The Influence of Social Atmosphere on Work Performance: An Examination of Creativity and Complex Problem-Solving

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ABSTRACT

The study conducted here is dedicated to the topic of how social atmosphere influences work performance when solving creative and complex problem-solving tasks. A total of 39 students from the Harz University of Applied Sciences were divided into two groups, each of which was presented with pleasant or unpleasant video stimulus material designed to create a corresponding social atmosphere. The students then completed a creative task and a complex problem-solving task. Items to validate the stimulus material showed that the intended social atmospheres could be reliably generated in both conditions. In the pleasant condition, the students mentioned significantly more and more creative ideas in the creative task. The complex problem-solving task was evaluated on several dimensions as well as using a category system. Results show that in the pleasant condition participants wrote significantly longer answers. In the unpleasant condition participants addressed the issue of time more often. Although only partial effects were found, results indicate that a deepening and broadening of the research subject could reveal worthwhile findings.

Keywords

Social atmosphere – complex problem-solving – creativity – work performance

1 Introduction

Employees are the main components of any organization. The success of a company relies on the effective performance of its employees. Therefore, addressing performance issues is a crucial matter that requires identifying the underlying causes to enhance employee performance. In numerous studies, it has been observed that the workplace environment, including factors such as office size, lighting, room temperature, acoustic conditions, and privacy, can impact both work performance and motivation (Block & Stokes, 1989; Boyce et al., 2006; Haka et al., 2009; Maher & von Hippel, 2005; Witterseh et al., 2004). Moreover, previous studies have indicated that mood and emotional states can also influence work performance. Specifically, there is a performance difference related to emotion regulation, with joy, for instance, favouring creative problem-solving (Starker, 2012). However, negative moods also have cognitive effects; for example, anger can lead to a decrease in logical, analytical, and differentiated thinking (Starker & von der Weth, 2014). The success of an organization heavily depends on the behaviour of employees (Wang et al., 2005). Characteristics such as environment, mood, and behaviour play a role in defining atmosphere.

Therefore, atmosphere, especially social atmosphere, as a holistic construct, plays a role in employee performance. Hence, the focus of this study is on how the social atmosphere influences the work output, especially in complex problem-solving and creative tasks.

1.1 Social Atmosphere

Prior to defining social atmosphere, it is necessary to establish a clear understanding of the concept of atmosphere. In everyday language, it is known that the experienced space is perceived as an atmosphere. Rauh (2018) therefore describes the two elements atmosphere is consisting of as Atmos and Sphere. Atmos is described as a subtle, elusive presence that moves and spreads between subjects, i.e., humans and objects as well as their surroundings (Rauh, 2018). Thus, Atmos could attempt to describe a potentially emotional or interpersonal dimension that is not directly tangible but rather has a palpable yet difficult-to-define existence. Sphere is described as a formal, clearly defined vessel through which presence is held together (Rauh, 2018). This indicates that the sphere has a distinct form, clearly delineated, and serves as a kind of container, shell, or space to enclose or preserve presence.

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The concept of atmosphere was developed as a theory in the phenomenology of the body by Hermann Schmitz and in the ecological aesthetics of nature by Gernot Böhme (Rauh, 2018). Böhme (1995) mentions various aspects that define atmosphere:

- Space (sphere) with a present presence (atmos)
- Shared reality between the perceived and the recipient
- Experience of presence
- Experience of what is perceived during the physical presence of people and objects or in a space
- Relationship between environmental qualities and human condition

These elements of Böhme's definition can also be found in the description of atmosphere by other authors. Kotler (1974) characterizes atmosphere as „the air that surrounds a sphere" (p. 50). Furthermore, he writes that atmosphere can colloquially be described as the quality of the environment. This suggests that atmosphere is always presumed to be a quality of the surrounding space. Becker (2004) further describes that atmospheric moments do not solely arise from the object, and they are not purely subjective projections. This statement suggests that the atmosphere of a situation is shaped by the specific mutual relationship between the acting subject and the involved objects (Becker, 2004). Furthermore, a distinction is made between the atmosphere as an object-related measurable combination of elements in the environment and the atmosphere as a subjectively perceived variable that arises in the mind (Uhrich, 2008). Similarly, Schmitz (2011) characterizes atmosphere as a „holistic, objective power of feeling" (p. 10ff), which individuals experience physically and thus are subjectively influenced. Wiedmann (2016) defines atmosphere as a measurable and object-related combination of specific environmental elements that an individual perceives in their entirety and subjectively processes them. Furthermore, according to Hermann Schmitz, the atmosphere is fundamentally perceivable and nameable in the same way for every person (1969). However, the atmosphere is subjectively perceived by each individual and can thus have different effects for each person (Schmitz, 2016). In coherence with these statements, Kotler (1974) had already highlighted the crucial aspect that atmosphere is perceived by everyone.

