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Faculty of Business Economics

Master of Management

Master's thesis

Could multiple work environments increase creativity? The impact of un-routinized physical environments on creativity.

Valeria Vallenas

Thesis presented in fulfillment of the requirements for the degree of Master of Management, specialization International Marketing Strategy

SUPERVISOR :

Prof. dr. Allard VAN RIEL

MENTOR :

Mevrouw Melisa YILDIZ

2022
2023

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Acknowledgments

I would like to start by expressing my gratitude to my supervisor Professor Allard van Riel, and my mentor Ms. Melisa Yildiz who gave me the opportunity to work on a topic of my interest and gave me timely feedback and all the tools necessary to conduct this research. Thanks to this experience and their collaboration, I was able to conduct a very interesting study that challenged me every step of the way and pushed me to learn and surpass my goals.

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Valeria Vallenas Callirgos

Hasselt, 2023

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1. Introduction

Today's business environment is changing faster than before; companies must anticipate these changes, and a slow response could mean a severe mistake (Van Knippenberg et al., 2020). Liu et al. (2021) also emphasize the need for novel ideas to be utilized as sources of competitive advantage. Novel ideas do not crystallize only in the form of products but also in processes and social innovations, and they all can lead to success in terms of growth and profitability (Heunks, 1998).

Generating novel ideas is one of the first stages of innovation, and creativity has become a fundamental skill throughout the process (Amabile, 1988; Moultrier, 2017). Furthermore, creativity is an exciting topic in business, design, education, and psychology literature. This interest in creativity created new definitions and theories, opening new doors for more research and questions challenging our knowledge.

One of the new potential drivers of creativity that has become of interest in recent years is the physical space (Blomberg & Kallio, 2022). A significant influence on this topic is Amabile's (1997) theory, where she explains how the work environment dramatically influences creativity, and this indirectly enhances the company's innovation efforts and overall success. From here, the work environment is defined as a physical environment that supports employees while working on their tasks (Davis et al., 2011).

In practice, companies invest in work environments that can indirectly boost productivity and idea generation (Magadley & Birdi, 2009; Moultrie et al., 2007). For example, The Royal Mail of the UK, the Dutch Tax Office, Kodak, and Cisco have created spaces to stimulate employee and customer creativity (Lewis & Moultrier, 2005). Unfortunately, some of these examples, such as Kodak and The Royal Mail of the UK, are struggling to keep up with disruptive innovation in their fields (Conway & Espiner, 2023; Scott, 2016). On the contrary, IDEO, one of the biggest innovation consultancies in the world, credits its success to its environment and infrastructure as a catalyzer for creativity and innovation with a people-centric approach (Kelley & Littman, 2001).

In that sense, more studies are looking to understand what can make a physical work environment effective in supporting employees. The physical elements of the work environment are not disconnected from the psychological elements (Vithayathawornwong et

al., 2003). For example, the physical environment can positively influence employees' motivation and social interaction, allowing them to be more creative (Vithayathawornwong et al., 2003). Other literature shows that routine can greatly impact creativity (Liu et al., 2021).

According to some studies, routine in the everyday task of an employee can decrease creativity. Because, by doing repetitive tasks employees will be less motivated and more bored, decreasing their creativity (Choi et al., 2009). Consequently, motivation is a psychological component fundamental for creativity (Amabile, 1988), and the physical work environment and routinization can influence it. Is it possible that the creative outcome would be indirectly affected by a physical work environment that is non-repetitive?

This research aims to connect physical and psychological elements to understand better how the physical environment can impact creativity, including a relevant construct such as routinization that could also help in the discussion. This research also aims to fill a gap in the literature by including routinization as a construct that can affect creativity through the physical and psychological components of the work environment. Additionally, If the physical environment can play a role in which it helps the company achieve its goal, there should be a motivation for its research (Moultrie et al., 2007). Furthermore, the importance of the strategic design and planning of the working areas should always be remembered (Kotler & Rath, 1984).

This research was executed by conducting a field experiment to obtain valuable information from real experiences. It was important to design an experiment that could later be replicated in practical situations, such as in universities or companies, and that reflects the variability of creativity because it changes depending on the individual and their situation as other human behaviors do (Field & Hole, 2002). 140 Hasselt University students formed the sample; the respondents completed a questionnaire basing their responses on one particular memory of completing a creative task using one or multiple available working environments at Hasselt University (both campuses: Hasselt & Diepenbeek).

This research provides new knowledge of the impact of un-routinized physical work environments that support creativity through social-psychological components. Most importantly, conceptualizing a model that includes physical and psychological conditions. Additionally, new concepts, such as un-routinized physical work environments, are introduced by integrating two often-seen elements when discussing creativity. Moreover, we

add clarity to Liu et al.'s (2021) theory on routinization and investigate if the un-routinization of the physical environment works as a catalyzer of creativity.

Finally, the findings are expected to lead to practical applications for innovation companies or labs worldwide to potentiate their creative output; as a result, they will also indirectly impact their success positively, the organization's culture (Kallio et al., 2015) and positively impact their job satisfaction (May et al., 2005; Vischer, 2007). The results of this research will contribute to increasing the innovation efforts and success of innovative companies, incubators, and classrooms at all levels of education worldwide, such as the results that IDEO achieved (Kelley & Littman, 2001).

2. Literature Review

2.1. Why is innovation important?

Innovation has been the focus of many researchers as it has become crucial for companies to stay competitive in today's market (Kline & Rosenberg, 2009). According to Moultrie (2007), innovation plays a significant role in a company's commercial success and helps maintain or gain a market presence (Christensen, 1997). New and small firms often depend on innovation in the form of products, processes, and social innovations to achieve success (Heunks, 1998). Furthermore, innovation can drive growth and increase profitability, leading to success (Hyvärinen, 1990).

Various definitions have been proposed in the study of innovation due to its complexity, uncertainty, and disorganized nature (Kline & Rosenberg, 2009). According to Kline et al. (2009), these definitions often involve creating and introducing something new, referring not only to new products but also to new processes, resources, management solutions, and tools. Van de Ven (1986) also emphasized that innovation encompasses not only the implementation of new ideas but also the actions of individuals. As Zaltman et al. (1973) noted, adopting innovation is very important for organizations.

2.1.1. The link between innovation and creativity

One of the most discussed methodologies to implement innovation at the corporate level is the innovation process, consisting of four stages: ideation, creation, design, and delivery (Moultrie et al., 2007). Creativity is essential for all the stages of the innovation process. Still, it can have a more significant role in the ideation stage because, with the idea, the following stages can be accomplished (Amabile, 1988). This process is complex, has technical and social challenges, and differs for every industry and situation (Kline & Rosenberg, 2009). Additionally, Tschimmel (2012) believes that creativity and multiple innovation processes, like design thinking, are responsible for the innovation output of a company when combined.

These processes can mitigate some common challenges in innovation, such as helping control the rising cost of innovation, maximizing the idea-generation process, and controlling financial risks. It is an excellent example of how technology and economic variables work together (Kline & Rosenberg, 2009). Understanding the benefits of creativity in the organization’s innovation should be a priority.

2.2. Creativity

Creativity is a complex term that does not have only one definition and has been discussed in all the research done on it in the past years (Plucker et al., 2004 & Mullet et al., 2016). Because this study will focus on understanding how creativity can be nurtured, mentioning some of the lenses through which creativity is studied is essential. Runco (2004) summarized that most definitions could be grouped into four main categories: Personal Creativity, Product Creativity, Creativity Process, and Environments that foster creativity.

From a personal creativity perspective. Findlay & Lumsden (1988, p. 9) defined creativity as "the collection of personality and intellectual traits, shown by individuals, who, given freedom, spend most of their time engaging in the creative process." Some of these traits can be named as an attraction to complexity, high energy, behavioral flexibility, intuition, emotional variability, self-esteem, risk-taking, independence, and tolerance to ambiguity (Feist & Runco, 1993).

Another perspective is the creative process called cognitive creativity in literature (Said-Metwaly et al., 2017). Creativity is defined as finding problems and gaps in knowledge, developing a possible solution, testing it, and sharing the findings (Torrance, 1977). Similar to this definition, Mednick (1962) describes it as a process of bringing elements together in different ways to meet a requirement. Furthermore, Guilford (1975) mentions two types of cognitive creativity, divergent and convergent production. Divergent production is applied to find logical solutions or alternatives to broad problems, while convergent production finds local solutions to a specific problem (Guilford, 1975).

Kaufman & Sternberg (2007) defined creativity as the idea of something new or innovative, of high quality and appropriate to the need; in other words, useful. Product creativity is an idea, not just an individual effort but a result of teamwork (Kaufman & Sternberg, 2007), different from the abovementioned perspective.

Lastly, it is argued after late 1970 that creativity depends significantly on social and environmental interaction (Feist & Runco, 1993), whether from an individual or organizational perspective. In McLarens (1993) paper "The Dark Side of Creativity," he points out that creativity can create harm and adverse effects. The application of creativity for a good or negative impact is not the focus of this study; what he contributes to this study is that the environment defines what is perceived as creative. The interchange between the

individual and their environment or context is also called Press in the literature (Thompson & Lordan, 1999).

After having a better understanding of the multiple scopes from which creativity is observed; for this research, creativity is finding solutions to multiple problems (Torrance, 1977), and these solutions are new, innovative, and useful (Kaufman & Sternberg, 2007). These solutions are achieved thanks to the flexibility of an individual or group of individuals and the social-environmental factors with which they interact (Feist & Runco,1993). This definition has been chosen because it is more product-oriented and simpler to measure based on the results rather than personality or process. It also shares most similarities with concepts related to innovation.

