficacy of a certain creativity driver means that there is no corresponding psychological response that can impact their creative self-efficacy. This leads to the formulation of Hypothesis 1:

H1: The strength of a LIToC regarding a creativity driver moderates the influence of the perceived activation of that creativity driver on creative self-efficacy beliefs, such

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that the perception of the activation of that creativity driver will improve creative self-efficacy beliefs, but only for individuals displaying a strong LIToC regarding that creativity driver.

Generating ideas typically involves a challenging process that demands both time and mental exertion, and it comes with a considerable level of uncertainty and potential for failure. Consequently, it is crucial for individuals to cultivate the self-assurance required to persevere in their creative brainstorming efforts, ultimately nurturing creative self-efficacy (Tierney & Farmer, 2002). Creative self-efficacy thus plays a crucial role in shaping creative behaviors and outcomes (Mathisen, 2011; Nisula & Kianto, 2016). When individuals possess high levels of creative self-efficacy, they are more likely to take on challenging creative tasks, persist in the face of obstacles, and generate novel solutions. On the other hand, individuals scoring low on creative self-efficacy might be hesitant to engage in creative tasks and may doubt their capacity to come up with innovative ideas. This leads to the formulation of the mediated moderation Hypothesis 2:

H2: Creative self-efficacy beliefs will mediate the interactive relationship of the perception of the activation of a creativity driver and the strength of a LIToC regarding that creativity driver on creative performance, such that the perception of the activation of a creativity driver will only enhance creative self-efficacy beliefs and creative performance among individuals displaying a strong LIToC regarding that creativity driver.

Thus, a moderated mediation model through the creative self-efficacy route may predict how LIToCs regarding creativity drivers could increase creative performance. But creative self-efficacy beliefs are not the only antecedent of individual creative behaviors. As a cognitive process, creativity requires certain cognitive efforts (Doyle, 2016). Indeed, creativity involves intricate mental activities that encompass divergent thinking, problem-solving, pattern recognition, and the generation of novel ideas. These cognitive processes are an integral part of the creative act, as individuals use a variety of mental pathways to explore

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alternative perspectives and original solutions. This means that creativity demands an engagement of cognitive faculties beyond routine thinking. In this perspective, the dual pathway to creativity model, initially proposed by De Dreu et al. (2008) and further explored by Baas et al. (2008) and Nijstad et al. (2010), offers the core premise that creative outcomes, such as original ideas and problem-solving, can be achieved through two distinct cognitive pathways: the flexibility pathway and the persistence pathway. The flexibility pathway encompasses a creative cognitive style characterized by flexible, fluent, and divergent thinking (Winkielman et al., 2003; De Dreu et al. 2008; Roskes et al., 2012), while the persistence pathway entails a creative cognitive style that relies on persistent and systematic thinking (Nijstad et al., 2021). The latter approach involves high effort, perseverance, and a slower pace of cognitive operation. It relies more heavily on executive control processes and is constrained by working memory capacity (Dietrich, 2004; Dietrich & Kanso, 2010). Besides, ideas generated during an ideation phase tend to bear a strong resemblance to solutions applied to analogous past issues, unless deliberate cognitive exertion is channeled toward broadening the exploration and encoding of information beyond the scope initially activated (Weisberg, 1988). Consequently, the level of effort exerted in a creative task can influence the resulting creative performance. This prompts to consider how the perception of being exposed to something that is believed to enhance creativity could affect the amount of cognitive effort dedicated to creativity.

While no specific research has investigated the link between beliefs and efforts in a creativity situation, notable findings have emerged from the literature on complex problem-solving. Studies investigating the impact of one's belief in God on self-regulation reveal that individuals engaged in a word game containing several God-related terms displayed reduced effort in a subsequent anagram task (Laurin & Fitzsimons, 2012). This decrease in effort was more pronounced if these individuals had earlier communicated to the researchers their

