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Creativity Unlocked *and* Locked Down: Different Creative Activities Differently Affected by Restrained Social Interactions During the COVID-19 Pandemic

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ABSTRACT

Both social interaction and the lack thereof have been discussed as being beneficial for creativity. Strikingly, in both cases there seems to be an implicit assumption that different creative activities are all influenced in the same way. However, the idea that different creative behaviors are all equally influenced by social interaction seems not reasonable (e.g., poem writing *vs*. singing a song at a family celebration). The reduction in social contacts in Germany during the coronavirus pandemic offered a unique opportunity for a field experiment with high ecological validity. To explore how different creative activities are each influenced by reduced social interaction, 130 participants were asked in an online survey using a proxy pretest design about the frequency of everyday creative activities before and during the core episode of social distancing. The change in frequency for performing a given creative activity depended on the frequency at baseline, but not in a linear manner. Instead, the relationship was u-shaped: creative activities most frequently performed at baseline showed an increase in frequency, creative activities of medium frequency at baseline decreased, and the least frequent activities changed the least. In particular, activities represented by "Personal Environment Creativity" increased in frequency, while activities represented by "Self-Expressive Creativity" decreased in frequency during lockdown. Recalling the four p's of creativity, it is accepted that the person aspect differs between domains. It is therefore surprising that we commonly assume press-level features work the same way across all domains, which is challenged by the current study.

KEYWORDS:

social interaction, everyday creativity, creative domains, environment, creative press

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Is social interaction a benefit or a hindrance for creativity? A remarkable, albeit ambiguous answer to this question can be found in the historic case of the "Hutchinson Internment Camp" on the British Isle of Man during the Second World War. Austrian and German refugees suspected of being part of a "fifth column" were relocated to the camp. While being isolated from the rest of the island, let alone Britain, the enforced conflation and interaction within the camp led to a flourishing of creative activity (Parkin, 2022).

Quantitative research has fortunately targeted the question of whether social interaction is associated with creativity. Although not labelling social interaction as such, a meta-analysis (Porter, Keith, & Woo, 2020) provided some insights, because it evaluated studies examining the influence of social networks on creativity. Among the factors investigated, the size of an individual's social network (or degree centrality) can be interpreted as a fair approximation for the quantity of social interaction and the strength of an individual's network (or strong ties) as an approximation for the quality aspect of social interaction. The meta-analysis (Porter, Keith, & Woo, 2020) showed that both a high number of close contacts and overall network size were associated with people's engagement in the creative process. [The latter is reminiscent of everyday creativity, which is about the personal experience during the process of being creative (Moran & John-Steiner, 2003)]. Thus, the meta-analysis (Porter, Keith, & Woo, 2020) strongly indicated that social interaction, and not solitude, are important for creativity.

The effects of the COVID-19 pandemic on social interaction

However, the COVID-19 pandemic forced people around the world to reduce their social contacts. Especially in 2020, governments imposed curfews or restricted public life, trying to constrain social contact between individuals. This led to a decrease in both the quality of social contacts and the quantity of interactions (Lampraki et al., 2022), making solitude a characterizing experience of lockdowns (Banerjee and Rai, 2020). Surveys of representative samples indicated a high burden of loneliness during lockdowns (Killgore et al., 2020; Li & Wang, 2020), with an increase in loneliness especially among women and younger adults (Bu, Steptoe, & Fancourt, 2020). Populations in countries with a comprehensive welfare system have been less affected (Geirdal et al., 2021).