2.3. Why is creativity important for innovation?

According to the definitions of innovation and creativity mentioned above, they have similar elements; by referring to something new or novel, a link between them is implicitly created (Amabile, 1988). Amabile (1988) also highlights the differences between innovation and creativity by indicating that although innovation uses creative ideas as a foundation of organizational innovation, innovations must be developed and implemented. Other researchers also identified that innovation comes from creativity, but this idea needs to be transformed to exploit it and achieve a successful implementation (West & Farr, 1990). Furthermore, innovation can be an intermediary between creativity and the creation's success (Heunks, 1998).

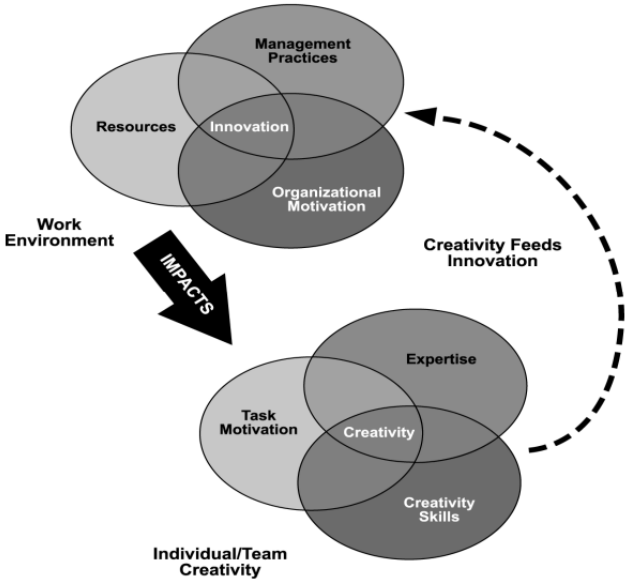
Many authors have discovered that creativity is often silenced in the educational system to standardize education (Beghetto, 2005). However, teachers can avoid myths and stereotypes around the concept when they understand creativity better (Beghetto & Kaufman, 2010). Therefore, companies can also be better equipped to nurture creativity from a business perspective when they understand its concepts, making this research valuable for companies and academic organizations.

Amabile (1988) found that creativity can have the most remarkable results when three main components overlap (resources, techniques, and motivation). The component can be found at an individual level as well as at an organizational level. Consequently, the creative product depends not only on an individual; the organization plays a substantial role in the process (Amabile, 1988).

To have a deeper understanding, Amabile (1988) explains that the resource components are the raw elements for creativity; at an individual level, they are the individual relevant skills or talents. At an organizational level consist of funds, materials, systems, people, and the information available. The technique components refer to the creative skills, thinking style, working, and approach to an individual's work. However, from an organizational point of view, it includes the management skills, such as how creativity is nurtured, developed, and implemented. Finally and most importantly, according to Amabile (1988), the motivation component will define the final creative result; resources and techniques can define what the individual is capable of but not what the individual accomplishes. Organizations must also use motivation as a catalyst to look forward and take risks (Amabile, 1988).

Lastly, Amabile (1987) considers that these elements are comparable to the organization's innovation process; in other words, to innovate, resources in the task domains, skill in innovation management, and motivation to innovate are needed, and they are equivalent to the creative elements as shown in Figure 1. Furthermore, James et al. (1999) also believed that organizational and individual factors shape creativity. Autonomy and perceived control of the work can catalyze positive creativity. A positive organizational climate can also promote creativity (James et al., 1999).

Figure 1 *The impact of the organizational environment on creativity*



Note. The impact of the organizational environment on creativity. From “Motivating creativity in organizations: On doing what you love and loving what you do”, by Amabile, T.

M, 1997, California management review, 40(1), p.53 (https://doi.org/10.2307/41165921). Copyright 1997 by The Regents of the University of California.

2.4. Work environment and creativity

Research shows that the work environment is a reflection of the organizational culture (Kallio et al., 2015), influencing job satisfaction and performance (May et al., 2005; Vischer, 2007), as well as employee moods and creativity (Magadley & Birdi, 2009). Moultrie et al. (2007) believe that understanding how these elements relate to each other can provide support for the company's innovation efforts; for that reason, creativity and the work environment have high value in an organization (Schein, 1990). Creativity and innovation significantly impact the success of products, processes, tools, and companies. How can the company increase its creativity and innovation efforts through its environment?

The importance of the environment has often been stated in the literature about creativity and innovation because it is where creativity takes place. Mumford and Simonton (1997) concluded that the work environment is the most promising place to look for creativity. Still, there is a lack of research on it, or very scattered around (Moultrie et al., 2007). Most studies have focused on the social-psychological aspects rather than the physical ones, as Vithayathawornwong et al. (2003) mentioned. In addition to this, Vithayathawornwong et al. (2003) found that the work environment has physical and social-psychological conditions that influence the individual's creative behavior. The physical conditions influence creativity through socio-psychological conditions.

2.4.1. Physical work environment and creativity

The physical work environment can be described as a space that supports employees in completing their work tasks (Davis et al., 2011). A creative environment has one goal, to enhance creativity with visuals, aesthetic qualities, flexible layout, and technology to support creativity and social interaction (Leurs et al., 2013). In addition, Lin and Chang (2020) stated that when employees positively perceive their work environment by including spatial organization and architectonic details, it enhances their creative outcome by increasing their positive mood.

The physical aspects of the workspaces include indoor air quality, atmosphere, furniture, space distribution, and lighting (Vischer, 2007). Open and flexible spaces also help

employees communicate with one another, ask more questions, give more feedback, and share information more effectively, which will have, as a consequence, a better creative result. (McCoy & Evans, 2002). The efforts of the organization to enhance its physical environment can reflect an organizational culture that supports creativity and innovation (Lin & Chang, 2020).

Spacial organization refers to the variety of work environments where tasks, in general, are completed; also, to the organization settings that contribute to the interaction between members and other secondary supporting and informal environments that can be given to the members of the organization (Lin & Chang, 2020). Another definition of spacial organization is the multiple conditions that define a work environment, such as shape, allocation, divisions, or size (Blomberg & Kallio, 2022). These conditions help determine other essential work performance factors, closeness, privacy, control, or flexibility (Blomberg & Kallio, 2022). A good example is co-working spaces that allow flexibility and change, ultimately creating more opportunities for social interaction (Gerdenitsch et al., 2016) and knowledge sharing (Coradi et al., 2015). These will later improve the organizational climate and social environment (Zalesny & Farace, 1987), impacting the individual's positive moods and creativity (Lin & Chang, 2020).

The concept of the physical environment for this research will be identified as the environment that supports its members in accomplishing their tasks (Davis et al., 2011). As Lin & Chang (2020) mentioned, those tasks can be very diverse, and the physical work environments can be multiple, especially supporting interaction between the members. The physical work environment that supports creativity will also have three main characteristics: a flexible layout, availability to technology, support in social interaction (Leurs et al., 2013) and will serve a variety of functionalities for work-related tasks as well as for non-related functions (Proshansky et al., 1970; Vithayathawornwong et al., 2003).

2.5. Socio-psychological work environment and creativity

2.5.1. Mood

Within the literature on creativity, a recurrent topic is the individual's mood as an antecedent of creativity (Chi et al., 2021). Research has shown that the environment's physical features influence mood (Lin & Chang, 2020). A study by Hedge (1982) found that plants in a work

environment positively impact mood. Chi et al. (2021) found a direct relationship between positive mood and increased creativity.

Positive moods can activate and deactivate (Baas et al., 2008). Some examples of activating positive moods are excitement and enthusiasm, while positive but deactivated moods are calmness and relaxation (Chi et al., 2021). To et al. (2012) conducted a study and found evidence of the direct relationship between positive activating moods and creativity. Later, Chi et al. (2021) had the same results but applied to creative workers.

2.5.2. Dynamism and freedom

Vithayathawornwong et al.'s (2003) investigation showed that the physical work environment impacts creativity by contributing to the individuals' psychological conditions. These psychological conditions are employees' behavioral aspects in a shared work environment (Ekvall, 1996). There are ten psychological conditions in total (change, freedom, idea support, trust, dynamism, playfulness, debates, conflicts, risk-taking, and idea time)(Ekvall, 1996). However, the physical work environment impacts creativity only through two conditions: dynamism and freedom (Vithayathawornwong et al., 2003). Dynamism is the enthusiasm needed to complete the tasks, and freedom is the level of flexibility and independence to define and execute the task. In this research, the physical environment influences creativity through a psychological condition (Vithayathawornwong et al., 2003). In addition to this conclusion, dynamism was the psychological condition more influenced by the physical environment that contributed to creativity; the participants in the research stated that "The physical work environment induces life and enthusiasm into my job" (Vithayathawornwong et al., 2003, p. 6). As mentioned, enthusiasm can also be defined as a positive, activating mood.

In contrast with the psychological condition mentioned above, Chi et al. (2021) consider the physical environment has two dimensions, first the adjustability of the work area, explaining to which degree the space can be changed to personalize to the employee's satisfaction (Elsbach & Pratt, 2007). This dimension can be related to the psychological condition of freedom. Elbasch & Pratt (2007) second is the facilitation of informal interaction. This dimension reflects the barriers of the workspace and to which degree the space allows interaction and communication between the employees to have informal conversations and social relationships (Elsbach & Pratt, 2007). This last dimension can also be related to the

freedom and dynamism of the space by providing life and enthusiasm into the everyday work environment.