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conviction in the potential influence of external forces on their probability of achieving success in complex tasks. Similarly, research on beliefs about free will has shown that rejecting free will attenuates the activation of brain areas involved in the decision to perform a specific action, thus affecting intentional commitment to the action (Rigoni et al., 2011). Overall, this suggests that when people believe that external forces could help them accomplish a task, they would attribute their success not only to their own ability but also to external factors. Thus, they would regulate their engagement in the task, which could affect their performance. Applied to the perception of the activation of a creativity driver, this would mean that those holding a strong LITOC regarding that creativity driver could perceive the activation of that creativity driver as a “magic pill”, something that helps the creative process, leading them to put less effort into the task, and harming creative performance, resulting in a counterproductive effect on creative performance. Hypotheses 3 and 4 are thus formulated as follows:

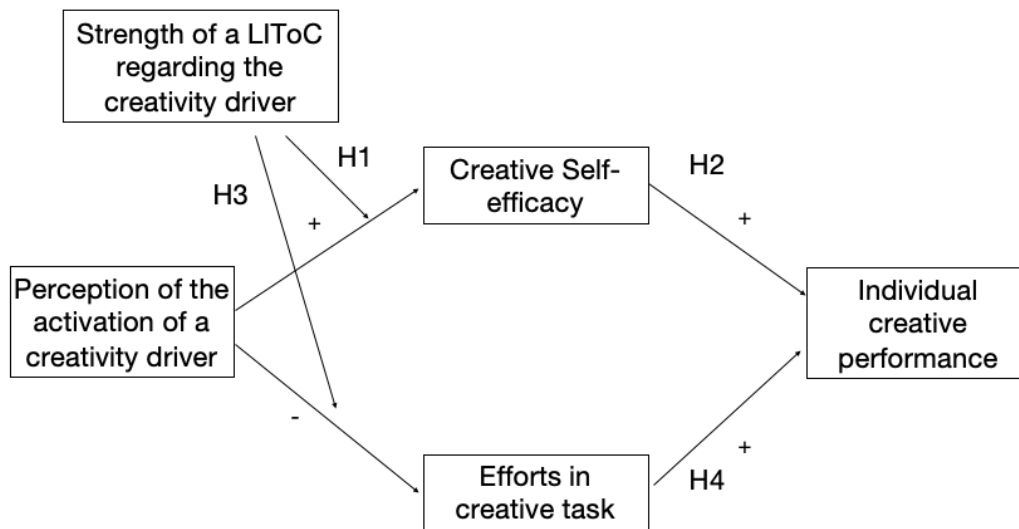
H3: The strength of a LITOC regarding a creativity driver moderates the influence of the perceived activation of that creativity driver on the efforts dedicated to creativity, such that the perception of the activation of that creativity driver will decrease the efforts dedicated to creativity, but only for individuals displaying a strong LITOC regarding that creativity driver.

H4: The efforts dedicated to creativity will mediate the interactive relationship of the perception of the activation of a creativity driver and the strength of a LITOC regarding that creativity driver on creative performance, such the perception of the activation of a creativity driver will only decrease the efforts dedicated to creativity and creative performance among individuals displaying a strong LITOC regarding that creativity driver.

Figure 1 synthesizes our conceptual model, with our 4 hypotheses and two (potentially competing) routes that may explain the influence of perceiving the action of a creativity driver on individual creative performance.

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Figure 1 - Conceptual model



We now specifically test how the strength of a LIToC regarding a creativity driver influences individual creative performance using a controlled experiment.

3. METHOD

3.1. Activating LIToCs: the case of energy drinks

In the following study, we investigated the implicit theories people may have about the stimulating effects of energy drinks on creativity to determine whether they promote or hinder creativity. We opted to employ energy drinks as a catalyst for creativity that could be introduced in a creative task due to its practicality and straightforward implementation.

Energy drinks are popular and continue to represent a rapidly growing share of the beverage market in Western countries. Students around the world consume them to improve their academic performance (Badar et al., 2019; Ghozayel et al., 2020). A recent study suggests that 50% of members of the U.S. military consume energy drinks, hoping for an

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energy boost and/or increased mental alertness (Attipoe et al., 2018). Other reports suggest that healthcare providers also regularly consume energy drinks to boost performance and delay fatigue in the workplace (Guilbeau, 2012). In sum, energy drinks have found their way in the workplace because of the implicit theory that individuals have about their cognitive effects. Indeed, several studies have described the placebo effect of drinking juice labeled as an energy drink on motivation and risk-taking behaviors (e.g., Cornil et al., 2017; Schmidt et al., 2017). Thus, energy drinks have great potential to activate LIToCs in individuals, while being increasingly present in organizations.

