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Moody Encounters: Mixed-Methods Exploration of Collaborative Creativity, Mood and Emotional Synchrony

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Abstract

Art experiences, individual creative activities, and collective gatherings are all known to support psychological wellbeing; however, their combined effects—particularly through visual media—remain understudied. This study explored the affective and interpersonal experiences of collaborative everyday creativity and whether an interactive art installation (*Moody*) could enhance them. Fifteen participants, divided into four small groups, engaged in two collaborative painting tasks: one control and one with Moody. A mixed-methods design integrated quantitative measures of mood, perceived emotional synchrony (PES), feelings of connection, and self-perceived creativity with qualitative data from focus group discussions analyzed through deductive thematic analysis. Quantitative results showed a significant mood improvement, moderate levels of PES and connection, and positive associations between PES and self-perceived creativity across conditions. Moody did not significantly enhance these effects. Qualitative findings revealed that shared meaning-making was central to behavioral coordination, emotional synchrony, and creativity, which unfold in situational and mutually reinforcing dynamics that lead to experiences of synchronization or disconnection. PES emerged not only as an outcome but also a mechanism of collaborative creative improvisation. Integrating these insights, the study supports the relevance of interpersonal synchronization theories for understanding collaborative creative experiences and demonstrates that visual media can afford group improvisation. More broadly, it highlights that even brief, non-professional creative encounters can foster positive affect and social connection, underscoring the potential of everyday creativity to promote wellbeing.

Moody Encounters: Mixed-Methods Exploration of Collaborative Creativity, Mood and Emotional Synchrony

Currently, most research on creativity focuses on what drives creative performance and how to enhance it, while paying less attention to the broader effects creative activity brings beyond achievement (Forgeard & Kaufman, 2016; Kaufman & Glăveanu, 2025). Newer, more socially oriented approaches in creativity studies and visual arts challenge this focus (Bishop, 2006; Glăveanu, 2011b) and inspire the present study, which explores everyday creativity in its collective and affective dimensions (Richards, 2010). This perspective also reconsiders the traditional view of visual art in psychology as an individual, non-interactional domain (Kimmel & van Alphen, 2025). Developed in collaboration with artist Jo Caimo, the study became both experiment and artistic exercise—an encounter that connected art and science and investigated how shared creativity shapes affective experience.

Positive Impact of Art and Creativity on Affect and Wellbeing (Art x Affect)

Over recent decades, research in the psychology of creativity and the arts has established a strong association between artistic experiences and improved affect and wellbeing (Acar et al., 2020; Jean-Berluche, 202; Fancourt et al., 2025). Art engagement activities comprise two levels: art-viewing and art-making. Art-viewing has been associated with positive affect through aesthetic experience, or the pleasure derived from appreciation of artworks, regardless of their specific content (Mastandrea et al., 2019). According to Leder et al. (2004), this is the result of cognitive processing, such that the more an artwork is understood, the more likely it is to experience positive emotions, making it a self-rewarding experience. However, additional evidence shows that art-viewing activates multiple, unspecific neurological pathways (Mastandrea et al., 2019; Leder & Nadal, 2014), which may explain why in cases of cognitive impairment people can still enjoy and engage with art (Cantu & Fleuriet, 2018; Camic et al., 2014). Even brief art-viewing activities have been proved to improve wellbeing by reducing negative mood, anxiety, or loneliness (Trupp et al., 2022; Igdalova & Chamberlain, 2023), supporting

their increasing application in psychological treatment and wellbeing promotion for aging adults (e.g. de Witte et al., 2021; Tymoszuk et al., 2020; Quinn et al., 2025).

While traditional visual media, such as painting and sculpture, have been the primary research focus, installation art remains a far less explored modality despite growing interest (Pelowski et al., 2018). Installations combine objects and their space into immersive, time-bound artworks that require active participation to be fully realized (Byrne & Moran, 2010a). Designed to make the participant's experience itself an object of observation, they could potentially lead to richer affective and cognitive processes than traditional art (Pelowski et al., 2018; Kühnapfel et al., 2023), and their appreciation may extend beyond aesthetic judgment to encompass their "ability to create the conditions for a reflective, insightful, or emotional experience" (Pelowski et al., 2018, p.3). Current research of installation art experiences primarily addresses immediate responses to artworks (Pelowski et al., 2018; Kühnapfel et al., 2023), yet their effects on metacognitive reflection (Pelowski et al., 2018) and bodily awareness (Kühnapfel et al., 2023) suggest they lie somewhere between art-viewing and art-making, in terms of active and meaningful engagement. Considering evidence that more interactive, cognitively demanding activities are more effective for mood repair (Drake et al., 2023), installation art could yield stronger affective outcomes than passive viewing.