According to Vithayathawornwong et al. (2003), the physical environment and creativity are linked by that psychological condition. In addition, Amabile (1988) also believed that multiple sensory stimuli in the work environment could help flexible and novel thoughts. As Mumford and Gustafson (1988) inferred, creative behavior is a complex interaction of the attributes of the surroundings and their attributes.

2.6. Routine and creativity

Another condition that influences creativity are routines, which some might even say impedes creativity (Amabile & Conti, 1999). Research on how some tasks can influence creativity has been done, but the results have brought more questions than answers (Liu et al., 2021). Some argue that executing routine or repetitive tasks gives employees more free cognitive resources to apply to idea generation (Chae & Choi, 2019). On the other hand, other research shows that repetitive tasks can decrease creativity because they lead to boredom and less motivation (Choi et al., 2009).

Routinization translates to the level of repetitive work an employee has and the degree to which rules and regulations must be followed (Parasuraman & Alutto, 1981). Opposed to that definition, non-routinization includes having multiple tasks different from each other that are related to problem-solving and also giving the employee the freedom to decide the best procedure to complete it (Jehn, 1995). From the definitions mentioned above and for this research, a new term is constructed, un-routinize work environments. Un-routinize work environments are multiple locations, different from each other, that support employees in completing their tasks.

According to the mood theory, the boredom created by routinized jobs can be considered a negative deactivating mood that decreases creativity (Chi et al., 2021). Additionally, according to Amabile (1988), lacking motivation reduces individual creativity when explaining her intersection theory. The literature shows that the physical work environment indirectly affects the creative outcome (Vithayathawornwong et al., 2003). In addition, the physical work environment supports routinized or un-routinized tasks (Liu et al., 2021). Considering these connections between creativity, routine, and the physical work environment, a new link can be created between the physical environment and routine by

having un-routinized or routinized physical work environments. Could the routine or un-routinized nature of the physical work environments indirectly affect the creative outcome? Therefore, the first hypothesis is proposed:

H1: Un-routinized physical work environments will increase perceived creativity.

An un-routinized physical work environment, based on the previous definitions, will refer to multiple physical work environments that allow creativity by supporting interactions, communication information exchange, autonomy, and a sense of control through its layout, accessibility, proximity, and diversity (Liu et al., 2021; Vithayathawornwong et al., 2003).

In addition, creativity can be measured in multiple ways, from self-reported methods, such as self-perceived creativity, to objective reports, such as supervisor ratings (Ng & Feldman, 2012). In contrast with other performance indicators, creativity is often measured with self-reported methods because doing an assessment from an outside position turns out to be very challenging (Ng & Feldman, 2012). Moreover, when seen at creativity from an innovation perspective, self-reported creativity is considered to be better suited to measure creativity performance, especially when involved in complex tasks and a work context element (Shalley et al., 2009).

Madjar et al. (2011) mentioned that routine could influence creativity on an engagement level. Similar to what Vithayathawornwong et al. (2003) presented as dynamism, a socio-psychological condition that, when influenced by the physical work environment, can impact creativity positively or negatively . According to Vithayathawornwong et al. (2003), the physical work environment influences creativity most through the social-psychological condition of dynamism.

Dynamism additionally impacts at an interpersonal level, where interaction, communication, and exchange of ideas are needed (Vithayathawornwong et al., 2003). The layout of the offices, the space provided, how accessible it is, and how close to each other the members are will define how dynamic the work environment is. According to the literature, a new link between un-routinized work environments and dynamism can be formed. By having an un-routinized physical work environment, is it possible to improve the perception of dynamism?

H2: Un-routinized physical work environments will increase the perception of dynamism.

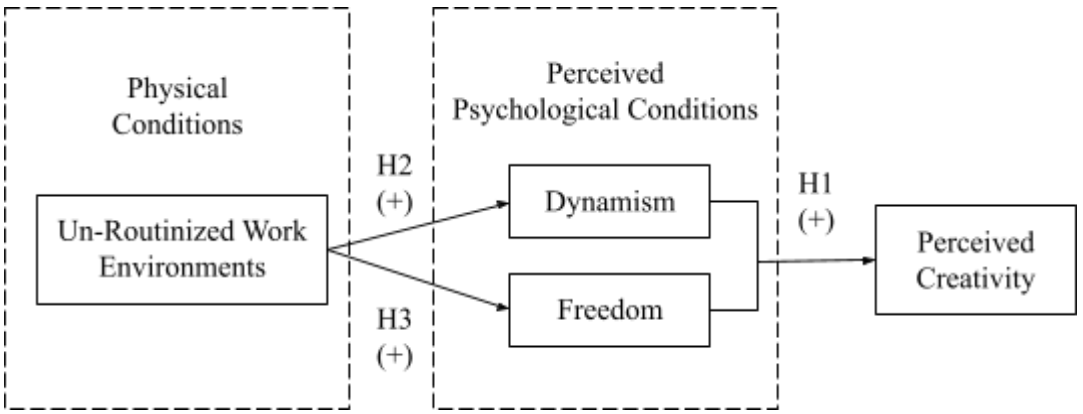
Freedom is the second most crucial socio-psychological condition found by Vithayathawornwong et al. (2003), from which the physical work environment can influence creativity. At a personal level, freedom has two sub-dimensions, autonomy and a sense of control over the work. According to (Proshansky et al., 1970; Vithayathawornwong et al., 2003), Freedom proposes to give freedom of choice to the members working on creative tasks and is very important to provide options, including options for the physical work environments. The environments could have a work purpose or recreational one; also, it was found that having a breakroom and other non-work related areas in the physical work environment is the most mentioned element when identifying freedom (Vithayathawornwong et al., 2003).

A new link is formed between the un-routinized physical work environment and freedom. Given multiple options of the physical work environments, the perceptions of freedom, including its sub-dimensions of autonomy and sense of control, could influence them. Therefore, by having an un-routinized physical work environment, would it be possible to improve the perception of freedom?

H3: Un-routinized physical work environments will increase the perception of freedom.

All three hypotheses can be found from a graphical perspective in Figure 2.

Figure 2 *Conceptual Model*



3. Research Design

3.1. Field Experiment

To answer the research questions presented previously, two scenarios were possible; in one, it was possible to conduct an experiment in which multiple variables would be manipulated to remain constant except for one, the un-routinization of the physical environment. The second option would be to obtain valuable information from actual experiences. It was later concluded that the first scenario could be hard to replicate in practical situations, such as in universities or innovation companies, even though it could provide more precise results. Creativity is not constant and, as mentioned before, changes depending on the individual and their situation as other human behaviors do (Field & Hole, 2002). The environment's manipulation could have also prevented the result from showing an accurate snapshot of how natural physical environments affect creativity.

Additionally, creativity is a complex psychological construct; some use creativity to describe a human quality or human behavior; it can also have multiple definitions and be used to describe different outcomes as novel and useful (Parkhurst, 1999). In order to study complex constructs that can not be measured in an exact form (McCoy & Evans, 2002), it is better to observe what naturally happens and obtain measures about the level or degree that we can observe or perceive what is happening. This is why a field experiment methodology has been chosen for this research.

3.2. Sample Choice

In previous research that studies creativity, most samples come from two groups: students and employees. For business research, using employees as the sample is more common than using students because, in some cases, students lack external validity (Bello et al., 2009). However, using students as a sample is often seen, especially in socio-psychological research that requires experimentation and questionnaires, to observe attitudes and values, mainly because it is easy to access and vast (Bello et al., 2009). A student sample can be considered appropriate when the study includes experimentation involving complex constructs, and the results can be later replicated to corroborate with other samples, preferably employee base (Bello et al., 2009).

It is important to always take into account that a lack of generalizability for a student sample is possible (Bello et al., 2009). Nevertheless, studies that collect data from employees focus on groups of companies from different industries or within the same industry, which can sometimes also be a limitation to the generalization of their results (Lin & Chang, 2020).

Students from Hasselt University were considered the sample from both university campuses (Hasselt and Diepenbeek); due to the large amount, accessibility, and real-life experiences with creative tasks. There was no specific quota per campus because students often use both campuses for recreational and study purposes. All study programs were also included for both English-speaking and Dutch-speaking students.

3.3. Instrument

In order to measure the degree to which physical environments that are un-routinize affect creativity and their dynamism and freedom, a questionnaire was created (see Appendix A). Multiple times in the literature, questionnaires are used to measure creativity and other aspects that can potentially influence it, for example, the physical and psychological aspects of the environment (Lin & Chang, 2020; Madjar et al., 2011; Vithayathawornwong et al., 2003).

The questionnaire's objective was to collect data about the personal experiences of Hasselt University students when working on a creative task they could remember in the university facilities in order to measure their perception of reality and not their expectations and opinions of creativity; it was crucial to stimulate their memory and help them focus on only one experience so that the data collected later was based on a snapshot in their memory. The questionnaire started with an open question to trigger their memory of a past group assignment that required a creative task.

3.3.1. Control Variables

Every individual experience working on a creative task is different; this could make the consistency of the results hard to maintain. Two control variables were included to minimize the effect of other causes apart from the variables measured in this research (Field & Hole, 2002). These variables are the task's creative level and the respondent's creativity.

Multiple problems can require different reactions and solutions; also, these problems or tasks will have different levels of creative performance (Reiter-Palmon et al., 2009). A creative

task refers to finding solutions to problems (Lassig, 2020). Kozbelt et al. (2010) and Sternberg (1996) explain that presenting students with a non-structured or non-defined task and a problem with multiple solution paths is possible to consider the students engaging in higher creative task achievement. This research used those elements to measure the task's creative level.