3.2. Procedure and measures

The experiment took place in the offices of a professional market research institute and was advertised as a test for a new beverage. In the placebo condition, participants were greeted and offered a plastic glass containing a pre-mixed beverage, supposedly consisting of fruit juices mixed with Red Bull. However, the beverage was only composed of a mixture of various strong and unusual tasting fruit juices (e.g., guava, passion fruit, pineapple) in order to make it plausible for participants that it could contain Red Bull. The protocol was the same for participants in the control condition, except that the beverage was presented – which was true – as being composed solely of fruit juices. To reinforce the placebo condition, piles of Red Bull cans were displayed in the experimental room in the placebo condition.

Participants were then given 10 minutes to drink their beverage while answering questions regarding their **self-perceived creativity** using 4 7-point items adapted from Amabile (1996) and George & Zhou (2007) (e.g., “*I generally approach problems in a creative manner*”, “*I like to use my imagination to come up with several ideas*”) to be controlled for, along with participants’ age and gender. They also reported their **drinking habits** for different beverages, including energy drinks, on a 5-point frequency scale. We then

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measured the **LIToCs** by asking questions about their beliefs about the stimulating effects of energy drinks, using 3 ad hoc 7-point items (i.e., “*Drinking energy drinks stimulates the brain / encourages risk-taking / has a disinhibiting effect*”). Fiability analysis encouraged us to only retain 2 items (i.e., “*Drinking energy drinks stimulates the brain / encourages risk-taking*”). We did not ask direct questions about their belief regarding the influence of energy drinks on creativity as we did not want participants to know that this was an experiment investigating creativity *per se*. Then, participants were asked to spend the next 10 minutes writing down as many creative ideas as possible to complete the “egg task”, which is commonly used in research on individual creativity (e.g., Agogu   et al., 2014a, 2014b; Agogu   & Parguel, 2020; Bissola & Imperatori, 2011). The egg task is presented as follows: “*Please suggest as many original solutions as possible to the following problem: Make sure that a hen's egg dropped from a height of 10 meters does not break.*” We then measured **creative self-efficacy** using 4 7-point items from Shaw, Kapnek and Morelli (2021) (e.g., “*I was confident in my capacity to generate creative ideas / answer creatively to the exercise*”). Finally, participants were asked to answer other survey questions about their experience with the creative task and to guess what the study was about. No participant guessed that our purpose was to study LIToCs. Table 1 presents elements regarding the psychometric scales used in our research design.

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Table 2 – Psychometric scales

Variable	Items	Factor loadings	Mean (SD)	Cronbach Alpha / Correlation for 2 items
Self-perceived creativity	<i>To what extent do you ...</i>			
	<i>Approach problems in a creative manner</i>	.807		
	<i>Enjoy discovering new ways to consider an issue</i>	.732	5.70	.801
	<i>Like to engage my imagination to generate multiple ideas</i>	.857	(0.87)	
	<i>Enjoy working on exceptional ideas</i>	.701		
LIToC	<i>To what extent do you think that drinking energy beverages ...</i>			
	<i>Stimulates the brain</i>	.819	4.73	.707
	<i>Encourages risk taking</i>	.892	(1.35)	
Creative self-efficacy	<i>During the creative task, to what extent were you confident in your capacity</i>			
	<i>To do well in the task</i>	.878		
	<i>To realize efficiently the task</i>	.868	5.29	.892
	<i>To answer creatively</i>	.872	(1.27)	
	<i>To propose original solutions</i>	.745		

To measure the **efforts dedicated to the creativity task**, we chose not to rely on self-assessment of efforts, as such self-report may be tainted by the belief held by the participants regarding their performance and involvement in the task. We therefore chose to use fluency, i.e., the number of solutions proposed by each participant, as a proxy for the efforts deployed.