Following the above, art-making, and creative activities in general, have been argued to produce wellbeing effects through different mechanisms (Holt, 2018; Holinger & Kaufman, 2023). First, art-making enables self-expression and emotional release, while also allowing to process and make sense of their contents (De Petrillo & Winner, 2005; Futterman-Collier & Wayment, 2021). For example, Futterman-Collier and Wayment (2021) found that painting with a focus on learning from negative experiences led to mood repair by increasing positive mood and reducing negative emotions. A second pathway is the fulfillment of basic psychological needs—autonomy, competence, and relatedness—and self-regulation (Ryan & Deci, 2000; Putney et al., 2024). In this case, self-expression also fulfills the need

for autonomy, e.g. by exerting choice over creative tasks (Bujacz et al., 2016). Koehler and Neubauer (2020) observed that hobby musicians experienced greater satisfaction of all needs on days of creative activity, with autonomy and competence mediating the effect of these days on positive mood. Regarding relatedness, Richard et al. (2024) found that social bonds formed during a dance program helped explain positive results in improving creative potential. Thirdly, art-making can improve mood through cognitive stimulation and flow (Holt, 2018; Grossman and Drake, 2023), by providing distraction from negative thoughts (Drake and Winner, 2012) or feelings of accomplishment from skill mastery and productivity (Cseh et al., 2015; Futterman-Collier & Von Károlyi, 2014). Supporting this, Jin and Ye (2022), observed that creativity and self-efficacy moderated the positive association between enrolling in fine arts courses and psychological wellbeing. This mechanism is emphasized by studies focusing on older adults and dementia patients, such as Cantu and Fleuriet (2018) and Camic et al. (2014), as participants reported an increased ability to concentrate after art-making intervention programs.

Across all mechanisms, enjoyment or pleasure plays a transversal role: it is a path to wellbeing in itself (Grossman & Drake, 2023; Holinger & Kaufman, 2023). In this line, Drake et al. (2023) compared the effects of art-making and art-viewing after negative mood inducement, indicating that while both activities reduced negative affect, art-making was associated with greater enjoyment. Likewise, in Silvia et al.'s (2014) experience-sampling study, the only significant within-person predictor of creative engagement was positive emotions, suggesting that "people doing something creative are more likely to feel happy and enlivened" (p. 187).

In sum, artistic and creative activities have been consistently linked to improved wellbeing through multiple pathways, with enjoyment and positive affect as common threads (Holinger & Kaufman, 2023). And, while many art engagement activities are collective—such as exhibitions, theater classes, or mural painting—most research still targets only individual experience, or group dynamics as predictors of creativity at work (Madrid et al., 2023; Emich & Lu, 2023). This leaves much to be learned

about affective processes in collaborative artistic and creative experiences (Emich & Lu, 2023; Vass et al., 2014; Glăveanu, 2011b), therefore before considering this domain, it is useful to review how collective activities more broadly relate to affective states and wellbeing.

Collective Experiences' Contribution to Wellbeing (Affect x Collective)

Collective experiences are events that individuals undergo together, giving rise to understandings, emotional responses, and actions qualitatively different from private experiences, because they are shared (Collins, 2014; Brown & Fredrickson, 2021). In these situations, shared affective states often emerge, which has been explained through different, yet complementary, processes. The most basic is emotional contagion, where an innate and automatic tendency to mimic, feedback, and align facial expressions, vocalizations, postures, and movements with others around results in emotional and physiological entrainment (Kelly et al., 2014; Hatfield et al., 2014; Golland et al., 2015; Páez et al., 2015). For instance, in Golland et al.'s (2015) experiment, groups of three participants, instructed not to interact while watching videos, showed patterns of physiological synchronization, which in turn predicted the alignment of emotional responses.