Concerning Germany, similar effects of the lockdown have been reported. For example, reducing contacts was perceived as the most restrictive of 33 measures surveyed to combat the pandemic, including aspects of life such as distancing, traveling, or retail/services (Modersitzki et al., 2021). Furthermore, five out of the ten most restrictive measures, as perceived, concerned social distancing. In consequence, the needs of Germans for social support and social interaction at the workplace were significantly higher than the amount supplied (Breetzke & Wild, 2022). The change in social interaction was also reflected in online behavior. The number of pageviews for the term "Einsamkeit" (loneliness) changed on German Wikipedia during that time. The daily average of 115 pageviews in the time from February 17th to March 17th, 2020 increased to an average 157 pageviews per day from March 18th to April 17th. It seems reasonable to assume, that the degree of social interaction was considerably affected in Germany.

Creativity during the COVID-19 pandemic

Paradoxically, despite the reduction of social contacts during the pandemic and the importance of social interaction for creative process behavior (or everyday creativity, respectively, see Porter, Keith, & Woo, 2020), a review and an editorial letter summarized ample evidence that everyday creativity increased during the COVID-19 pandemic (Elisondo, 2022; Tang, Reiter-Palmon, & Ivcevic, 2022).

For instance, Hofreiter et al. (2021) found that positive emotions could directly lead to an increase in creativity in some everyday activities, while in circumstances of activating negative mood, motivation intervened to enable the link to creativity. Affect was also relevant in a study by Loópez-Persem et al. (2022). They investigated changes in creativity during the first lockdown of the COVID-19 pandemic and found that positive changes were linked with more time availability, more motivation, or the need to solve a problem, while negative changes were related to negative affective feelings or a lack of resources or opportunities.

In a daily diary study (Karwowski et al., 2021), students engaged slightly more in creative activities during the lockdown compared to the pre-pandemic period. This indicates that the lockdown may have provided more opportunities or motivation for engaging in creative activities. The pre- and during-lockdown comparison was similarly the focus of Mercier et al. (2021). They observed a significant increase in everyday creativity during lockdown, but not in professional creativity. Their results suggested that participants with a lower baseline creativity before lockdown benefited more from the situation than those with a higher initial baseline creativity.

In contrast to the meta-analysis into social networks mentioned earlier (Porter, Keith, & Woo, 2020), these studies highlighted the positive effects of social distancing on creativity. Outside of the context of the COVID-19 pandemic, there has been research supporting the idea of a beneficial effect of solitude on creativity. Individuals from the general population named creative activities as the third most frequent category of possible activities when they are in solitude (Ishanov, Osin, & Kostenko, 2018). Among creative professionals, qualitative studies on writers (Bales, 1998) and video game workers (Gong & Xin, 2019) similarly suggested that solitude promotes the emergence of creative works. Additionally, everyday creative activity is associated with being autonomously creative, that is, independent from the support by the social environment (Form, Schlichting, & Kaernbach, 2017).

The effect of social interactions for different creative activities

A possible explanation for the divergence between the studies emphasizing solitude or social interaction, respectively, as beneficial might be the sampling of different creative activities, which may react differently to changes in social environment. In fact, there seems to be an implicit assumption in the literature that different creative activities are all influenced in the same way. However, the idea that different creative behaviors are all equally influenced by social interaction seems not reasonable. Writing a short story is possible in private, but singing a self-composed song at a family celebration is impossible without social interaction. The relationships might be more

complex for other everyday creative activities. For example, if large family gatherings are prohibited during a lockdown, one won't perform a puppet theatre for one's grandchildren, but one can still do so for one own's offspring.

Research into the influence of environmental effects, or the "press," on creativity has a long history (e.g., Christie, 1970). This branch of research has investigated the influence of different kinds of environments on single domains or specific areas such as working climate, class climate in education, or divergent thinking (Hunter, Bedell, & Mumford, 2007; Ma, 2009). While there has been some awareness in theory that environmental components of creativity vary across different domains (Jordanous & Keller, 2016), empirical creativity research has rarely explored the possibility that different domains may require different "presses."

Among the few exceptions to this pattern, a study found differing family environmental presses for exceptional giftedness in different domains (Albert & Runco, 1985). Another study observed that expected evaluation had a negative impact on students' scientific creativity, but it positively influenced their artistic creativity (Xue et al., 2020). Most recently, a meta-analysis showed that the same environmental factor does affect creativity in different domains differently (Liu et al., 2022).