In line with the dual pathway to creativity model (see De Dreu et al, 2008), we measured **individual creative performance** through participants' responses on two criteria: **flexibility** (the ability to generate solutions in different directions, measured by the number of solution categories) and **originality** (the ability to provide some highly original solutions). To assess flexibility and originality, we draw on previous studies (i.e., Agogu   et al., 2014a; Camarda et al., 2018) that proposed a coding matrix consisting of 62 categories of solutions so that each idea (for instance "we can attach a big helium balloon to the egg") can be affected to one of the 62 categories (for instance Category "Balloon / Air Balloon"). Each category within this matrix is then linked to a specific originality score, which was calculated with a 10-point scale

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ranging from 1 (“not at all original”) to 10 (“highly original”) using Amabile’s (1982) Consensual Assessment Technique: two trained raters evaluated each category on this scale, and interrater agreement was excellent (97%). For each participant, another independent trained rater then used this coding matrix to calculate the number of categories explored and the Top 2 originality index proposed by Silvia et al. (2008), which consists of the sum of the scores of each participant’s two most original responses. Following this approach, participants were evaluated by the best level of performance they could achieve on a constant number of responses. In line with Pichot and colleagues’ (2022) argument that novelty is primarily the driver of creativity, we did not assess the value or utility of ideas.

3.3. Participants

While most studies on creative cognition rely on student samples, our experiment involved 69 subjects (35 females and 34 males, mean age=43) recruited through a professional market research institute. Each participant was randomly assigned to one of the two experimental conditions, i.e., the control ($n=34$) vs. the placebo condition ($n=35$). The two groups did not differ in terms of gender ($\chi^2_{(1)}=.01$, ns), age ($F_{(1,67)}=1.74$, ns), self-perceived creativity ($F_{(1,67)}=.00$, ns), beliefs about the stimulating effects of energy drinks ($F_{(1,67)}=.18$, ns), or frequency of energy drink consumption ($F_{(1,67)}=.07$, ns).

All the participants provided written consent and were tested in accordance with international norms governing the study of human research participants. The Ethic Committee of one of the authors’ institutions approved this study. For ethical purposes, after completing the entire procedure, the participants in the placebo condition were informed that the beverage offered to them was only a mixture of various fruit juices.

4. RESULTS

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To test our hypotheses, we used a floodlight analysis, i.e., a spotlight analysis repeated for all the values of the moderating variable (Cadario & Parguel, 2014). Specifically, we used SPSS's PROCESS macro (Hayes, 2013) to perform such floodlight analysis for each of our mediators, and each of our 2 creativity measures, considering our manipulation, participants' beliefs, and their interaction as independent variables, and controlling for participants' age, gender, frequency of energy drink consumption, and self-perceived creativity.

We first acknowledge the correlations between the variables of our model, as illustrated in Table 2 :

Table 2 – Correlations between the main variable of the model

	Flexibility	Originality	Efforts dedicated to the creativity task	Creative self-efficacy	Frequency of energy drink consumption	Self-perceived creativity
Flexibility	1	,496**	,808**	0,106	-0,159	0,065
Originality		1	,376**	0,059	0,098	-0,028
Efforts dedicated to the creativity task			1	0,15	-0,097	0,099
Creative self-efficacy				1	,306*	,440**
Frequency of energy drink consumption					1	,254*
Self-perceived creativity						1

**. The correlation is significant at the 0.01 level (two-tailed).

*. The correlation is significant at the 0.05 level (two-tailed).