Additional important aspects of the atmosphere are the social situation of the people present, as well as the mood (Baker et al., 1994; Bierhoff & Müller, 1999, 2005; Grewal et al., 2003; Julmi, 2018; Müller, 2012). According to Julmi (2018) the atmosphere is significantly dependent on the shared social situation.

Individuals are engaged in various social contexts that not only determine which actions are currently appropriate but also influence the perception of the environment (Rauh, 2018). The perception of an environment as threatening, eerie, or disturbing occurs due to the specific situation from which the perception takes place (Großheim et al., 2014). Thus, the social atmosphere primarily depends on the shared social situation of those present and can accordingly be relaxed or tense. Furthermore, Russell and Snodgrass (1987) noted that the physical presence of another person is an important component of any environment. In the context of store atmosphere, for example, it has been found that the presence of multiple employees in a store helps customers perceive the wait time as shorter and judge it as more reasonable (Grewal et al., 2003). The finding implies that the visible presence of staff creates a more engaging and service-oriented atmosphere, potentially making customers feel attended to and reducing their perception of waiting time, leading to a more favourable judgment of the waiting experience as reasonable. Therefore, it can be concluded that the presence of more or less people in an environment can influence the perception of the atmosphere.

The perceived atmosphere can evoke emotional reactions that, in turn, can influence behaviour (Bitner, 1992). Russell, along with various colleagues, conducted a series of research on the systematic emotional responses to environments (Mehrabian & Russell, 1974; Russell & Lanius, 1984; Russell & Pratt, 1980; Russell & Snodgrass, 1987). In their studies, they found that the emotion-inducing qualities of environments are captured by two dimensions: pleasure-displeasure and degree of arousal, representing the amount of stimulation or excitement. In other words, any environment, whether natural or man-made, can be positioned in a two-dimensional space that reflects people's emotional response to that environment. Research findings suggest that the emotional response measured on these dimensions is capable of predicting behaviour regarding the environment. For example, people tend to invest time and money in environments that evoke positive moods (Donovan & Rossiter, 1982; Mehrabian & Russell, 1974), while unpleasant environments are avoided. Additionally, stimulating environments are perceived positively as long as this stimulation is not accompanied by discomfort (Mehrabian & Russell, 1974). In other words, unpleasant environments that are simultaneously highly stimulating (for example, through noise or confusion) are particularly avoided.

These results imply that the atmosphere is significantly dependent on the social situation shared by the people present. This suggests that the mood or environment in a particular space or context is heavily influenced by the social dynamics and relationships among the people present. Thus, the atmosphere is determined not only by the physical space but also by the social interactions, relationships between people, or the mere presence of individuals within that space. Therefore, the following six aspects of the atmosphere can be understood as central components of social atmosphere:

1. Social atmosphere is understood as a sphere with a present presence, indicating that it encompasses a space permeated by a tangible presence.

2. In the context of the physical presence of people and objects or in a space, the experienced atmosphere emphasizes that atmosphere is not only abstract but also concretely perceptible.
3. The perception of atmosphere as an experience of presence highlights that it is not only objectively measurable but also subjectively experienced by individuals.
4. Social atmosphere is also understood as a relationship between environmental qualities and human well-being, indicating a mutual interaction between the environment and the emotional states of people.
5. The atmosphere significantly depends on the shared social situation, influencing perception.
6. This perception triggers emotional reactions that can influence subsequent behaviour.