From a cognitive perspective, emotional contagion can be strengthened by shared understandings, such as common goals and concerns (Kelly et al., 2014; Salmela & Nagatsu, 2016). Social appraisal theory (Manstead & Fischer, 2001) posits that group members perceive how others appraise stimuli, and through their interactions can gradually come to an agreement, resulting in convergent affective responses. Their agreement is perceived as positive, generating a sense of connection that further amplifies the effect (Aoyama-Lawrence & Weinberger, 2022). Supporting this, Aoyama-Lawrence and Weinberger (2022) reported that children engaged in more productive dialogues during dyadic tasks were more likely to share emotional experiences. Similarly, Prepin and Pelechaud's simulation model (2013) showed that greater levels of shared understanding between communicating partners predicted stronger nonverbal behavior synchronization, which may trigger emotional contagion.

Adding to the above, the theories of multifaceted social synchronization (Páez et al., 2015) and interaction rituals (Collins, 2014), rooted in Durkheim's analysis of religious rituals (1915/1912), identify specific conditions in collective gatherings for the emergence of shared affect (Wlodarczyk et al., 2020). These are: bodily co-presence of participants and their awareness of each other's expressions and reactions; a mutually reinforced shared focus of attention, which creates a common ground for experience; and behavioral entrainment and alignment, either by mirrored or complementary actions (Páez et al., 2015; Liu & Tao, 2019; Salmela, 2021). When this process is successful, participants experience heightened shared positive emotions—collective effervescence—, which motivate them to repeat such events (Páez et al., 2015; Brown & Fredrickson, 2021). Páez et al. (2015) and Wlodarczyk et al. (2020) operationalized it as *perceived emotional synchrony* (hereafter, PES), or "the shared perception of entrainment, coordination, and synchronization of the affective experience" (Wlodarczyk et al., 2020, p.3).

One final approach to consider is the theory of extended emotion (Slaby, 2014). Inspired by extended mind theory, it argues that just as some mental processes are enhanced using "tools for thinking" (Clark & Chalmers, 1998), affective processes can be extended with "tools for feeling": physical or symbolic elements of the environment, including other people's emotions (Slaby, 2014; Viola, 2024). From this perspective, collective affect would be a case of extended emotion, because, when individuals interact, their emotional displays scaffold, forming a phenomenal coupling that extends each other's experiences into shared or synchronized affective states (Slaby, 2014; Salmela, 2021). In other cases, emotions are extended through human-made tools, or *affective artifacts* (Viola, 2024), which connects this approach to the earlier discussion of art installations, as these are deliberately designed to expand emotional experiences through their material and spatial affordances (Pelowski et al., 2018).

These processes highlight the interplay between cognitive, behavioral and emotional dynamics in collective activities that lead to the "subjective sensation of synchrony" (Llobera et al., 2016; Bouchat

et al., 2024; Mogan et al., 2017). This experience, in turn, has been associated with psychological wellbeing predictors such as: increased positive affect (Bouchat et al., 2024; Brown & Fredrickson, 2021), perceived social connection and support (Páez et al., 2007; Cheong et al., 2023), self-esteem and empowerment (Lumsden et al., 2014; Wlodarczyk et al., 2021), and pro-social behavior (Wiltermuth and Heath, 2009; Rennung & Göritz, 2016). These were observed even in events with negative valence, such as university hazing (Wlodarczyk et al., 2020) or commemorations of a tragedy (Hawdon & Ryan, 2011), emphasizing the value of experiences that promote collaboration and mutual connection. As Páez et al. (2015) reflect, experiencing similar emotions with others may translate into feeling less alone, shared humanity and solidarity, which can lead to positive outcomes not only for individuals, but also for communities and society (Gauntlett, 2018; Brown & Fredrickson, 2021; Kaufman & Glăveanu, 2025). This concern echoes the art world's *social turn*, which since the late 20th century, has given increasing prominence to participatory practices and their effects (Bishop, 2006; Hand, 2010).