In conclusion, while much research has focused on identifying the factors that influence creativity, it is important to consider that the same environmental factor or press can have different effects in different creative domains.

The present study

The present study examined this possibility for social interaction as an environmental press. The reduction in social contacts ("social distancing") enforced by authorities in Germany during the pandemic offered a unique opportunity to investigate the influence of social interaction with high ecological validity. This was examined by two approaches. First, it compared different individuals in distinct conditions or compared the same individuals at different points in time, respectively. Second, it compared a creative activity like painting at baseline with its change in a new condition. More precisely, the frequency of an activity in the sample before lockdown condition (baseline) was put into relation to its change under constrained social interaction due to lockdown. While creative activities should vary in frequency in the sample at baseline, this shouldn't depend systematically on social factors. Conversely, the increase in frequency of an activity should be influenced by constrained social interaction. For example, activities involving social interaction should generally decrease no matter how frequently they were previously performed. The frequency of an activity at baseline should therefore *not* be systematically associated with its absolute change. To falsify this, the change in frequency of activity was regressed on the frequency of a creative activity at baseline.

While much research has focused on identifying the factors that influence creativity, it is important to consider that the same environmental factor or press can have different effects in different creative domains. The present study aims to examine this possibility for social interaction as

an environmental press, using the unique opportunity provided by the reduction in social contacts during the COVID-19 pandemic.

METHODS

Power analysis

To determine the necessary sample size, a power analysis (Faul, Erdfelder, Lang, & Buchner, 2013) was carried out assuming an alpha significance criterion of .05 (two-tailed), and a standard power criterion of 80%. For the expected effect size, a recent meta-analysis (Porter, Keith & Woo, 2020) was used as a guide, because it related factors of the social environment to creativity, like the present study. Factors that did have an influence on creativity were in the range of $r = .21$ to .35. Thus, an effect size of about $r = .26$ (or $f^2 = .0725$ for that matter) was expected. Calculation with these parameters resulted in a necessary sample size of $N = 111$.

Sampling

Participants were recruited via SociSurvey (https://www.soscisurvey.de/), a tool for creating and conducting online surveys in which the participants can give their answers anonymously. The link to the study was published on Thesius (https://www.thesius.de/), an online platform, where one can participate in a raffle in exchange for study participation. Additionally, the link to the study was published on SurveyCircle (https://www.surveycircle.com/). Its basic principle is, the more one supports others' studies, the higher one's own study ranks in a listing of offered studies on the platform, leading more people to take part in one's study.

Data acquisition started on March 30th, 2020, 17 days after universities, colleges, schools, and day-care centers were closed (see Infobox: Timeline of actions taken for mitigation). Data acquisition ended on April 20th, 2020 at which time restrictions were eased by the German government.

Screening and participants

One hundred and sixty-two individuals completed the survey. To control for quality of data, the speed of responding was applied as an indicator for fast test completion due to careless responding as suggested by Leiner (2019). Speed of responding is a variable automatically recorded by the SociSurvey platform. It is used to calculate an index or score for fast responding or low questionnaire completion time, respectively. Extreme outliers (> Q1 - 3 * IQR) for this score were accordingly excluded ($n = 9$). Additionally, outliers for high creativity either before or during the pandemic were also excluded ($n = 6$).

Finally, among the creativity items for baseline and under social distancing, there was in both cases an item asking how often a participant engaged in team sports. The comparison of these two items served as a kind of manipulation check: If a participant's frequency for engaging in team sports has increased, the participant was considered as not bothering about governmental restric-

tions or social distancing. The respective individuals were omitted from data analysis (n =17). This resulted in 130 participants for whom data were analyzed (31.2% males). The mean age was 28.0 years (18–58 years, SD = 8.2).