Drawing from the preceding literature, the following definition for social atmosphere can be summarized for the present study: Social atmosphere is understood as the relationship between environmental qualities and human well-being, indicating the mutual interaction between the environment and the emotional states of people.

However, the social atmosphere is not exclusively limited to social structures and defined groups but represents a temporary overall state based on the individuals currently present. The nature of the atmosphere significantly depends on the shared

1.2 Differentiation from Related Constructs

Related constructs to social atmosphere include social climate, work atmosphere, and group atmosphere. Social climate arises from the dynamic interactions of group members (Perreault et al., 2020). As for work atmosphere, it refers to the human work environment, which cannot be touched or seen but still exists (Davis, 1977). It includes behavioural patterns, attitudes, and feelings that are frequently displayed and make up the character of life in the organization (Dekawati, 2020).

Stringer (2004) characterizes the organizational work atmosphere as the totality of all elements within the work environment, experienced directly or indirectly by individuals present in that setting. Group atmosphere is an affective state similar to mood but refers to the group, not the individual (Bierhoff & Müller, 2005). It is the result of the shared social perception of several people of the same environment (Anderson & West, 1998). Past research has already been conducted on these constructs, examining the work performance of individuals. The results obtained by these studies indicate that, for instance, group atmosphere influences productivity (Dekawati, 2020), performance (Konar-Goldband et al., 1979), motivation (Stringer, 2004) and cooperative support (Bierhoff & Müller, 1999, 2005). Further research suggests that the physical workplace can influence employee satisfaction, productivity, and motivation (Becker, 1981; Davis, 1984; Donald, 1986; Steele, 1986; Sundstrom & Altman, 1989; Sundstrom & Sundstrom, 1986).

Unlike the mentioned constructs, social atmosphere is not limited to social structures and fixed groups such as colleagues or teams but is a temporary holistic state based on the people currently present.

Based on the literature, the created definition and the existing results related to similar constructs of social atmosphere, but acknowledging the research gap on social atmosphere, this report addresses the following research question: What impact does the social atmosphere have on work outcomes?

The hypotheses deduced from this research question are as follows:

H1: A pleasant social atmosphere has a positive impact on work outcomes.

H1a: A pleasant social atmosphere has a positive impact on creativity.

H1b: A pleasant social atmosphere has a positive impact on work outcomes in complex problem-solving.

2 Material and Methods

The research question was investigated using a quasi-experimental design with two conditions: a pleasant and an unpleasant social atmosphere. The manipulation of the social atmosphere was achieved through videos that were presented to each of the groups collectively. To collect the data an online questionnaire was used consisting of demographical data, measures to validate the experimental manipulation and the experimental tasks. For the validation of the experimental manipulation, the PANAS scale (Breyer & Bluemke, 2016) was used as an indicator for the emotional state as well as open text fields with the instructions to list three words associated with the situation on hand. Additionally, a scale was developed to measure the social atmosphere. The experimental tasks included a creative task where participants were instructed to name possible functions of a paper clip and a complex problem-solving task concerning a wildfire.

2.1 Sample

The survey was conducted with 39 students from two semesters of Hochschule Harz. 21 third semester students were allocated to the pleasant atmosphere condition while the unpleasant atmosphere condition consisted of 18 first year students. 77 % of the participants considered themselves to be female and 23 % male with an average age of 20.59 years (SD = 2.348) (Table 1).

Table 1: Demographics: Age.

	Full Sample		Group 1		Group 2	
	M	***SD***	***M***	***SD***	***M***	***SD***
Age	20.590	2.348	21.619	2.729	19.389	0.850

Note: N = 39 ($N_{group\ 1}$ = 21, $N_{group\ 2}$ = 18).

2.2 Stimuli

With the aim of participants to immerse in the social atmosphere, videos were chosen as stimuli. The videos were created specifically for this purpose intending to achieve a high external validity by using a familiar setting: students doing group work. The videos were created based on the results of a preliminary group discussion concerning the characteristics of pleasant and unpleasant social atmosphere. The results of the discussion concluded that pleasant social atmosphere is characterized by collaborative and respectful engagement among group members who acknowledge and appreciate each other's contributions and perspectives. The group members should maintain a calm and composed demeanour even in challenging situations and remain focused on the task at hand. Unpleasant social atmosphere is characterized by a lack of cohesion and understanding within the group represented as differences in communication styles and a failure to consider varying levels of expertise on the topic. Participants exhibit behaviours such as disengagement, withdrawal, or reluctance to communicate, resulting in frustration and inefficiency.