Regarding the respondent's creativity, Amabile (1997) recognized that the person's environment affects their motivation and creativity, not only the environment but also their personality; every individual's creativity has been influenced for many years by multiple factors. A study was made to identify the nature of the creative talent of architects (Mackinnon, 1962). Mackinnon (1962) compares two groups, one of already established talented architects with artistic and problem-solving abilities against a group of less accomplished and younger architects. His results show a group characteristics are common among most accomplished architects and opposite to younger architects (Mackinnon, 1962).

A higher level of personal creativity is shown in people identifying themself as inventive, determined, independent, individualistic, and enthusiastic; usually, this group of people has a good opinion of themselves. They would also like to be more sensitive and open to various experiences. In contrast, the groups with a lower level of personal creativity identify themselves as responsible, sincere, dependable, clear-thinking, tolerant, and understanding; they would like to be more original, disciplined, and resilient to new experiences or changes. This research used these characteristics to measure the respondent's personal creativity levels.

3.3.2. Measure for Perception of Creativity

Based on the literature review's conceptual model (Figure 2), creativity is the dependent variable for this field experiment; it is crucial to measure correctly to detect any changes from the independent variable, which will be discussed further in this section. According to Said-Metwaly et al. (2017), researchers have developed multiple measures of creativity due to various definitions; thus, finding the measure that will best fit needed time and consideration.

Zhou & George (2001) developed a scale to measure creativity based on the person, process, and result; initially, the supervisor used this scale as a creative evaluation. Later Lin & Chang (2020) used the scale as a self-evaluation to measure creativity. The approach taken by Zhou

& George (2001) and Lin & Chang (2020) was used because it measures creativity from the definition approach of this research.

3.3.3. Measure for Dynamism and Freedom

Dynamism and freedom are the two most noticeable psychological conditions that influence creativity via the physical environment (Vithayathawornwong et al., 2003); each of them has sub-dimensions that can be measured through items that include factors such as interpersonal communication, interaction, exchange of ideas, sense of control and autonomy. These items were used in this research.

3.3.4. Control group

The sample was divided into two main groups, one of them being the control group and the other being the test group. The control group includes all respondents with a routinized physical environment; it was possible to have this information based on the number of physical environments they used to complete the group assignment described in the first section of the questionnaire. All respondents who chose only one physical environment were considered part of the control group; 52 (37.1%) respondents matched that requirement (N=140).

The test group included all respondents that used two or more physical environments to complete the assignment described in the first section of the questionnaire; these respondents are considered to have an un-routinized physical environment. In total, 93 (62.9%) matched that requirement and belonged to the test group (N=140) (see Table 1).

Table 1 *Frequencies for Routinized and Un-Routinized*

Group	N	Percent
Routinized	52	37.1
Un-Routinized	88	62.9
Total	140	100

A group of respondents also included other environments in which they completed their creative tasks, some of them were specific classrooms within the campus, such as the ones located in the architecture department; those responses are included in the group of “open

classroom and PC–rooms.” A new environment included by the respondents was the online environment; these responses were also considered as one physical environment; although they were using an online tool for a virtual meeting, they were nevertheless using a physical environment to connect to the meeting.

3.4. Data Collection

The data was collected for ten days starting on April 19th, 2023; Qualtrics experience management software was used to create a digital survey and distributed it via email to all Hasselt University students. During the same data collection period, two visits to the campus were made, Diepenbeek and Hasselt, to encourage students to participate in the survey via QR code.

The number of respondents collected was 174 surveys; from this total, nine respondents were excluded from the research to be considered outliers after testing for outliers with the Mahalanobis distance measure, and one respondent was also excluded manually for including nonsense data (“She came by.”). In addition, respondents were asked if they had any group meetings on campus to complete the creative task they chose; those who did not have any meetings or only had one were filtered out; in total, 24 respondents, the remaining 140 respondents were the eligible sample.

4. Results

4.1. Demographics

The sample comprised 91 (65%) females, 47 (33.6%) males, one (0.7%) non-binary, and one (0.7%) Prefer not to say (N=140) (see Table 2).

Table 2 *Frequencies for Gender*

Gender	Frequency	Percent
Male	47	33.6
Female	91	65
Non-Binary	1	0.7
Prefer not to say	1	0.7
Total	140	100

A independent t-test was conducted in order to compare the means of the different gender groups in the dependent variables, equal variance is assumed for all dependent variables, there is also no significant difference between the groups as shown in Table 3.

Table 3 *Mean Differences between the Gender of Respondents*

Variable	Equal Variances	Sig.	df	Two-Sided p-value
PC	Yes	0.805	136	0.232
PD	Yes	0.858	136	0.381
PF[a]	Yes	0.656	136	0.618

[a.] Only 4 items out of 5 were included in the test of this variable due to the reliability of one item.

The sample's age range is mostly from 18 to 24 years old, with 121 (86%) respondents; since the sample was taken from university students, it is understandable that most students were above 18. The sample is also conformed by 16 (11.4%) respondents from 25 to 34 years old and three (2.1%) respondents over 35 years old (N=140) (see Table 4).

Table 4 *Frequencies for Age*

Age	Frequency	Percent
18-24 years	121	86.4
25-34 years	16	11.4
35+ years	3	2.1
Total	140	100

Also, due to their age range, it is unsurprising that they have been Hasselt University students for over six months to up to two years with a total of 84 (60%) respondents. The sample also included 14 (10%) respondents that have been students for no longer than 6 months, 38 (27.1%) responders that have been students for 3 to 5 years, and four (2.9%) respondents that have been students for over 5 years (N=140)(see Table 5).

Table 5 *Frequencies for Period of Enrollment*

Period of Enrollment	Frequency	Percent
Less than 6 months	14	10%
From 7 months to 2 years	84	60%
From 3 to 5 years	38	27.1%
Over 5 years	4	2.9%
Total	140	100

4.2. Descriptive statistics

Table 6 includes a list of abbreviations of the name variables that will be used in the following test; for consistency, these abbreviations will be used throughout this paper.

Table 6 *Abbreviation of variables name in data analysis*

Abbreviations	Item Name
PC	Perception of Creativity
PD	Perception of Dynamism
PF[a]	Perception of Freedom

MS	Task had Multiple Solutions
LE	Logical vs Emotional

For all the variables in Table 7, the mean values are 3.00 or above (M^{PC}=3.780) (M^{PD}=3.807) (M^{PF}=3.776) (M^{MS}=4.310) (M^{LE}=3.020). The standard deviation for all variables is above 0.557 (SD^{PC}=0.557) (SD^{PD}=0.629) (SD^{PF}=0.707) (SD^{MS}=0.795) (SD^{LE}=1.255), values of skewness of all variables suggest to be concentrated on the high right part of the graphs and variables PC, PD, PF, MS, have peak distribution except for LE. (see Appendix B).

Table 7 *Descriptive Statistics of Variables*

	Mean	Std. Deviation	Skewness	Kurtosis
PC	3.780	0.557	-0.877	1.087
PD	3.807	0.629	-1.060	2.890
PF[a]	3.776	0.707	-0.697	0.996
MS[b]	4.310	0.795	-1.395	2.582
LE[c]	3.020	1.255	-0.410	-1.094

[a] Only 4 items out of 5 were included in the test of this variable due to the item's low convergent validity.

[b] Originally, the factor was measured with two items. However, there was insufficient convergent validity to use both items of the factor; only one item was used "The result or product of the assignment could have had multiple solutions".

[c] Originally, the factor was measured with four items. However, there was insufficient convergent validity to use the factor; only one item was used.

4.3. Reliability

For this study, three constructs are measured PC, PD, and PF. However, because of the design of this field experiment, two more variables were included as control variables, MS and LE. These constructs comprised multiple items and were measured with a 5-point Likert scale. In order to check the reliability of the factors, their Cronbach's Alpha.

For the three constructs that are measured in this study, the Cronbach Alpha values were α^{PC} = 0.79, α^{PD} = 0.88, and α^{PF} = 0.738, indicating the factors' reliability. Other similar that measured Dynamism and Freedom had a reliability of α = 0.94 and α = 0.64 (Vithayathawornwong et al., 2003). It is important to mention that the original Cronbach Alpha of PF was α^{PF} =0.545. However, after observing the results of the Intern-Item Correlation matrix, one of the items .“Certain characteristics of the physical environment conveyed clear rules.” was not correlated to the total score; for that reason, it was removed. The complete tables of the measurement are shown in Appendix C.

For the two original control variables, the reliability was below what can be accepted; for that reason, a deeper observation of the intern-item correlation matrix was taken. For MS, the two items that formed the variable were not correlated; as a result, the item “It was entirely clear to me what was expected of me” was removed, leaving the variable with one item, “The assignment could have multiple good solutions.” For LE, item “Original vs. Sensitive” was negatively correlated to the variables; in addition to this, items “Responsable vs. Inventice” and “Open vs. Close to new experiences” had a correct item-total correlation under 0.3; for these reasons, they were also removed of the analysis. Lastly, only the item “Logical vs. Emotional” remained in the measurement (see Appendix C).

4.4. Correlations

There is a positive relationship between the variables, PD and PC have a strong correlation (*r*=0.561), as well as PF and PD (*r*=0.565). However, PF and PC have a moderate correlation (*r*=0.389). In addition to this, the control variables have a positive but weak correlation below r=0.30, especially MS and LE have a particularly weak correlation of r=0.037, ideal for one-way analysis of variances (see Table 8).