Design

Participants responded in an online survey using the so-called recollection proxy pretest design about the frequency of everyday creative activities before social distancing (baseline) and during the core episode of social distancing. In other words, creativity was measured at baseline from recollection and during the pandemic.

For creativity at baseline and during distancing, there were different preceding instructions for each assessment. Participants were asked for creativity at baseline to think of two typical weeks in January and February and how many times they performed the respective behavior, that is, reported from recollection. For creativity during social distancing, the CBI was preceded by an instruction asking how many times each behavior was performed during the last two weeks. Different time references at two measurement points with one being in retrospect have been also used in other studies examining the effects of the COVID-19 pandemic (e.g., Alt, Reim, & Walper, 2021; Tang et al. 2022).

Self-reported creativity

Creativity at baseline and during social distancing were both derived from a self-report measure, the German translation (Form et al., 2017) of the short form (Dollinger, 2003) of the Creative Behavior Inventory (CBI; Hocevar, 1989). The original 28-item questionnaire asks for common creative behaviors and how often they were performed in the past. Participants rate items in frequency on a 5-point ordinal scale.

Given the short time period under consideration (two weeks), the CBI was adapted in two ways. First, the wording of some items was changed to reflect engagement in the creative process instead of having a creative product finished within the two weeks of interest. For example, "I created a sculpture" was changed to "I worked on a sculpture."

Second, considering the short time span of two weeks, it was anticipated that some creative activities might not occur frequently enough to be captured accurately. Therefore, the six most rarely performed behaviors in an earlier study (Form et al., 2017) were replaced by five other activities, which were *a priori* assumed to occur more frequently within a two-week period. For instance, "I wrote a play" was replaced with "I made a short video clip and shared it on social media." This adjustment was made to ensure that the frequency of creative activities reported by participants would be representative of their creative engagement during the specified period. The resulting 27 items were presented in randomized order.

No psychometric pre-testing of the instrument or an expert review were conducted, because sampling was scheduled to start about two weeks after the first major mitigations began, at a time when institutions and society as a whole were struggling to cope with the situation. Having said

that, the reliability in terms of Cronbach's alpha can be interpreted as excellent for creativity at baseline with .97 and for creativity during social distancing with .95.

Subscales

Besides the regression analysis, the average changes in frequency for each of the 27 creative activities across all individuals were examined. To determine the absolute change in frequency of a given activity, its frequency during lockdown was subtracted from its frequency at baseline for a given individual. The mean for the respective activity was calculated across all individuals. Then, 27 means (before lockdown) were compared with their 27 counterparts (during lockdown). The creative activity with the highest increase was "I redesigned or beautified a part of my apartment/house." The creative activities with the strongest decrease were "I drew a picture for aesthetic reasons" and "I prepared and gave a speech." Among the nine activities with the strongest decrease, a scale was constructed by eliminating items based on corrected item-total correlation until three items remained. This scale was referred to as "Self-Expressive Creativity" (Cronbach's $\alpha = 0.56$). A similar approach was applied to the nine activities with the strongest increase to construct a second scale, referred to as "Personal Environment Creativity," with three items (Cronbach's $\alpha = .64$).

RESULTS

A regression analysis was performed to examine the relationship between the frequency of a creative activity during lockdown and its change in frequency. Contrary to expectations, baseline frequency was found to predict absolute change (corrected $R^2 = .41$, $\beta = .65$, $p < .001$). However, explorative plotting suggested a curvilinear relationship. This relationship is illustrated in Figure 1, where each data point represents a different creative activity. The x-axis represents the baseline frequency of each activity, while the y-axis represents the absolute change in frequency during the lockdown.