2.3 Validation

To validate the material used for the manipulation of the social atmosphere, the participants emotions were analysed using an adapted version of the German PANAS scale (Breyer & Bluemke, 2016) as the emotions of group members are closely related to the perception of social atmosphere (Bierhoff & Müller, 1999, 2005). The results indicate a successful manipulation through the videos. The first group, in the pleasant social atmosphere condition, is significantly more likely to express positive emotions, while participants in the unpleasant social atmosphere condition express significantly more negative emotions (Table 2).

The items were rated on a scale ranging from does not apply (1) to does apply (5).

As further validation, participants were asked to spontaneously name three words they felt described the video material they had seen best. The resulting words were sorted and rated according to their valence. Terms such as „team" or „friendly" were assigned a positive valence, while terms such as „tense" or „unpleasant" were considered negative. Based on this classification, a valence scale was designed ranging from three negative answers to three positive answers. Each participant was assigned a value on the scale. A t-test was then carried out to analyse group differences regarding the valence of the terms mentioned. Results show that in the group with a pleasant social atmosphere significantly more positive terms were mentioned (M = 5.143, SD = 1.389) compared to the group with an unpleasant social atmosphere (M = 1.611, SD = 0.778), $t(37)$ = 9.569, $p < .001$, d = .724.

Table 2: PANAS scale.

	Group 1		Group 2				*Cohens'*
	M	***SD***	***M***	***SD***	***t (37)***	***p***	***d***
pleased	2.667	1.065	1.944	1.110	2.701	.045	0.666
satisfied	3.524	0.928	2.500	1.339	2.729	.011	0.902
relaxed	3.667	0.966	2.333	1.085	4.061	.000	1.305
attentive	4.286	0.561	3.333	1.138	3.231	.004	1.089
angry	1.524	1.030	3.000	1.572	-3.406	.002	-1.129
annoyed	2.134	1.108	3.444	1.464	-3.155	.003	-1.013
irritated	2.286	1.146	3.222	1.353	-2.341	.025	-0.752
nervous	1.619	0.805	2.889	1.278	-3.641	.001	-1.211

Note: N = 39 (N_{group1} = 21, N_{group2} = 18); only items with significant results shown.

Table 3: Scale social atmosphere.

Items	Source	Item Statistics	
		M	*SD*
If there is an unpleasant atmosphere during group work, it bothers me.	Happ & Pfetsch, 2018	4.49	0.644
When I see people feeling uncomfortable in situations, I can relate.	Happ & Pfetsch, 2018	4.23	0.536
I consider the emotions my messages as emails or chats may evoke in others.	Happ & Pfetsch, 2018	4.26	0.677
In a pleasant work atmosphere, I can focus better on my tasks.	Frese, Greif, & Zapf, 1997	4.72	0.510
If I don‘t feel comfortable in my surroundings, I find it hard to solve complex tasks.	Frese, Greif, & Zapf, 1997	4.13	0.615
Working in tense environments blocks my creativity.	Frese, Greif, & Zapf, 1997	4.26	0.751
I am influenced by the mood in group work.	Frese, Greif, & Zapf, 1997	3.82	0.854
The presence of certain individuals creates an unpleasant atmosphere.	Happ & Pfetsch, 2018	3.97	0.959
In some situations I feel like I‘m criticized for every little thing.	Happ & Pfetsch, 2018	2.41	1.186
Communication among each other influences the prevailing atmosphere.	Frese, Greif, & Zapf, 1997	4.67	0.478
Sometimes, there are difficulties in coordinating with group members.	Frese, Greif, & Zapf, 1997	3.95	1.050

Note: The items were rated on a scale ranging from does not apply (1) to does apply (5), Cronbachs Alpha = .546 (N = 39).