Social Turn in Visual Arts and Research (Collective x Art)

As noted, psychological research on visual art has largely centered on the individual level, overlooking developments that highlight the inherently social nature of creative expression (Sawyer & DeZutter, 2009; Glăveanu, 2011a). One of these is the social turn in contemporary visual arts, which represents a shift from individual production toward the empowering potential of collective action and shared processes (Bishop, 2006). Participatory or relational arts, such as Moody, emphasize their capacity to create connections rather than final products (Bishop, 2006; Byrne & Moran, 2010b), turning people and their interactions into both media and outcomes of artworks—whether performances, games, or social events (Hand, 2010; Byrne & Moran, 2010b). Drawing attention to collective and process-oriented dimensions, these approaches align with sociocultural psychology (Glăveanu, 2011b), which frames creativity as distributed; a socially embedded process, emerging from group–environment interactions, rather than a purely individual act (Glăveanu, 2011b; Sawyer & DeZutter, 2009).

This orientation invites research to examine not only how individuals experience art in social settings (Jafari et al., 2013), but also how affective interpersonal processes unfold in creative collaborations, including in everyday forms of co-creation (Richards, 2010; Salmela, 2021). However, this kind of empirical research remains scarce, favoring music, theatre, or dance (Wilson & MacDonald, 2017; Sawyer & DeZutter, 2009; Łucznik et al., 2021). Visual arts, by contrast, are still largely seen as non-interactional (Kimmel & van Alphen, 2025), with only a few recent studies using collective visual media (e.g., Lakhani et al., 2022; Abraham et al., 2023; Guan et al., 2024). These show that such media can be accessible forms of social art-making, affording "means for joint engagement and coordination" (Abraham et al., 2022, p.1). Meanwhile, research on the wellbeing outcomes of creative activities mostly targets children, older adults, or clinical samples (e.g., Rumble et al., 2025; Wood et al., 2023; Camic et al., 2014). Studying affective outcomes of collaborative creative activities with visual media and healthy, younger populations thus presents a valuable opportunity to bridge this gap. Taken together, the reviewed themes support this rationale under the assumption that combining these elements may amplify their positive effects (Kaufman & Glăveanu, 2025). To further contextualize this approach, the next section turns to collaborative creative processes in other, more extensively studied domains.

Collaborative Creative Activities (Collective x Art x Affect)

In the distributed creativity framework, Sawyer and DeZutter (2009) describe processes of group improvisation, or *collaborative emergence*, as low-constraint interactions resulting in unpredictable joint products, in which all participants contribute equally, each action depends on the previous one, and the meaning of contributions can change according to others' interpretations. Thus, interaction and negotiation are emphasized as shared meaning-making and coordination devices (Sawyer & DeZutter, 2009; Vass et al., 2014), and while (shared) affect is not directly addressed, it has been suggested that since emotions are part of the antecedents, they should be part of the outcomes of creative processes (Glăveanu et al., 2013).

Analogous to individual creativity, distributed processes can foster *group flow*, a state of effortless joint attention on the task and each other, marked by shared enjoyment, and rapid additive contributions that smoothly build on one another, creating a sense of synchrony (Lavoie et al., 2024; Łucznik et al., 2021; Llobera et al., 2016). As an emergent state, group flow can be disrupted and last only brief moments (Lavoie et al., 2024; Łucznik et al., 2021); however, when reached, it can derive in *afterglow* (Lavoie et al., 2024): moments of collective reflection to acknowledge mastery of the interacting process, thus reinforcing positive affect and belonging—echoing collective effervescence and emotional synchrony (Páez et al., 2015; Wood et al., 2023). Indeed, group flow and social synchronization states have been found to overlap (Páez & Rimé, 2014; Páez et al., 2015; Bouchat et al., 2024), suggesting collaborative creative activities have the potential to promote interpersonal connection (Lavoie et al., 2024; Łucznik et al., 2021; Fusaroli et al., 2016). In this regard, in an improvisational dance study, Łucznik, May and Redding (2021) reported that "becoming one with the group" had protective effects on self-esteem, and Wood, Jepson and Stadler (2023) found that overcoming creative challenges in social (individual) creative activities promoted PES, self-worth, and shared pride. Emotional synchrony, in these contexts, supported participants transform negative individual emotions into shared positive ones (Wood et al., 2023).

Finally, positive affect has been argued to influence evaluations of the creative process and product (Cseh et al., 2015; Efklides, 2006). Experiencing flow or synchrony with a group helps sustain motivation and focus for longer, while improving collective efficacy beliefs and reducing self-criticism, thereby enhancing self-assessment of a production or performance (Łucznik et al., 2021; Lavoie et al., 2024; Madrid et al., 2023). In this line, if Moody effectively increases mutual awareness and synchronization of affective responses, it may also enhance self-perceived creativity (Kreitler & Casakin, 200). Even if they do not reflect objective reality, such perceptions can motivate participants to repeat

the experience (Páez et al., 2015), strengthening their skills, and reinforcing the long-term benefits of sustained creative practice (Holt, 2018; Kaufman & Glăveanu, 2025).