A u-shaped pattern emerged when considering the activities in order of increasing baseline frequency. While the x-axis and, thus, the frequencies reflect continuously distributed data, it might be split into three rough sections for the sake of simplicity. Activities with a low baseline frequency (left side of the 'U') or high baseline frequency (right side of the 'U') tended to be unchanged in frequency during the lockdown or increase in frequency, respectively. In contrast, activities with a medium baseline frequency (bottom of the 'U') tended to decrease in frequency. This pattern suggested that the impact of social distancing on creative activities was not uniform. Instead, it varied depending on how frequently the activity was performed prior to the lockdown. Activities performed very frequently before the lockdown were more likely to be performed even more often during the lockdown, while activities of medium frequency were performed less often.

This u-shaped relationship was statistically significant. A regression analysis with the square of the baseline frequency as a predictor explained a substantial portion of the variance in the change

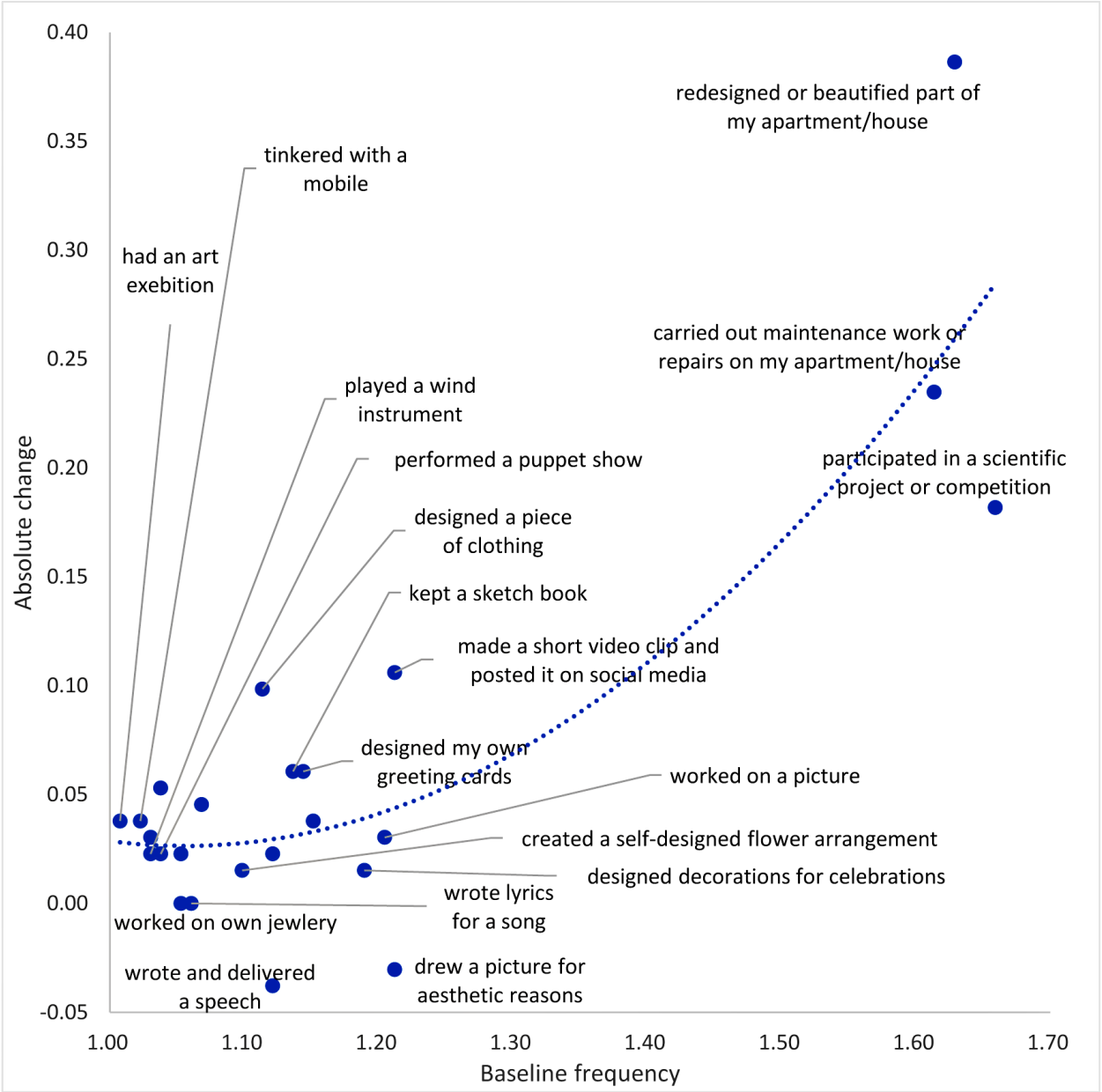

Figure 1. A scatterplot showing baseline frequency of creative activity vs. absolute change of frequency. The polynomial regression line indicated a u-shaped relationship. Some data labels were omitted for the sake of clarity

Note: 27 data points for 27 creative activities. Each data point is derived from the mean across 130 individuals

in frequency and with a slightly stronger effect size (corrected $R^2 = .72$, $\beta = .85$, $p < .001$) than the linear relationship. While this finding supported the idea that the influence of social interaction on creativity is complex and can vary across different creative activities, it was in contrast to the expected result. The changes in frequency were not (only) influenced by the dependence on social interaction, but systemically by the frequency at baseline.

Additionally to regression analysis, the changes in two different subscales were examined. "Self-Expressive Creativity" was compared before ($M = 3.18$, $SD = .44$) and during lockdown ($M = 3.08$,

SD = .39) using a pairwise t-test. The results indicated that the difference between the two time points was significant ($p = .018$, $t(129) = -2.40$, with a mean difference of -.09 (95% CI [-.17, -.02])).