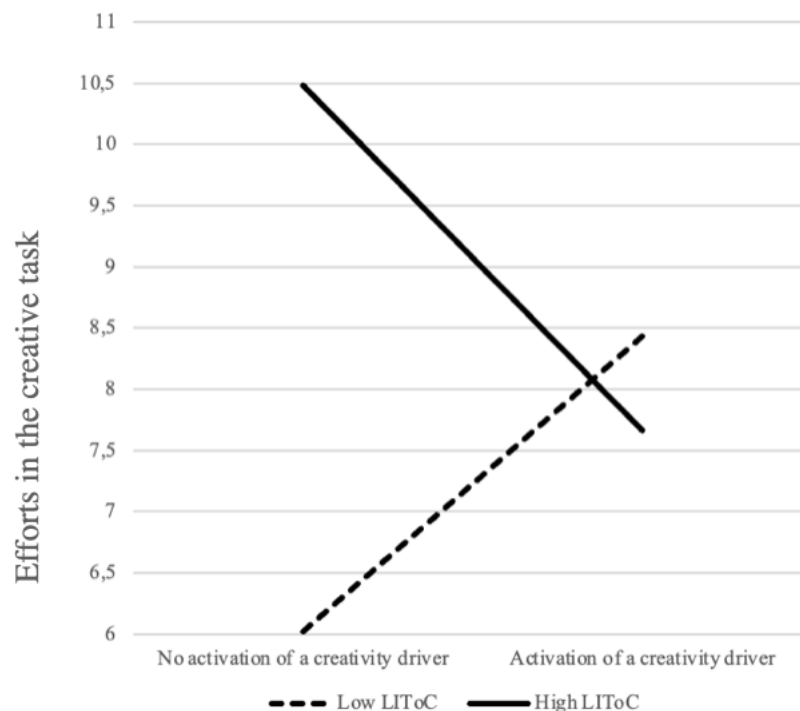
Regarding the influence on creative self-efficacy, a moderation analysis was conducted using SPSS's PROCESS macro (Hayes, 2013), Model 1. The analysis shows no direct effect of the activation of a creativity driver on creative self-efficacy ($p=.730$). The interaction between the activation of a creativity driver and the strength of a LIToC regarding that driver was not significant ($p = .813 > .05$), indicating that the relationship between the activation of a

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creativity driver and creative self-efficacy was not moderated by the strength of the LIToC. This doesn't support H1. We didn't further investigate H2.

Regarding the influence on efforts deployed in the task, a moderation analysis was conducted using SPSS's PROCESS macro (Hayes, 2013), Model 1. The interaction between the activation of a creativity driver and the strength of a LIToC regarding that driver was significant ($F=9.59$, $p = .003$), indicating that the relationship between the activation of a creativity driver and the efforts put into the creative task was moderated by the strength of the LIToC, supporting H3. The simple slope of X on Y was significant at high strength of LIToC ($t = -2.57$, $p = .012$) but also tends to be significant at low strength of LIToC ($t = 1.90$, $p = .06$). Figure 2 displays our result.

Figure 2 - The relationship between the activation of a creativity driver and the efforts put into the creative task was moderated by the strength of the LIToC.



To investigate H4, a moderated mediation analysis was conducted using SPSS's PROCESS macro (Hayes, 2013), Model 7. Hypothesis H4 suggested that the indirect effect of

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the activation of a creativity driver on Creative performance through the efforts put into the creative task will be moderated by the strength of LIToC regarding the creativity driver. Table 3 displays our analysis.

Table 3 – Regression analysis using SPSS’s Hayes PROCESS macro

Creative Self-efficacy (SPSS’s Hayes PROCESS macro - Model 1)			
R² = .3144			
	Coeff	t	p
Constant	1.84	1.82	.073
Activation of a creativity driver	.14	.34	.730
LIToC	.54	1.34	.183
Interaction between the activation of a creativity driver and the strength of a LIToC	-.13	-.23	.813
Frequency of energy drink consumption	.12	.83	.409
Gender	-.61	-2.04	.045
Age	.01	.84	.399
Self-perceived creativity	.56	3.32	.001

Efforts dedicated to creativity task (SPSS’s Hayes PROCESS macro - Model 1)			
R² = .2377			
	Coeff	t	p
Constant	5.79	1.89	.062
Activation of a creativity driver	2.41	1.90	.061
LIToC	4.45	3.65	.001
Interaction between the activation of a creativity driver and the strength of a LIToC	-5.22	-3.09	.003
Frequency of energy drink consumption	-.80	-1.76	.082
Gender	1.07	1.20	.234
Age	-.07	-1.96	.052
Self-perceived creativity	.68	1.32	.191

Flexibility (SPSS’s Hayes PROCESS macro - Model 7)			
R² = .6730			
	Coeff	t	p
Constant	2.59	1.53	.129
Activation of a creativity driver	-.51	-1.13	.261
Efforts dedicated to creativity task	.65	10.45	.001
Frequency of energy drink consumption	-.30	-1.28	.204
Gender	-1.17	-.36	.714
Age	-.01	-.73	.468