Current Study

The present study aims to explore affective experiences in collaborative creative activities, focusing on individual mood and perceptions of emotional synchrony and connection. To this end, a creative task was designed as a new setting for the display of Moody, a relational art installation by Jo Caimo, and four groups of participants were invited to paint, with and without Moody, while data were collected quantitatively and qualitatively. Moody aims to "technically enhance and extend the body to encourage awareness of social interconnectivity" (Caimo, n.d). Thus, as an affective artifact, it would be expected to enhance participants' shared affective experience by facilitating their mutual awareness and entrainment—or coupling (Viola, 2024; Slaby, 2014). Planned and prepared in continuous collaboration with the artist, the study treated Moody as both artwork and experimental condition. In this context, the artistic experience was not just a stimulus but part of the phenomenon under study, reflecting an epistemological stance where knowledge production is distributed and co-constructed across disciplines and lived experience (Glăveanu, 2011b). Therefore, this study also accepts the invitation from the emerging field of possibility studies to leverage more diverse tools and focus on processes as much as on outcomes (Glăveanu, 2023; Kaufman & Glăveanu, 2025).

Building on this, three research gaps are addressed: the affective dimension of collaborative creativity (Forgeard & Kaufman, 2016; Madrid et al., 2023); the role of installation art and visual media as interactional domains (Pelowski et al., 2018; Abraham et al., 2022); and the scarcity of studies with younger, non-clinical adult samples (Grossman & Drake, 2023). Accordingly, this study investigates the following questions at both the individual and group levels:

1. Does participation in collaborative creative activities lead to changes in participants' mood?

2. To what extent do collaborative creative activities foster feelings of connection and perceived emotional synchrony among participants and how do participants experience these processes?
3. Does the art installation (Moody) enhance the affective or social effects of collaborative creative activities?
4. Does the art installation influence how participants evaluate their collective creative process and products?

Methods

Design

This exploratory study followed a multiple-case, mixed-methods design. Four groups (cases) participated, allowing for both within-group and cross-case analyses. The quantitative component used a quasi-experimental repeated-measures structure with self-report questionnaires across two conditions, while the qualitative component drew on focus group discussions to capture participants' lived experiences and contextualize quantitative patterns. Given the novelty of Moody and the small-scale, intensive nature of the study, this design was well suited for exploring the affective and social dynamics of collaborative creative activities and the potential influence of an interactive art installation.

Participants

Fifteen participants (6 men, 9 women; ages 25–54 years, 66.7% aged 25–34) were recruited through convenience sampling, using personal networks, social media, and posters in creativity-related spaces (e.g., art shops, studios). Inclusion criteria were: capacity to provide informed consent, English language, and prior interest in painting. Participants were assigned, based on scheduling availability, to one of four groups, whose composition varied in terms of prior familiarity, as seen in Table 1. Ethical approval was granted by the Faculty's Ethics Committee.

Table 1

Cases Summary

Group	*n*	Familiarity	First Task (Condition—Prompt)	Second Task (Condition—Prompt)
A	3	Acquaintances	Moody — O	Control — F
B	4	2 friends; 2 unfamiliar	Control — F	Moody — O
C	3	Unfamiliar	Moody — F	Control — O
D	5	2 pairs of friends; 1 unfamiliar	Control — O	Moody — F

Materials

Quantitative

All self-report measures were administered via Qualtrics and answered on participants' smartphones. The complete questionnaire can be found in Appendix A.

- Mood was assessed using Pick-A-Mood (PAM, Desmet et al, 2016), a single item with eight gender-neutral cartoon characters arranged in a circle based on valence and arousal axes. Participants selected the figure that best represented their current mood pre- and post-task.
- PES was assessed post-task using the PES Scale short form (Wlodarczyk et al., 2020), consisting of six 7-point Likert items (e.g. "*We performed as one, like a single person*").
- Feelings of connection (hereafter IOS, for Inclusion of Other in the Self), a general sense of closeness within the group, was assessed post-task using the IOS Scale (Aron et al. 1992), a pictorial single item with seven pairs of circles, from non-overlapping to almost completely overlapping. Participants selected the one describing their relationship with the group during the task.
- Three items of self-perceived creativity were adapted from Kreitler and Casakin's (2009) Self-Assessment of Creative Design Questionnaire and measured post-task with 5-point Likert scales: product creativity, task smoothness, and satisfaction with the final product.