As a third mean of validation, an item battery was designed based on items from the Media-based Empathy Scale (Happ & Pfetsch, 2018) and the Workplace Social Stressor Scale (Frese, Greif & Zapf, 1997). The items were adapted to represent the research topic of social atmosphere (Table 3). Cronbach's Alpha was used to analyse the reliability of the newly formed scale. With $\alpha = .546$, the newly constructed scale does not reach an acceptable range. None of the items show significant differences between the groups.

2.4 Experimental Tasks

In the creative task, participants were instructed to name functions of a paper clip. The results were evaluated on two levels. Firstly, the number of ideas mentioned by each participant was analysed and compared between groups. Secondly, the uniqueness of the ideas was evaluated by implementing a scale rating the answers by frequency. It ranges from zero indicating the idea was mentioned more than five times, to five indicating the idea was mentioned once.

To evaluate the participants' ability to solve complex problems, a task was designed which met the criteria of being realistic as well as complex according to Dörner (1984). In the task the participants were put into the role of being the major and head of the fire department of a town in the woods who is confronted with a wildfire (). Their task then was to describe the steps they would take to combat the fire. The answers were evaluated regarding different aspects.

Table 4: Complex problem-solving task: Dimensions.

Dimension	Scale	Description
Level of detail	Not detailed at all (1) – very detailed (5)	Number of aspects considered, depth of description, subcategories mentioned
Structure	Not structured at all (1) – very structured (5)	Use of bullet points, chronological order, ordered by prioritisation
Forethought	Not far-sighted at all (1) – very far-sighted (5)	Long-term orientation, anticipation and consideration of possible problems
Social	Not social at all (1) – very social (5)	People considered, care for those affected, communication, team work

Note: Responses were rated on the scales by the consensus of three experimenters considering the parameters in the right column.

Firstly, the length of the answers was examined by character count and compared between groups. Additionally, the answers were analysed by the following dimensions: level of detail, structure, forethought and social. For each dimension the answers of the participants were ranked on a scale ranging from one (not at all) to five (very much) (Table 4).

To further assess the content of the responses, they were colour coded following an a priori coding system based on input of members of the fire brigade. During the assessment, the coding system was continuously adapted to the answers given by the participants. The final categories can be found in Table 5. To further examine the scope of the responses, the count of the mentioned categories was analysed and compared between groups.

Table 5: Complex problem-solving task: Categories coding system.

Category	*Description*
Location	Includes the accessibility of the area of operation via roads, bridges, railway tracks or the ground.
Threat	Includes potential damages or threats to humans, housing, animals and nature.
Impairment	Describes disruptions to traffic on roads and railways as well as disturbance of nature.
Area	Refers to the nature of the ground as well as the size and scope of the area where the fire is located.
Material	Focusses on the necessary equipment such as hoses, axes or clothing for the helpers.
Size	Encompasses the size of the area affected by the wild fire as well as how far it has spread.
Supply	Refers to the supply of firefighters with water, emergency personnel with food and other materials, and residents with shelter, food and medical and psychological care.
Weather	Refers to the influence of wind through its direction and strength, the occurrence of rain or thunderstorms and other weather phenomena.
Time	Focusses on the urgency of action in terms of aspects such as speed of fire, danger to people and the environment and uncontrollable factors such as weather or time of day.
Procedure	Describes strategic action in the form of agreements with those responsible, the division of operational areas and instructions for helpers.
Who & how	Describes the responsibilities of organisations such as the fire brigade, the Federal Agency for Technical Relief (THW), the German Red Cross (DRK) or external third parties. Particular attention is paid here to the coordination, infrastructure and (technical) possibilities and skills of the individual parties involved.
Technology	Describes which technical aids are required for an overview of the situation and how communication between those involved takes place. Which tools are used for extinguishing and fighting fires and how the rescue, evacuation and care of people and animals can be technically guaranteed. This category also includes emergency vehicles, aeroplanes and helicopters.
Communication	Focusses primarily on the dissemination of information to the population and the responsible authorities and agencies. This assesses how transparent information about the current situation is for the outside world.
Aftercare	Deals with aspects of care after the fire has been fought: What humanitarian supplies are needed, what form of psychological or medical care is required and how injured animals need to be treated are considered here.
Laws	Describes how applicable laws, guidelines and existing emergency plans are observed and implemented.