"Personal Environment Creativity" was compared before ($M = 4.36$, $SD = 1.40$) and during lockdown ($M = 4.99$, $SD = 1.87$) using a pairwise t-test. The results indicated that the difference between the two time points was also significant ($p < .001$, $t(129) = 5.38$, mean difference of .63 (95% CI [.40, .86]).

DISCUSSION

The present study investigated changes in frequency of creative activities as a reaction to the first core episode of social distancing during the COVID-19 pandemic in Germany. The results of this study suggested that there were significant changes in the frequency of creative activities before and during the lockdown. The change in the frequency of practicing a particular creative activity was not random, but systematically depended on the frequency at the beginning of the study, but not in a linear manner. There was u-shaped relationship: the least frequent activities changed the least, creative activities of medium frequency at baseline decreased, and creative activities most frequently performed at baseline showed an increase in frequency. The u-shaped relationship between the change in frequency of creative activities and their frequency at baseline could be interpreted as follows. The frequency with which an activity was performed in a population might depend in general on social interaction, whether with or without lockdown; this would, however, not explain non-linear changes. Alternatively, social interaction was only one among many factors, which influence the activity frequency. In this case, each factor determines for each activity separately the distance and direction in which a frequency was shifted depending on the specific affordances of a creativity activity (see below).

Further analyses suggested that activities represented by "Personal Environment Creativity" increased in frequency as has been reported for other creative activities during lockdowns (Elisondo, 2022; Tang et al., 2022), while activities characterized by "Self-Expressive Creativity" decreased in frequency during lockdown in the present study. In consequence, a question arises. Why did some activities become more frequent, while others did the opposite? In terms of item response theory (IRT), one may answer that the items of the CBI became less or more difficult, respectively. Applying IRT to the CBI has been elaborately done elsewhere (Rodriguez-Boerwinkle et al., 2021), but still, an IRT-approach cannot answer the question of why some creative activities become easier (or are generally easier) than others.