Table 8 *Correlation of Variables*

	PC	PD	PF	MS
PD	0.561**			
PF	0.389**	0.565**		
MS	0.237**	0.117	0.120	
LE	0.251**	0.217*	0.202*	0.037

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4.5. Hypotheses Testing

In order to test the hypothesis, it is important first to find if there is a relationship between the variable, but in this case, compare them when they are split into the two groups (Routinized and Un-routinized). To do this, a Pearson correlation coefficient was conducted.

In Table 9, we can see that PD and PC have a strong positive relationship in the routinized group, r=0.650, n= 52; with high levels of perceived dynamism, there are high levels of perceived creativity in the routinized group. A similar but slightly less strong relationship exists between PD and PC in the un-routinized group, r=0.486, n= 88; with high levels of perceived dynamism, there are high levels of perceived creativity in the routinized group.

It is also possible to see that PF and PC have as well a positive relationship in both groups, routinized and un-routinized, r=0.328, n= 52 for routinized and, r=0.455, n= 88 for un-routinized, with high levels of perceived freedom there is high levels of perceived creativity in both groups.

PD and PF are also very highly positively related for both of our groups, r=0.527, n= 52 for routinized and, r=0.586, n= 88 for un-routinized, with high levels of perceived dynamism there are high levels of perceived freedom in both groups.

Also, Table 9 shows how the control variables relate to our dependent variables in each group. We can see that MS and LE are positively related to PC r=0.300, n= 52 for MS, r=0.435, n= 52 for LE in the routinized groups. For the un-routinized group, the relationship is slightly different; MS and PC have a positive relationship, similar to the routinized group, r=0.363, n= 88, but LE and PC have a positive but less strong relation, r=0.123, n= 88. With high levels of multiple solutions to a task and an individual's emotional and sensitive characteristics, there are high levels of perceived creativity in the routinized and un-routinized group.

It is also possible to observe that for both groups, routinized and un-routinized LE, MS are positively related to PD and PF. However, in the routinize group, MS has a stronger positive relationship with PF, r=0.180, n= 52, than PD, r=0.016, n= 52, and LE has a stronger

relationship with PD, r=0.209, n= 52, than PF, r=0.087, n= 88. For the un-routinized group, even tho the relationship is still positive, the opposite happens, MS has a stronger positive relationship with PD, r=0.230, n= 88 than PF, r=0.108, n= 88, and LE has a stronger relationship with PF, r=0.266, n= 88 than with PD, r=0.184, n= 88.

Table 9 *Correlations among Factors by group*

			PC	PD	PF	MS
Group 1: Routinized	PD	r	0.650**			
		R^2	0.423			
	PF	r	0.328*	0.527**		
		R^2	0.108	0.278		
	MS	r	0.300	0.016	0.180	
		R^2	0.090	0.000	0.032	
	LE	r	0.435**	0.209	0.087	0.100
		R^2	0.190	0.044	0.008	0.010
Group 2: Un-routinized	PD	r	0.486*			
		R^2	0.236			
	PF	r	0.455**	0.586**		
		R^2	0.207	0.343		
	MS	r	0.363**	0.230*	0.108	
		R^2	0.131	0.052	0.012	
	LE	r	0.123	0.184	0.266*	0.021
		R^2	0.015	0.033	0.071	0.000

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Based on the Fisher r-to-z transformation, the difference between groups is not significant for any of the variables, see Table 10.

Table 10 *Between-group comparison*

	PC	PD	PF	MS
PD	0.1738			
PF	0.3173	0.6312		
MS	0.0512	0.2225	0.6818	
LE	0.0561	0.8887	0.303	0.6599

Note. Sig. (2-tailed) = *p*

Although we have so far found a relationship between variables and a difference between the groups, we need to find if these relationships also exist when we control for the effect of our control variables MS and LE. For that, a partial correlation analysis was conducted.

The results shown in Table 11 that the relationship between variables remains positive and somewhat strong after controlling for MS and LE, r=0.528 for PD and PC, r=0.342 for PF and PC, and r=0.540 for PD and PF. When comparing the correlation and partial correlation values, we can see some but little effect of the control variables on the strength of the relationship between the variables.

Table 11 *Comparison of correlation between variables with and without covariance effect*

		PC	PD	PF	MS
Without Control	PD	0.561**			
	PF	0.389**	0.565**		
	MS	0.237**	0.117	0.120	
	LE	0.251**	0.217*	0.202*	0.037
With Control	PD	0.528			
	PF	0.342	0.540		

Similar results were obtained when we performed the same partial correlation test between groups. In Table 12, we can see that the relationship between variables and between the groups remains positive and moderately strong after controlling for MS and LE, r=0.635 for PD and PC, r=0.332 for PF and PC, and r=0.531 for PD and PF in the routinized group, and

r=0.432 for PD and PC, *r*=0.435 for PF and PC, and *r*=0.561 for PD and PF in the un-routinized group. When comparing the correlation and partial correlation values between the groups, we can see some but little effect of the control variables on the strength of the relationship between the variables, see Table 12.

Table 12 *Comparison of correlations between groups with and without covariance effect*

			PC	PD	PF	MS
Group 1: Routinized	Without Control	PD	0.650**			
		PF	0.328*	0.527**		
		MS	0.300	0.016	0.180	
		LE	0.435**	0.209	0.087	0.100
	With Control	PD	0.635			
		PF	0.332	0.531		
Group 2: Un-routinized	Without Control	PD	0.486*			
		PF	0.455**	0.586**		
		MS	0.363**	0.230*	0.108	
		LE	0.123	0.184	0.266*	0.021
	With Control	PD	0.432			
		PF	0.435	0.561		

It is important also to mention that the effect of the control variables in each group is different, the effect of MS and LE in the routinized group is making the relationship between PF and PC and PF and PD stronger instead of weaker like in the other relationships.

So far, we can say the variables are positively related, but we do not know yet if that relationship is linear. For that, we have conducted a linear regression analysis. Also, because our independent variables are non-metric (routinized or un-routinized), we have used a dummy coding, see Table 13.

Table 13 *Dummy Variables*

Num of Physical Work Environment				G^1
If	= 1	Routinized	Then	0
	=>2	Un-routinized		1

Three bivariant analyses were considered, each with their own model. The grouping variable of routinization is our independent variable, and PC is our first dependent variable (Model 1). Multicollinearity was low, r=0.032. The result of Model 1 in Table 14 indicates that there is no relationship between routinized or un-routinized physical work environments and perceived creativity (R^2=0.001, p=0.707), which indicates that having multiple physical work environments does not lead to higher perceived creativity when covariants are not being considered (see Appendix D).

$PC=\alpha+\beta G_1+\varepsilon$ (Model 1)

$PC=3.757+0.037G_1+\varepsilon$ (Model 1)

$Y=\alpha+\beta X_1+\varepsilon$ (Model 1)

Table 14 *Coefficient Table of Model 1*

	Beta	t	p-value
Constant	3.757	48.476	<0.001
Un-Routinized	0.037	0.377	0.707

We continued to test the second model that includes the grouping variable of routinization as our independent variable and PD (Model 2). Multicollinearity for PD and the grouping variable was low r=0.255. The result of Model 2 indicates that there is a positive relationship between routinized or un-routinized physical work environments and perceived dynamism (R^2=0.065, p=0.002) (see Table 15), which indicates that having multiple physical work environments does lead to higher perceived dynamism when covariant are not being considered (see Appendix D).

$PD=\alpha+\beta G_1+\varepsilon$ (Model 2)

$PD=3.6+0.331G_1+\varepsilon$ (Model 2)

Table 15 *Coefficient Table of Model 2*

	Beta	t	p-value
Constant	3.600	42.534	<0.001
Un-Routinized	0.331	3.098	0.002

Additionally, we tested the third model that includes the grouping variable of routinization as our independent variable and PF (Model 3). Multicollinearity for PF and the grouping variable was low r=0.155. The result of Model 3 indicates that there is no relationship between routinized or un-routinized physical work environments and perceived freedom (R^2=0.024, p=0.067) (see Table 16), which indicates that having multiple physical work environments does not lead to higher perceived dynamism when the covariants are not being considered (see Appendix D).

$PF=\alpha+\beta G_1+\varepsilon$ (Model 3)

$PD=3.635+0.226G_1+\varepsilon$ (Model 3)

Table 16 *Coefficient Table of Model 3*

	Beta	t	p-value
Constant	3.635	37.395	<0.001
Un-Routinized	0.226	1.845	0.067

We are interested in finding the relationship of PC, PD, and PF with our grouping variable and taking in consideration our two control variables, for this reason, we conducted a one-way between-group analysis of covariance. For this, the independent grouping variable was the type of routine physical work environment (Routinized or Un-Routinized), and the dependent variables consisted of the mean scores of Percieved Creativity (Model 4), Perceived Dynamism (Model 5), and Percieved Freedom (Model 6) for each of the groups. The Multiple Solution possibilities (MS) of the task and their Individual Creativity (IC) were used as control variables in this analysis.

$PC=\alpha+\beta G_1+\beta^{MS}+\beta^{LE}+\varepsilon$ (Model 4)

$PD=\alpha+\beta G_1+\beta^{MS}+\beta^{LE}+\varepsilon$ (Model 5)

$PF=\alpha+\beta G_1+\beta^{MS}+\beta^{LE}+\varepsilon$ (Model 6)

Assumption tests were conducted to ensure no violation of the variances' normality, linearity, and homogeneity. Linearity was controlled with a group scatter/dot graph from which we could find linearity for PF with both covariants and PD with LE. However, we found an interaction between PC and the covariants as well as PD and MS. This often happens when we are trying to explain a more challenging and more complex way to see reality (Seltman, 2012).