Note: Responses were allocated to the categories by the consensus of three experimenters following the descriptions above.

3 Results

This section provides the empirical outcomes derived from the comparison of participants in a pleasant social atmosphere with participants in the unpleasant social atmosphere condition concerning their creativity and ability to solve complex problems.

To evaluate the influence of social atmosphere on creativity, the number of ideas per participant was compared as well as the uniqueness of the mentioned ideas. In terms of the number of ideas generated, the first group in the pleasant social atmosphere condition generated significantly more ideas (M = 6.67, SD = 3.715) than the second group in the unpleasant social atmosphere condition (M = 4.556, SD = 1.98), U = 265, p = .031. The effect size according to Cohen (1992) is d = .724, indicating a medium to high effect. The same effect is apparent regarding the uniqueness of the ideas mentioned. Under a pleasant social atmosphere, group 1 (M = 11.7, SD = 14.136) generated significantly more unique ideas than group 2 in an unpleasant atmosphere (M = 4.167, SD = 4.973), $t(37)$ = 2.151, p = .038, d = .689.

The analysis of the impact of the social atmosphere on the participants' ability to solve complex problems included the comparison of dimensions depicting the response style and strategies of the participants as well as the comparison of the content of the answers by analysing the categories mentioned. In assessing the response style and strategies the answer length was analysed. The analysis shows a α = .1 significant difference between the groups (U = 255, p = .065) indicating that in a pleasant social atmosphere participants write more (M = 541.905, SD = 228.437) than in an unpleasant social atmosphere (M = 442.056, SD = 200.179). The effect is considered small (d = .462). The analysis of the dimensions level of detail, structure, forethought and social provided no evidence for a significant difference between the two groups (Table 6).

Responses were rated on the scales by the consensus of three experimenters considering the parameters in the right column.

The count of the mentioned categories validates this result, showing no significant difference between a pleasant (M = 8.762, SD = 2.914) and unpleasant social atmosphere (M = 7.556, SD = 2.684), U = 245.5, p = .112.

To analyse whether the content of the responses differs between groups, it was compared how often each category was mentioned in each group. Under both circumstances, a pleasant and an unpleasant social atmosphere, the content regarding the mentions of the categories location, threat, impairment, area, material, size, supply, weather, procedure, who & how, technology, communication, aftercare and laws did not significantly differ (Table 7). Only the category time shows a difference on a α = .1 significance level indicating that in an unpleasant social atmosphere time is referred to more often (M = 0.095, SD = 0.301) than in a pleasant social atmosphere (M = 0.333, SD = 0.485), $t(37)$ = -.871, p = .069. The effect is considered medium (d = -.601).

Table 6: Results complex problem-solving task: Dimensions.

	Group 1		Group 2				*Cohens'*
	M	***SD***	***M***	***SD***	***U***	***p***	***d***
Answer length	541.905	228.437	442.056	200.179	255	.065	.462
Level of detail	3.333	1.317	3.222	1.114	202.5	.703	.09
Structure	2.286	1.586	1.944	0.873	196	.848	.262
Forethought	2.714	1.384	2.833	1.150	176	.716	-.093
Social	2.905	1.375	3.000	1.188	184	.896	-.074

Note: N = 39 (N_{group1} = 21, N_{group2} = 18).

Table 7: Results complex problem-solving task: Categories Coding System.

	Group 1		Group 2				Cohens'
	M	*SD*	*M*	*SD*	*U*	*p*	*d*
Category count	8.762	2.914	7.556	2.684	245.5	.112	.429
Location	0.095	0.301	0	0	207	.197	.446
Threat	0.571	1.076	0.667	0.767	159	.339	-.103
Impairment	0.190	0.402	0.056	0.236	214.5	.224	.407
Area	0.048	0.218	0.056	0.236	187.5	.941	-.035
Material	0.429	1.326	0.222	0.548	193.5	.866	.204
Size	0.095	0.301	0.056	0.236	196.5	.669	.144
Supply	0.762	1.375	0.222	0.548	217.5	.285	.516
Weather	0.095	0.301	0	0	207	.197	.446
Time	0.095	0.301	0.333	0.485	144	.073	-.601
Procedure	1.619	1.627	2.056	1.434	149.5	.260	-.285
Who & how	1.762	1.578	1.722	1.179	179.5	.792	.029
Technology	2.000	1.183	1.611	0.979	222	.339	.358
Communication	0.857	0.793	0.500	0.618	236.5	.143	.502
Aftercare	0.048	0.218	0	0	198	.382	.311
Laws	0.095	0.436	0.056	0.236	188	.971	.111

Note: N = 39 (N_{group1} = 21, N_{group2} = 18).