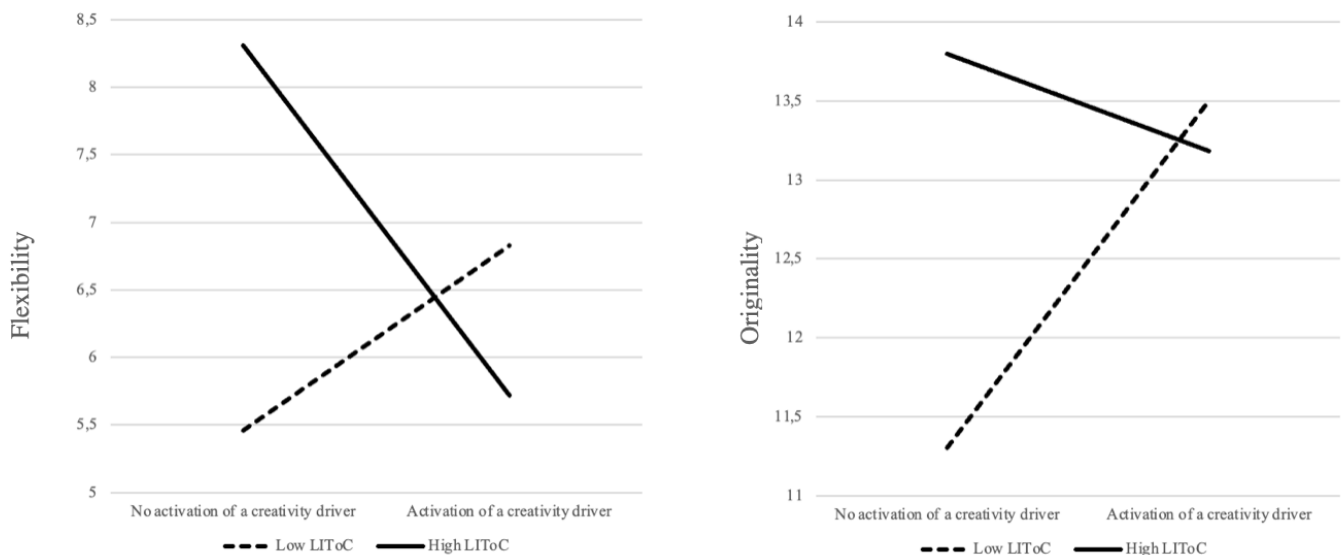
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Self-perceived creativity	.10	.38	.701
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Originality (SPSS's Hayes PROCESS macro - Model 7)			
R² = .1937			
	Coeff	t	p
Constant	11.42	5.39	.001
Activation of a creativity driver	.68	1.22	.225
Efforts dedicated to creativity task	.26	3.42	.001
Frequency of energy drink consumption	.35	1.18	.240
Gender	.12	.21	.831
Age	-.013	-.71	.477
Self-perceived creativity	-.24	-.69	.492

H4 was supported as the index of moderated mediation (index = -3.41, 95% CI = [-5.8827/-1.0796] for flexibility and index = -1.41, 95% CI = [-3.3611/-0.1269] for originality) is significant since the 95% CI does not include zero. Figure 3 displays our results.

Figure 3 - The relationship between the activation of a creativity driver and creative performance (flexibility and originality) was moderated by the strength of the LIToC.



5. DISCUSSION

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5.1. Theoretical contributions

In seeking to sustain creativity, organizations adopt several strategies, including recruiting individuals that exhibit more creative qualifications (Ford, 1999), establishing corporate cultures that promote creativity (Amabile, 1998; Nemeth, 1997), using training and specific methods to facilitate the generation, sharing and distribution of ideas (O'Connor, 2008; Rampa & Agogu , 2021; Yekanielibeiglou et al., 2021) or designing spaces for creative activities (Kristensen, 2004; Haner, 2005). Yet such strategies mostly focus on alterations to the environment or creating incentives to stimulate creativity. Less dominant in the organizational literature is how an individual's beliefs, attitudes, and expectations about how creativity may be stimulated influence their creativity. We contribute to this gap by offering insights on the potential influence of LIToCs regarding the stimulation of creativity.