We found no significant difference between the routinized and un-routinized group on PC, F(1,136) = 0.005, *p*=0.941, partial eta squared = 0.000. There was a weak relationship between the groups on PC, as indicated by the partial eta squared value of 0.115. The routinized and un-routinized groups on PD were significantly different, F(1,136) = 8.195, *p*=0.005, partial eta squared = 0.057. Finally, we also found no significant difference between the routinized and un-routinized group on PF, F(1,136) = 1.220, *p*=0.111, partial eta squared = 0.019. There was a weak relationship between the groups on PC, as indicated by the partial eta-squared value of 0.071 (see Table 17).

Table 17 *Test Between Subjects (ANCOVA)*

	F	p	Partial Eta Square
PC	0.005	0.941	0.000
PD	8.195	0.005	0.057
PF	1.220	0.111	0.019

Note. ANCOVA= Analysis of Covariance

5. Discussion

After reviewing the results from the previous section, we can confirm that there is a strong positive relationship between the perception of dynamism and the perception of creativity, as well as a strong positive relationship between the perception of freedom and the perception of creativity, supporting the findings of previous studies (Ekvall, 1996; Vithayathawornwong et al., 2003). These results are very similar for the two groups we studied.

We can also see that this relationship has not been affected by the control variables; the partial correlation showed the same strong positive relationship when we removed the influence of the control variables. From the results, we can also notice that the perception of dynamism has a stronger relationship with the perception of creativity than the perception of freedom, which is also in line with previous research (Vithayathawornwong et al., 2003).

When we controlled the effects, such as whether a person was more logical than emotional or if the task had multiple solutions, we could not find significant differences in the results. We can infer that having multiple solutions for a task does not change the perceived creativity; for some studies, this can be explained by the level of confidence the person has in their abilities; people with higher creative potential but lower self-confidence will probably get overwhelmed with the lack of direction (Ekvall, 1996).

We can also speculate that where someone identifies as more logical than emotional does not change the perceived creativity they achieved. We believed that this outcome could be explained by the fact that this was measured on an individual level. In contrast, the perceived creativity was measured as a result of a group effort; it is possible that other group members that collaborated on the task identified themselves as either more logical or more emotional.

We also found some relevant aspects regarding the relationship between our dependent and independent variables. We found that the routinization or un-routinization of the physical environment does not change the perceived creativity of the respondents; the results also show that there was no significant difference between the groups on their perceived freedom. However, we found that the perception of dynamism increases in multiple physical work environments.

From what we found in the literature, the physical work environment influences the perception of creativity through the perception of dynamism (Vithayathawornwong et al.,

2003). However, in our research, we see the routinized and un-routinize physical work environment having an effect on the perception of dynamism but not on the perception of creativity; a possible explanation for this is that a higher perception of dynamism alone is not enough to increase the perceived creativity, other variables should be considered. Another possible explanation for the difference in the results is the difference in procedures; for example the sample, we used a student sample, while Vithayathawornwong (2003) used employees and limited their study to four companies.

Overall our un-routinize group did not show significant differences from our routinized group when observing the perception of creativity; this result is in line with Liu et al.'s (2021) results, where they also found that the relationship between job non-routinization and creativity is not significant for creative employees in China. We can presume a link between the un-routinized physical work environment and job non-routinization.

Another interesting similarity with Liu et al. (2021) is that we did not find a linear relationship between creativity and un-routinized physical work environments, and they found a curvilinear relationship between job non-routinization and creativity. They deduce that when having unroutinized and routinized tasks simultaneously, employees have more challenges in being creative (Liu et al., 2021). Based on their deduction, we can also assume that maybe Hasselt University students work on multiple tasks simultaneously, for some assignments, they might use more physical spaces, especially the ones that require more team meetings and more team discussion. They might use only one physical workspace with less collaborative work for other assignments. Table 18 summarizes the result of our hypotheses.

Table 18 *Summary of Hypothesis Testing*

	Hypothesis	Discussion	Result
H1	Un-routinized physical work environments will increase perceived creativity.	The utilization of multiple physical work environments alone does not lead to a higher creative perceived performance.	Not Supported
H2	Un-routinized physical work environments will increase the perception of dynamism.	Making use of more than one physical work environment can increment the perception of dynamism.	Supported

H2	Un-routinized physical work environments will increase the perception of Freedom.	Utilizing more than one physical work environment does not lead to an increment of perceived freedom.	Not Supported

6. Conclusions

6.1. Theoretical Implications

This study contributes to the literature in many respects; we contribute to the understanding of creativity and its relationship with the physical environment; we were able to confirm previous research by finding a strong positive relationship between the perception of dynamism, the perception of freedom and the perception of creativity, as psychological constructs that are part of the physical environment (Ekvall, 1996; Vithayathawornwong et al., 2003).

We were also able to see a difference between the perception of dynamism and the perception of freedom, where the perception of dynamism has a stronger relationship with creativity, supporting previous findings in the literature (Vithayathawornwong et al., 2003). We were also able to introduce to the literature a new term for un-routinized physical work environments, which opens the possibility to study the physical work environment not only as one physical environment but also as a combination of the environment.

Furthermore, We concluded that although utilizing multiple physical environments this might not change the perception of creativity and freedom, it does change the perception of dynamism. This also opens new possibilities to consider new elements from the physical environment that can significantly influence creativity. This study also brought two often topics discussed in the literature about creativity that still need to be combined, the physical work environment and routinization (Liu et al., 2021; Moultrie et al., 2007).

The result also contributes to the discussion about routinization by finding that routinization of the physical work environment does not have a linear relationship with the perception of creativity. This supports the results of Liu et al. (2021), where a curvilinear relationship is suggested.

Lastly, we contributed to the literature by showing that Zhou & George's (2001) measure of creativity is reliable and that this measure can also be applied from a self-evaluation perspective (Lin & Chang, 2020). Similarly, we contributed by using Ekvall's (1996) items to measure dynamism and freedom from a self-evaluation perspective.

6.2. Managerial Implications

The physical work environment is an important component of any employee's everyday activities and is where all the tasks are meant to be achieved (Davis et al., 2011); our results provide additional information that managers should consider when discussing how to provide a workplace that nurtures creativity, and that is in line with the reflection of the organizational culture (Ekvall, 1996)

We found a strong positive relationship between the perception of dynamism, the perception of freedom, and the perception of creativity. This shows us that when designing a physical work environment that nurtures creativity, managers need to ensure that the space supports these two psychological factors that nurture creativity.

Additionally, the perception of dynamism has a stronger relationship with creativity than the perception of freedom. This makes the dynamism of the physical work environment the most important psychological factor to consider for managers.

Our results show that when an organization provides multiple work environments to complete the creative task, the perception of dynamism of the employees could be incremented; this means the employee will feel more enthusiasm around work also, feel a constant state of change, and have low levels of boredom (Ekvall, 1996). Enthusiasm and low levels of boredom are considered a positive activating mood (Chi et al., 2021) that can motivate the employees, improving their creative outcome and overall the company's innovation efforts.

Furthermore, we also found that despite dynamism playing a significant role in how the physical work environment affects creativity, using more than one physical work environment does not mean that the creative outcome will improve; it is essential for managers with the objective of improving the company’s creative outcome to consider as well other elements of the environment that can support creativity.

6.3. Limitations and Suggestions for future research

It is also important to discuss this research's limitations. The sample included Hasselt University students; as mentioned in the methodology section, although the sample is acceptable for psychological research, applying a sample of workers could bring new and more precise results (Reiter-Palmon et al., 2012). The participant's age and years of enrollment can possibly impact the amount of experience they have solving problems or

self-evaluating their own skills. For future research, researchers should consider a diverse sample in age, area of work, and years of experience.

Another limitation is the language of the instrument; although most students at Hasselt University speak English to at least a conversational level, they felt more comfortable writing about their experiences in their own language; maybe with a questionnaire in Dutch mis-interpretation could be avoided, and more participants could have been included.

This research measures creativity through a self-reported questionnaire because creativity as a psychological construct is complex and linked to each individual's opinion of themselves (Ng & Feldman, 2012; Parkhurst, 1999). However, because it is different for each individual, it can also have significant differences from one person to the other based on what each has experienced. Future research could focus on the sample with the same experience level.

Additionally, a new experiment could be conducted in which all variables could be manipulated to stay the same, with the exception of one, the use of multiple spaces. That way, we could observe a clear difference between the use of routinized and un-routinized physical environments.

An additional opportunity for future studies is considering that maybe Hasselt University students tend to switch between assignments constantly, from assignments with routine tasks to assignments with un-routinized tasks. Based on Liu et al. (2021) assumption that employees have more challenges in being creative when simultaneously having unroutinized and routinized tasks, it is possible to assume that students might experience similar effects.

A new approach can also be taken by including online work environments. Nowadays, remote work and online meetings for academic and professional tasks are more often used, and it is also expected to increase (Ozimek, 2020). Many of the respondents in this research mentioned in open questions “Other physical environment they use” that they had meetings, in some cases online. The online work environment brings new communication patterns between team members (Aseniero et al., 2020) that can impact creativity.

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Appendices

Appendix A. Questionnaire

Hello, and welcome to our survey.

We are excited to have you participate in this study. Your valuable feedback will allow us to understand better the relationship between physical environments and creativity.