4 Discussion and Conclusion

The results show that a pleasant social atmosphere under the conditions and tasks investigated here can tend to have a positive influence on the work results of the respondents, which is noticeable to varying degrees depending on the type of task. The work performance in relation to the creativity tasks set differs significantly between the groups analysed in the two social atmospheres studied. After the presentation of the pleasant stimulus material, the group in the pleasant condition had significantly more and significantly more creative ideas in relation to their rating on the creativity scale designed by the researchers. This corresponds to the assumptions of hypothesis *H1a*, according to which it was assumed that a pleasant social atmosphere has a positive influence on creativity. Regarding hypothesis *H1b*, according to which it was assumed that a pleasant social atmosphere has a positive influence on work results when solving complex problems, important partial findings were obtained. Participants in the pleasant condition provided significantly longer answer texts when answering the complex problem-solving task compared to the unpleasant condition. No significant effects could be demonstrated for other dimensions used to evaluate the answers (see Table 6).

4.1 Limitations

It should be noted that this is a very small, specific and unrepresentative sample of students from the Harz University of Applied Sciences. The requirement of the central limit theorem, according to which a normal distribution of the mean values in the sample can be assumed if the individual experimental groups correspond to at least n = 30 (Bortz & Schuster, 2010), is not fulfilled. The Shapiro-Wilk test to determine the normal distribution showed that a normal distribution cannot always be assumed for the analysed groups. The resulting main application of the non-parametric Mann-Whitney U-Test therefore indicates a greater robustness of the findings, but the statistical significance of the results generated here is lower compared to parametric methods based on a normal distribution assumption (Bortz & Schuster, 2010).

As the stimulus material was only presented once in each of two different semesters, the evaluation of the demographics revealed clear group differences. Students from the higher semester, who were in the condition of the pleasant social atmosphere, were older compared to the first semester students in the unpleasant social atmosphere and may have more experience with participating in experiments and surveys due to their advanced academic achievements (Table 1). This experience could reduce possible distortions, such as social desirability, compared to the respondents in the first semester.

In addition, the sample of prospective and experienced business psychology students selected here is severely limited in its transferability to work situations outside the university context. The results of the PANAS scale (Breyer & Bluemke, 2016) and the creativity task showed a high level of validity for the stimuli specially designed for the experimental setting of student group work. However, these research results do not answer the question of how the social atmosphere in other contexts of social settings affects work performance or whether the stimulus material can achieve the same validity there. For example, the characteristics of group work previously identified in the focus group could vary among colleagues in an entrepreneurial context. For the investigation of other settings outside the Harz University of Applied Sciences, renewed qualitative research with people from the intended target group would therefore be necessary to design the stimulus material accordingly.

In addition, the survey situation is a factor that could have influenced the quality and scope of the answers given. The experiment was carried out in both groups in the last 20 minutes of a 90-minute course. Therefore, it cannot be ruled out that some students were already mentally exhausted or were unable to concentrate sufficiently on the tasks assigned to them as they were looking forward to their lunch break. To minimise such influences in future research, a controlled test environment should be used. In addition, it could be beneficial for the quality of the responses if future experiments of this type were announced in advance to minimise the possible time and performance pressure caused by surprise effects.

Corresponding adaptation to varying contexts would also be necessary for the scale for measuring atmosphere. The items adapted from Happ & Pfetsch (2018) and Frese, Greif and Zapf (1997) achieved poor values in terms of their reliability with Cronbach's alpha, which is why a general revision is recommended for further research. In terms of content, the items focus on traits, i.e. characteristics of individuals that are stable over time and change only slightly and slowly over time (Montag, 2016).