This research investigated how the potency of Lay Implicit Theories of Creativity (LIToCs) concerning factors that drive creativity can impact the creative performance of individuals who believed these factors were triggered. We conducted an experiment where participants consumed an identical beverage comprising a blend of different fruit juices. They were informed that it was either a standard fruit juice blend (the control group) or a mixture of Red Bull and fruit juices (the placebo group). Consequently, we focused exclusively on the psychological influence of beliefs about the invigorating effects of energy drinks while accounting for potential physiological effects. Our results showed an interaction effect with subjects' LIToC, such that, among subjects displaying strong LIToC about the stimulating effects of energy drinks, creative performance was lower in the placebo condition than in the control condition, due to a decreased level of efforts deployed in the creative task. Oddly, having strong LIToCs did not influence creative self-efficacy. Overall, this suggests an underlying cognitive mechanism: having strong beliefs in the effects of some creativity factors might trigger a complacent attitude when these drivers are activated and reduce the

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effort invested in generating creative ideas. However, our results also underline two surprising additional elements.

First, having weak beliefs regarding a creativity driver trigger additional efforts in the task when individuals perceived that this driver is activated, which leads to greater creativity as well. This is quite surprising to see that having little belief is actually beneficial for creativity. This resonates with the fact that just as people cope with their own beliefs or lay theories, they may be aware that others hold lay theories as well and form perceptions of others' lay theories, i.e., meta-lay theories (Rattan et al., 2018; Lou & Noels, 2020), in line implicit theory of mind, i.e., *"humans' ability to reason about the mental processes (e.g., beliefs) of others and to recognize that these may be different from their own"* (Schneider et al., 2014, p. 43). Such meta-lay theories may then influence behavior. Indeed, in our experiment, just before performing the creative task, participants were asked about their beliefs about energy drinks and given a beverage to drink. This made the lay theory about creativity salient. When a specific presumed driver of creativity is activated, individuals holding a weak belief about this driver may try to attribute its activation and form the meta-lay theory that greater creativity is expected. Therefore, when having a weak LIToC regarding a creativity driver and being confronted with this driver, individuals would anticipate high expectations of creative performance, and therefore put more effort and involvement in the task, as such enhancing creative performance.

Second, our results show an interesting effect of LIToCs regarding creativity drivers in a condition where these creativity drivers are not present: indeed, in the condition where the creativity driver was not activated, in the condition where participants were told they were drinking a mixture of different juices (and indeed they were), those with strong LIToCs regarding energy drinks performed better than those with weak LIToCs, due to more effort deployed in the creativity task. As previously mentioned, questions about LIToCs about the

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stimulating effects of energy drinks were asked before engaging in the creative task, highlighting the hypothesized link between energy drinks and creative performance. For individuals displaying strong LIToCs, not receiving Red Bull may have led them to believe that they were on their own – not supported by any energy drink – and that in order to perform well, they had to compensate and double their effort, leading to better creative performance. This means that contexts that are perceived to be difficult or hostile for creativity, where resources that are supposed to be helpful are not present, are beneficial for individuals that believe in the positive influence of such context. This echoes the work on the role of constraints in the creative process (Caniëls & Rietzschel, 2015), that showed that supportive aspects within the organization help counteract the adverse influence of constraining organizational factors on cultivated creativity (ibid).

5.2. Managerial implications

Individual creativity is influenced by numerous factors that may be managed, including mood (Baas et al., 2008), creative self-efficacy (Tierney & Farmer 2002; Mathisen & Bronnick, 2009), efforts invested in the task or beliefs regarding creativity. This malleability of individual creative performance is consistent with previous studies that have shown that LIToCs regarding the *Nature* and *Process* of creativity will guide individuals to socialize and organise differently (Baas, et.al., 2015; Paletz & Peng, 2008; Simmons & Ren, 2009; Stone, 2015). Yet, our study offers new insights into the specific influence of LIToCs regarding the *Stimulation* of creativity on creative performance. We argue that when individuals believe they are supported by a favorable external factor – the combination of strongly believing that something will help them be creative and apparently receiving it – they adopt a complacent attitude. They expect the favorable external factor to help them perform well, and thus put less effort into the task, which leads to poorer creative performance. On the other end, not being providing with something that is supposed to boost creative performance ends up

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stimulating efforts in the creative task. This offers another perspective on direct incentives to boost creativity: it is indeed usually among the managers' tasks to shape an organization's culture likely to disseminate values and beliefs regarding creativity, thus providing psychological safety (Hu et al., 2018) and sustaining individual ideation through an innovative climate (Liu et al., 2021). Direct instructions from managers to employees – such as instructions to “be creative” – have been shown to have a concrete impact on creative performance (Harrington, 1975; Nusbaum et al., 2014), while sometimes generating psychological reactance (O'Hara & Sternberg, 2001). Influencing LIToCs of employees thus become a new way to nudge creativity (Agogu   & Parguel, 2020), as long as there is a clear diagnosis of the non-alignment of the LIToCs and the organizational context provided for creativity.