This survey aims to gather information about your experiences with multiple physical environments at UHasselt that support your creative tasks. We want to know your perception of creativity when you complete creative tasks, like brainstorming, solving a problem, or writing your ideas in different environments in UHasselt, such as the library, study rooms, or the agora.

The survey takes less than 10 minutes to complete, and all responses will be treated anonymously and confidentially in an aggregate format. Your participation is entirely voluntary, and you can abandon the survey anytime if you need it.

By continuing to the survey, you express explicit consent that your responses will be recorded at UHasselt and used for this research purpose.

Thank you for taking the time to participate in our survey!

Research Team

Part 1: Priming

Creative tasks are solutions to multiple problems; these can be new, innovative, and useful. For example, to a master of management student, a creative task could be creating a business model, designing a conceptual model, writing a report, creating a presentation, or finding a solution to a strategic business problem.

Based on your experience, think of one specific group assignment that required completing a creative task and took multiple weeks.

What was the main objective of the assignment?

(Brief explanation)

(Open questions)

Part 2: Control variable: Creative Tasks

Based on that group assignment, you explained

What your opinion would be on the following statements?

(Strongly disagree - Strongly agree)

- It was clear to me what was expected of me. (inverted)
- The result or product of the assignment could have had multiple solutions.

Part 1: Priming 2

How many weeks did that group assignment take to be completed?

a. 1 or 2 weeks

b. 4 weeks

c. 4 weeks or more

How many group meetings did you and your teammates have at UHasselt to work on that assignment?

a. None or only once (Finish survey)

b. 2 - 4

c. 5 - 7

d. 8 or more

Part 3: Categorizing

Select the physical environment (s) at UHasselt that you and your teammates used for your group meetings:

*Select as many options as you need.

a. Cafeteria

b. Open Classroom and PC-rooms

c. Library group work zones open and close

d. Library workplaces and cubicles

e. Outdoor areas

f. Agora

g. Study rooms (Cells in Hasselt campus)

h. Other:

Part 4: Dependent variable: Perception of Creative Behaviour

After concluding that assignment,

What would be your opinion on the following statements?

(Strongly disagree - Strongly agree)

- We found new ways to achieve our goals or objectives.
- We came up with creative ideas and solutions to problems.
- We found new and practical ideas to increase the quality of our assignment.
- We were a good source of creative ideas.
- We were not afraid to take risks.
- We supported other people's ideas.
- We developed adequate plans and schedules to develop new ideas or solutions.
- We often had a fresh approach to problems.

Part 5 Measure variables:

Keeping in mind that same experience and the physical environment(s) you selected before

What would be your opinion on the following statements?

(Strongly disagree - Strongly agree)

a. Dynamism

- The physical environment(s) encouraged high communication among us.
- The physical environment(s) made me feel motivated
- I often witnessed open discussions and debates in the physical environment(s).
- My team members and me could easily express their new ideas in the physical environment(s).
- The physical environment(s) encouraged open relationships among us.
- During the day, I often had a chance to talk and listen to other student's problems and suggestions in the physical environment(s).
- The physical environment(s) supported the efficient flow of information I needed to carry out my assignments.
- The physical environment(s) supported the exchange of ideas and opinions.
- The physical environment(s) supported the free and straightforward flow of information.
- The physical environment(s) gave me a sense of openness.

b. Freedom

- Certain characteristics of the physical environment(s) conveyed rules of use and conduct. (inverted)
- The physical environment(s) facilitated a break from routine if we wanted to.
- The physical environment(s) allowed me to choose my own work rhythm.
- The physical environment(s) gave me a sense of control over my own work.
- The physical environment(s) allowed me to vary how I work.

Now, we would like to get to know you better.

Part 6: Control variable: Personal Creativity

How would you describe yourself on a scale of 1 to 5?

- 1 Someone responsible, sincere, reliable, dependable, clear-thinking, tolerant, and understanding.
- 5 Someone inventive, determined, independent, individualistic, enthusiastic, and hard-working.
- 1 Someone who does not often show their own feelings and emotions is logical and objective and often has similar interests.
- 5 Someone open with his/her feelings and emotions, sensitive, and having different interests.
- 1 Someone with a strong sense of boundaries and selectiveness for new experiences.
- 5 Someone that is always open to having new experiences.
- 1 Original and disciplined.
- 5 Sensitive.

Part 7: Demographic variables

Gender

You identified yourself as:

a. Male
b. Female
c. Non-binary/third gender
d. Prefer not to say

Age

Your age is:

a. Under 18

b. 18-24

c. 25-34

d. 35 over

Q10: Studying experience

You have been a UHasselt student for:

a. 6 months or less

b. Over 6 months, up to 1 year

c. Over 1 year, up to 3 years

d. Over 3 years, up to 5 years

e. Over 5 years

Thank you for your time spent taking this survey.

Your responses have been recorded.

Appendix B. Descriptive Statistics

- ***Frequencies***

Routinized Group

	Frequency	Percent	Valid Percent	Cumulative Percent
1 Routinized	52	37.1	37.1	37.1
2 Un-Routinized	88	62.9	62.9	100.0
Total	140	100.0	100.0	

Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
1 Male	47	33.6	33.6	33.6
2 Female	91	65.0	65.0	98.6
3 Non-binary / third gender	1	.7	.7	99.3
4 Prefer not to say	1	.7	.7	100.0
Total	140	100.0	100.0	

Age

	Frequency	Percent	Valid Percent	Cumulative Percent
2 18 - 24	121	86.4	86.4	86.4
3 25 - 34	16	11.4	11.4	97.9
4 35 - 44 or older	3	2.1	2.1	100.0
Total	140	100.0	100.0	

Period of Enrollment

	Frequency	Percent	Valid Percent	Cumulative Percent
1 6 months or less	14	10.0	10.0	10.0
2 Over 6 months, up to 2 years	84	60.0	60.0	70.0
3 Over 3 year, up to 5 years	38	27.1	27.1	97.1
5 Over 5 years	4	2.9	2.9	100.0
Total	140	100.0	100.0	

- ***Descriptives***

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Gender	140	1	4	1.69	.524	.118	.205	1.212	.407
Age	140	2	4	2.16	.420	2.743	.205	7.234	.407
Period of Enrollment	140	1	5	2.26	.753	1.179	.205	3.331	.407
Perception of Creativity	140	1.875	5.000	3.780	.557	-.877	.205	1.087	.407
Perception of Dynamism	140	1.000	5.000	3.808	.629	-1.060	.205	2.890	.407
Perception of Freedom	140	1.400	5.000	3.496	.545	-.656	.205	1.500	.407
Creative Task	140	1.500	5.000	3.304	.581	.365	.205	.651	.407
Personal Creativity	140	1.000	4.750	3.002	.698	-.152	.205	-.413	.407
Valid N (listwise)	140								

Appendix C. Reliability

- ***Reliability Perception of Creativity***

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.793	.794	8

- ***Reliability Perception of Dynamism***

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.877	.880	10

- ***Reliability Perception of Freedom***

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.738	.740	4

Appendix D. Test of Hypotheses

- ***Correlation***

Correlations

		Perception Creativity	Perception Dynamism	Perception Freedom	Multiple Solutions	Logical vs Emotional
Perception Dynamism	Pearson Correlation	.561**	1	.565**	.117	.217*
	Sig. (2-tailed)	<.001		<.001	.167	.010
	N	140	140	140	140	140
Perception Freedom	Pearson Correlation	.389**	.565**	1	.120	.202*
	Sig. (2-tailed)	<.001	<.001		.159	.017
	N	140	140	140	140	140
Multiple Solutions	Pearson Correlation	.237**	.117	.120	1	.037
	Sig. (2-tailed)	.005	.167	.159		.667
	N	140	140	140	140	140
Logical vs Emotional	Pearson Correlation	.251**	.217*	.202*	.037	1
	Sig. (2-tailed)	.003	.010	.017	.667	
	N	140	140	140	140	140

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

- ***Partial Correlation***

Correlations

Control Variables			Perception Creativity	Perception Dynamism	Perception Freedom	Multiple Solutions	Logical vs Emotional
Without Covariants [a]	Perception Creativity	Correlation	1.000	.561	.389	.237	.251
		Significance (2-tailed)	.	<.001	<.001	.005	.003
		df	0	138	138	138	138
	Perception Dynamism	Correlation	.561	1.000	.565	.117	.217
		Significance (2-tailed)	<.001	.	<.001	.167	.010
		df	138	0	138	138	138
	Perception Freedom	Correlation	.389	.565	1.000	.120	.202
		Significance (2-tailed)	<.001	<.001	.	.159	.017
		df	138	138	0	138	138
	Multiple Solutions	Correlation	.237	.117	.120	1.000	.037
		Significance (2-tailed)	.005	.167	.159	.	.667
		df	138	138	138	0	138

	Logical vs Emotional	Correlation	.251	.217	.202	.037	1.000
		Significance (2-tailed)	.003	.010	.017	.667	.
		df	138	138	138	138	0
With Covariants	Perception Creativity	Correlation	1.000	.528	.342		
		Significance (2-tailed)	.	<.001	<.001		
		df	0	136	136		
	Perception Dynamism	Correlation	.528	1.000	.540		
		Significance (2-tailed)	<.001	.	<.001		
		df	136	0	136		
	Perception Freedom	Correlation	.342	.540	1.000		
		Significance (2-tailed)	<.001	<.001	.		
		df	136	136	0		

[a]. Cells contain zero-order (Pearson) correlations.