Curiously, we know little of what makes people prefer one creative activity over the other. Part of the answer lies in inter-individual differences, for example, in how different types of motivation favor different domains (Benedek, Bruckdorfer, & Jauk, 2020). Another part is in the environment as the present study suggested. Elisondo (2022) discussed that those activities had been increased which enable people to solve problems linked to the constraints imposed by the pandemic

in a novel way. In conclusion, one might speculate whether the perceived usefulness generally contributes to the frequency of a creative activity in a population. A changing environment could then change the perceived usefulness and accordingly the frequency of an activity.

Overall, the findings can be interpreted in a broader context in light of the five A's framework of creativity, namely actor, action, artefact, audience, affordances (Glăveanu, 2013). The latter two of those are the most interesting in the present case. The 'audience' could be considered as the social environment that normally interacts with or responds to the actor's creative output. In the context of social distancing, the audience may have been limited or absent, which could have influenced the frequency of creative activities. For example, activities that typically require or are enhanced by an audience (e.g., performing music or dance) may have decreased in frequency, while activities that can be performed alone (e.g., writing, painting) may have been uninfluenced or increased in frequency.

The 'affordances' refer to the opportunities or constraints provided by the environment that enables or inhibits creative action. In the present study, the lockdown can be seen as a change in affordances. It constrained social interaction (an affordance for some creative activities) while potentially providing more time or fewer distractions (affordances for other activities). The impact of social distancing on creative activities could thus be understood in terms of changes in these affordances. Activities that rely heavily on social interaction may have been inhibited, while activities that can be performed in solitude may have been facilitated.

Possible limitations and future directions

Although this study provided valuable insights into the effect of social environment of creative activities during the COVID-19 pandemic, it is important to acknowledge its limitations. First, it relied on self-reported measures, which may be subject to recall bias or social desirability bias. However, there is no apparent reason, why a bias should be more or less pronounced in one activity than in another. Any biases should have applied equally to all kinds of creative activities. Thus, the method of creativity assessment did not undermine the present results.

Second, creative outputs are commonly discussed as having fixed attributes (e.g., Form, Aue, & Kaernbach, 2019). However, a change in expected usefulness or novelty of an output triggered by a change in environment might mediate a change in frequency of creative activities. However, this mechanism cannot be determined by examining mere frequencies.

CONCLUSION

The present findings have two implications for creativity research. In light of the evidence that different creative activities may react differently to a reduction of social interaction, it is important to consider that the same environmental factor can have different effects in different creative domains. While some creative activities may thrive in isolation, others may require social interaction

to prosper. More generally, the relationship between environmental factors and creativity may be more complex than previously thought.

Recalling the four p's of creativity, it is generally accepted that characteristics at the person level differ between domains (scientists *vs*. artists). It is therefore surprising that we commonly assume that press level features work the same way across all domains, which is challenged by the current study. While we recognize without hesitation that there are differences between artists and scientists, why do we assume that the press is the same for painting a picture and conducting an empirical study? Creativity researchers may consider the possibility that the same environmental factor can have different effects in different creative domains. This will allow for a more comprehensive understanding of the complex relationship between environmental factors and creativity.

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Infobox 1: Timeline of actions taken for mitigation in Germany

The most important developments in Germany were the following: On March 12th, 2020, then Chancellor Merkel recommended social distancing in a broadcast speech. Fourteen of the 16 German federal state governments ordered universities, colleges, schools and day care centrers to close on March 13th, 2020 forcing working parents to stay at home to take care of children. All sports and leisure facilities were ordered to close in the entire country from March 17th on. At the same date, religious buildings had to be closed as well as playgrounds and tourist places. By March 18th, remote working had become the rule if possible. Additionally, car manufacturers closed their production facilities on March 19th, ordering the employees to stay at home. Finally, the German government announced a nationwide restriction of social contacts on March 22nd, allowing individuals only to leave their home for activities like commuting to work and engaging in non-team sports. Retailers were ordered to be closed except for groceries and supermarkets. Meeting of groups with more than two individuals would be prohibited, if they were not from the same household.

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