Situational and temporally variable states are not asked about in detail. This could be a possible explanation for the lack of significant differences between the groups: In the long run, sensitivity to the prevailing social atmosphere does not differ regardless of which context-specific atmosphere the participants are in. Significant differences could then indicate that a group would have a fundamentally different sensitivity to the social atmosphere, which would require further investigation.

The open-ended naming of three terms spontaneously associated with the stimulus material has proven to be a meaningful item for validating the stimulus material. However, it should be noted, also for the further evaluation of the complex problem-solving task, that the classification of the valence of the terms in an independently designed scale and the categorisation into neutral terms is highly susceptible to the subjectivity of the researchers. For the German language area, the researchers were able to clearly categorise the terms into positive or negative valences as well as neutral answers. However, the linguistic and cultural meaning of individual terms and their connotation could vary interculturally and thus lead to different classifications and results.

Nonetheless, the assessment of creative tasks could also be easily transferred to other subject areas. By using the number of mentions as a basis for evaluation, the evaluation scheme can also be used for other types of (creative) tasks in which the number of answers given is decisive.

About the complex problem-solving task set, the selected evaluation dimensions and categories are subject to various factors such as the selected scenario topic and its content as well as the researchers' factual knowledge in this area. Based on the important aspects assumed by the researchers, a provisionally used rating system was developed. Although this system was developed by consensus between the researchers, the categorisation system itself and the allocation of the answers given remain very subjective and susceptible to bias. To counteract content bias, the categories were expanded and concretised based on the contributions of two firefighters. In addition, the system was further expanded based on the analysed answers to the complex problem-solving task. Although this increases validity, it is still possible that the selected and subsequently adjusted categories do not fully represent the answers given. As the evaluation of the responses is based on the subjectively designed evaluation system, it cannot claim to be objective or standardised. This circumstance limits the comparability of the results and the transferability to other settings outside the selected complex problem scenario or samples.

The scenario of a forest fire was used for this study, as such situations have occurred several times in the Harz region in the past. This should make it easier for respondents to answer the complex problem-solving task, as there may be initial practical points of contact with the topic. Nevertheless, it was assumed that all respondents had a similar level of knowledge in relation to the selected scenario. This was to ensure that the focus was on the ability to solve complex problems and that existing prior knowledge was not used exclusively as the basis for answering the task. It is true that individual students can contribute more specialist knowledge through their experience in the volunteer fire service or similar organisations. However, there was no significant difference between the groups in the assessment dimensions

of structure, depth of detail or foresight due to the possible prior knowledge of some respondents (see Table 6). The topic of forest fires remains very specific. It is therefore possible that the respondents attempted to solve the complex problem-solving task less intensively due to a lack of knowledge or a general lack of interest in the subject area. This could be a possible explanation for the fact that the answer length dimension in this study did not show any significant difference between the groups.

4.2 Implications for Further Research

To be able to further analyse the effect of the social atmosphere on work performance in other settings, a larger and preferably representative sample should be used in the future. It would also be possible to continue investigating specific settings or to collect overarching data by using a panel. By choosing a complex problem-solving task that is less based on regional events, participants can approach the task more freely and are not reliant on experience or memories. In addition, it could prove advantageous in future studies to evaluate the participants' level of experience with the respective complex problem scenario. In this way, confusion between factual knowledge from experience and intuitive solution ideas can be reduced. In addition, such a survey would make it possible to compare experts with each other and to analyse them in more detail.

In this study, the creativity task and the assessment dimensions of time (see Table 5 for a more detailed explanation of the category) and text length proved to be particularly promising. As significant effects have already been demonstrated in relation to these dimensions and criteria, replication of the research in other settings would be promising. It could also be investigated what influence the social atmosphere has not only between employees, but whether there are also influences from hierarchies within the company. For example, cooperative work performance between employees and superiors could be investigated in more detail.

The construct of social atmosphere offers great potential for further investigations. This research merely represents a first step in exploring the impact of social atmosphere on work performance in a university context. The investigation of this effect should not be limited to the context of work performance but can and should also be investigated for other settings, target groups and dependent target variables in the future. This offers the opportunity to expand and concretise the definition of social atmosphere conceived and used here and to investigate further effects of social atmosphere, also in relation to other affective atmospheres.

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