Besides, finding ways to boost individual and collective creative behaviors (Stieler & Henike, 2022) is at the heart of many managerial arrangements – and we argue that beliefs about creativity interact with these arrangements. In their seminal study on the influence of LIToCs on individual behaviors, Baas and colleagues (2015) showed that a strong belief that creativity is facilitated by defocused and flexible thinking, positive moods, and approach motivation rather than systematic and persistent thinking, negative moods, and avoidance motivation shaped the decisions people made when asked to design a creativity room. In this study, participants chose a relaxation room nearly twice as often as the activation room and having strong LIToCs on creativity reinforced by positive activating moods was a positive predictor of choosing the activation room over the relaxing room. This led the authors to conclude that “*managers may seek more creative problem solving in their employees by having expensive, but unproductive relaxation rooms built*” (p. 351-352). As such, LIToCs can influence the design of a creativity space, a topic that has been of interest for partitioners and academics (Schmidt & Brinks, 2017). Baas and colleagues' (2015) study found that

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LIToCs lead decision makers to propose an environment that is actually irrelevant to creativity.

Our study complements these findings by examining the potential behaviors that users of these spaces may engage in based on their own LIToCs. If a person strongly believes that a certain type of physical environment has a direct positive effect on creativity, when working in a creative space that matches those beliefs, that person will feel supported, helped, and may become complacent. This will lead them to invest less creative effort, and therefore produce less creativity. On the other hand, if this person has no *a priori* beliefs, when placed in this type of environment while being made aware of the potential influence of this environment (e.g., the merits of this creativity room are explicitly praised), they may have the intuition that they are expected to be creative and will therefore make more effort and be more creative. In other words, managers need to be creative in managing the antecedents of creativity in organizations: if they play on levers that people already have strong beliefs about their effectiveness, it will be counterproductive. Consequently, managers in charge of designing and facilitating creative devices to support creativity need to regularly renew the way they stimulate creative activities within their organizations in order to counteract any mechanism of self-indulgence. As such, they need to be creative about means to be creative.

5.3. Limitations and future research

This research has several limitations that offer paths for future research. First, we chose to investigate a very specific LIToC about the stimulation of creativity (namely the effects of energy drinks), which was practical for our experimental design, but may not be the most disseminated LIToC about stimulation. As such, additional research is needed to assess the effects of a broader range of LIToCs regarding the stimulation of creativity on creative performance. The present study extends previous research on the influence of beliefs about

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the potential cognitive stimulating effect of energy drinks (Champlin et al., 2016; Marinoni et al., 2021), but could be replicated in the contexts of other creativity drivers, such as factors related to the physical environment of creativity (e.g., creative room colors, furniture style, object) that are regularly mobilized in organizations to sustain creativity (e.g. Yekanianlibeiglou et al., 2021 ; Chen et al., 2020). Second, our experimental design focused on a very specific part of the creative process, namely the generation phase of the ideation process, and at an individual level. Future studies are needed to examine the effect of LIToCs about creativity drivers using other creative tasks than the egg's task, such as convergent thinking tasks, and on other cognitive processes critical to creativity such as idea construction (Gillier & Bayus, 2022) or idea communication (Steils & Hanine, 2022), taking into account beliefs in one's own ability to be creative (Puente- Díaz et al., 2021). Finally, we did not impact the LIToCs of our participants, while research has shown that lay theories are malleable and can evolve (Benedek et al., 2021). In that vein, research could investigate the influence of individual characteristics on the nature, strength and potential evolution of LIToCs regarding creativity in order to derive more relevant implications for managers wishing to manage creativity processes in their organizations.

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