- ***Correlation Between groups***

Correlations

			Perception Creativity	Perception Dynamism	Perception Freedom	Multiple Solutions	Logical vs Emotional
1 Routinized	Perception Creativity	Pearson Correlation	1	.650**	.328*	.030	.435**
		Sig. (2-tailed)		<.001	.017	.831	.001
		N	52	52	52	52	52
	Perception Dynamism	Pearson Correlation	.650**	1	.527**	.016	.209
		Sig. (2-tailed)	<.001		<.001	.910	.137
		N	52	52	52	52	52
	Perception Freedom	Pearson Correlation	.328*	.527**	1	.180	.087
		Sig. (2-tailed)	.017	<.001		.203	.540
		N	52	52	52	52	52
	Multiple Solutions	Pearson Correlation	.030	.016	.180	1	.100
		Sig. (2-tailed)	.831	.910	.203		.479
		N	52	52	52	52	52
	Logical vs Emotional	Pearson Correlation	.435**	.209	.087	.100	1

		Sig. (2-tailed)	.001	.137	.540	.479	
		N	52	52	52	52	52
2 Un-Routinized	Perception Creativity	Pearson Correlation	1	.486**	.455**	.363**	.123
		Sig. (2-tailed)		<.001	<.001	<.001	.252
		N	88	88	88	88	88
	Perception Dynamism	Pearson Correlation	.486**	1	.586**	.230*	.184
		Sig. (2-tailed)	<.001		<.001	.031	.086
		N	88	88	88	88	88
	Perception Freedom	Pearson Correlation	.455**	.586**	1	.108	.266*
		Sig. (2-tailed)	<.001	<.001		.316	.012
		N	88	88	88	88	88
	Multiple Solutions	Pearson Correlation	.363**	.230*	.108	1	.021
		Sig. (2-tailed)	<.001	.031	.316		.849
		N	88	88	88	88	88
	Logical vs Emotional	Pearson Correlation	.123	.184	.266*	.021	1
		Sig. (2-tailed)	.252	.086	.012	.849	
		N	88	88	88	88	88

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

- ***Correlation Between groups***

Correlations

Control Variables				Perception Creativity	Perception Dynamism	Perception Freedom	Multiple Solutions	Logical vs Emotional
Routinized	-none-[a]	Perception Creativity	Correlation	1.000	.650	.328	.030	.435
			Significance (2-tailed)	.	<.001	.017	.831	.001
			df	0	50	50	50	50
		Perception Dynamism	Correlation	.650	1.000	.527	.016	.209
			Significance (2-tailed)	<.001	.	<.001	.910	.137
			df	50	0	50	50	50
		Perception Freedom	Correlation	.328	.527	1.000	.180	.087
			Significance (2-tailed)	.017	<.001	.	.203	.540
			df	50	50	0	50	50
		Multiple Solutions	Correlation	.030	.016	.180	1.000	.100
			Significance (2-tailed)	.831	.910	.203	.	.479
			df	50	50	50	0	50
		Logical vs Emotional	Correlation	.435	.209	.087	.100	1.000
			Significance (2-tailed)	.001	.137	.540	.479	.

			df	50	50	50	50	0
	Multiple Solutions & Logical vs Emotional	Perception Creativity	Correlation	1.000	.635	.332		
			Significance (2-tailed)	.	<.001	.019		
			df	0	48	48		
		Perception Dynamism	Correlation	.635	1.000	.531		
			Significance (2-tailed)	<.001	.	<.001		
			df	48	0	48		
		Perception Freedom	Correlation	.332	.531	1.000		
			Significance (2-tailed)	.019	<.001	.		
			df	48	48	0		
Un-Routinized	-none-[a]	Perception Creativity	Correlation	1.000	.486	.455	.363	.123
			Significance (2-tailed)	.	<.001	<.001	<.001	.252
			df	0	86	86	86	86
		Perception Dynamism	Correlation	.486	1.000	.586	.230	.184
			Significance (2-tailed)	<.001	.	<.001	.031	.086
			df	86	0	86	86	86
		Perception Freedom	Correlation	.455	.586	1.000	.108	.266
			Significance (2-tailed)	<.001	<.001	.	.316	.012

			df	86	86	0	86	86
		Multiple Solutions	Correlation	.363	.230	.108	1.000	.021
			Significance (2-tailed)	<.001	.031	.316	.	.849
			df	86	86	86	0	86
		Logical vs Emotional	Correlation	.123	.184	.266	.021	1.000
			Significance (2-tailed)	.252	.086	.012	.849	.
			df	86	86	86	86	0
	Multiple Solutions & Logical vs Emotional	Perception Creativity	Correlation	1.000	.432	.435		
			Significance (2-tailed)	.	<.001	<.001		
			df	0	84	84		
		Perception Dynamism	Correlation	.432	1.000	.561		
			Significance (2-tailed)	<.001	.	<.001		
			df	84	0	84		
		Perception Freedom	Correlation	.435	.561	1.000		
			Significance (2-tailed)	<.001	<.001	.		
			df	84	84	0		

[a]. Cells contain zero-order (Pearson) correlations.

- ***Linear Regression for Model 1***

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.032[a]	.001	-.006	.5589062

[a]. Predictors: (Constant), UnroutinizedDummy
[b]. Dependent Variable: Perception Creativity

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.044	1	.044	.142	.707[b]
	Residual	43.108	138	.312		
	Total	43.152	139			

[a]. Dependent Variable: Dependent Perception Creativity
[b]. Predictors: (Constant), UnroutinizedDummy

Coefficients[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	3.757	.078		48.476	<.001
Unroutinized[b]	.037	.098	.032	.377	.707

[a]. Dependent Variable: Dependent Perception Creativity
[b]. Unroutinized Dummy

- L*inear Regression for Model 2*

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.255[a]	.065	.058	.6103406

[a]. Predictors: (Constant), UnroutinizedDummy
[b]. Dependent Variable: Perception Dynamism

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.574	1	3.574	9.595	.002[b]
	Residual	51.407	138	.373		
	Total	54.981	139			

[a]. Dependent Variable: Dependent Perception Dynamism
[b]. Predictors: (Constant), UnroutinizedDum

Coefficients[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	3.600	.085		42.534	<.001
Unroutinized[b]	.331	.107	.255	3.098	.002

[a]. Dependent Variable: Dependent Perception Dynamism
[b]. Unroutinized Dummy

- ***Linear Regression for Model 3***

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.155[a]	.024	.017	.70088

[a]. Predictors: (Constant), UnroutinizedDummy
[b]. Dependent Variable: Perception Freedom

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.672	1	1.672	3.404	.067[b]
	Residual	67.790	138	.491		
	Total	69.462	139			

[a]. Dependent Variable: Dependent Perception Freedom
[b]. Predictors: (Constant), UnroutinizedDum

Coefficients[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	3.635	.097		37.395	<.001
Unroutinized[b]	.226	.123	.155	1.845	.067

[a]. Dependent Variable: Dependent Perception Freedom
[b]. Unroutinized Dummy

- ***ANCOVA: Perception of Creativity***

Levene's Test of Equality of Error Variances[a]

Dependent Variable: Dependent Perception Creativity

F	df1	df2	Sig.
3.305	1	138	.071

[a]. Design: Intercept + Multiple Solutions+ Logical vs Emotinal + UnroutinizedDummy

Tests of Between-Subjects Effects

Dependent Variable: Dependent Perception Creativity

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4.959[a]	3	1.653	5.887	<.001	.115
Intercept	30.154	1	30.154	107.374	<.001	.441
Multiple Solutions	2.237	1	2.237	7.967	.005	.055
Logical vs Emotional	2.469	1	2.469	8.792	.004	.061
UnroutinizedDummy	.002	1	.002	.005	.941	.000
Error	38.193	136	.281			
Total	2043.906	140				
Corrected Total	43.152	139				

[a]. R Squared = .115 (Adjusted R Squared = .095)

- ***ANCOVA: Perception of Dynamism***

Levene's Test of Equality of Error Variances[a]

Dependent Variable: Dependent Perception Dynamism

F	df1	df2	Sig.
13.921	1	138	<.001

[a]. Design: Intercept + Multiple Solutions+ Logical vs Emotinal + UnroutinizedDummy

Tests of Between-Subjects Effects

Dependent Variable: Dependent Perception Dynamism

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6.183[a]	3	2.061	5.744	<.001	.112
Intercept	37.620	1	37.620	104.846	<.001	.435
Multiple Solutions	.786	1	.786	2.192	.141	.016
Logical vs Emotional	1.719	1	1.719	4.791	.030	.034
UnroutinizedDummy	2.941	1	2.941	8.195	.005	.057
Error	48.798	136	.359			
Total	2084.950	140				
Corrected Total	54.981	139				

[a]. R Squared = .112 (Adjusted R Squared = .093)

- ***ANCOVA: Perception of Freedom***

Levene's Test of Equality of Error Variances[a]

Dependent Variable: Dependent Perception Freedom

F	df1	df2	Sig.
10.107	1	138	.002

[a]. Design: Intercept + Multiple Solutions+ Logical vs Emotinal + UnroutinizedDummy

Tests of Between-Subjects Effects

Dependent Variable: Dependent Perception Freedom

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4.934[a]	3	1.645	3.466	.018	.071
Intercept	35.342	1	35.342	74.487	<.001	.354
Multiple Solutions	.968	1	.968	2.040	.155	.015
Logical vs Emotional	2.165	1	2.165	4.563	.034	.032
UnroutinizedDummy	1.220	1	1.220	2.572	.111	.019
Error	64.528	136	.474			
Total	2066.438	140				
Corrected Total	69.462	139				

[a]. R Squared = .071 (Adjusted R Squared = .051)