- Familiarity with other participants was measured with a single-item visual analogue scale (0–100%) in order to characterize relationships within the groups.

Qualitative

Semi-structured focus group discussions at the end of the activity, comparing task experiences and creative products. During these, participants' ideas were also collected on sticky notes. Discussions were audio-recorded and manually transcribed verbatim, identifying participants only by number to preserve anonymity. An equipment malfunction altered the audio quality of Group B, and only fragments were transcribed. The protocol can be found in Appendix B.

Procedure

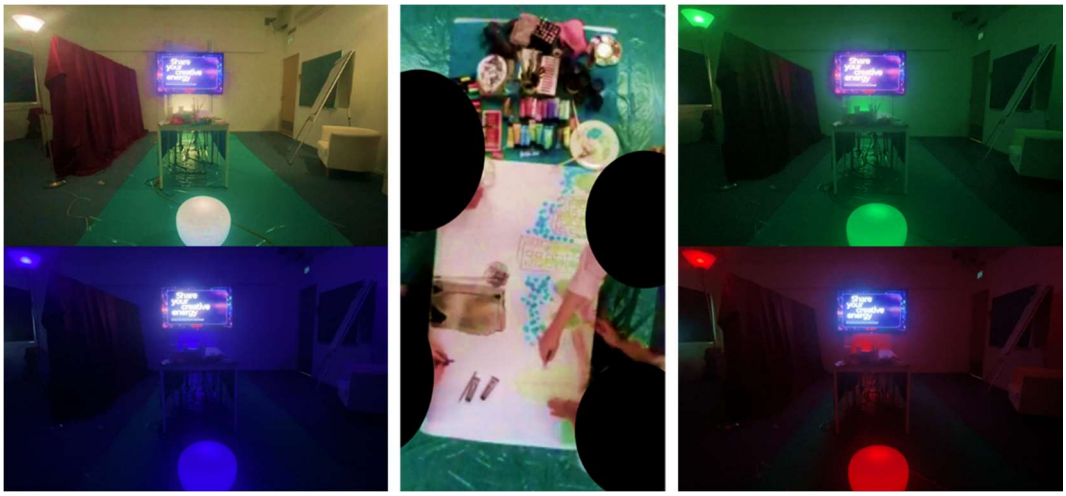
Each group attended a single two-hour session at a University laboratory. Upon arrival, participants selected a colored sticker for identification and received printed and digital informed consent forms, after which they completed the pre-questionnaire. Two collaborative painting tasks followed, each lasting approximately 30 minutes. Instructions asked participants to “work as a group”, and encouraged free use of materials: a 70 x 140cm paper canvas and markers, acrylic paints, brushes, water, etc. Prompts (“Opposites attract”, O; “the Future is”, F) were assigned as if they were random, and a timer was projected on a screen. Participants performed the tasks under two conditions:

- Control: standard lighting and ambient silence.
- Moody installation: An introductory video by the artist was played, after which participants donned their Moody’s. These interactive ear jewelry pieces visualize real-time excitement by measuring earlobe temperature and emitting color-changing lights (Figure 1; see also https://excitingresearch.io/). Meanwhile, synchronized lamps and speakers emit colored ambient light and sounds, controlled by the researchers to reflect participants’ visible colors (Figure 2), turning the surrounding environment into a tangible shared experience.

After each task, participants completed post-task questionnaire sections and took a short break**.** Following the last one, they gathered for a 30-minute focus group, where sticky notes and a flip chart were used to facilitate and structure open-ended discussions. Their paintings were displayed to facilitate their inclusion in the reflection. All sessions were conducted in the same space with identical materials and procedure, but conditions and prompts were counterbalanced to minimize order effects (see Table 1).

Figure 1
Moody Ear-Jewelry

Figure 2
Moody Environment and Materials



Data Analysis

Quantitative Component

Data were prepared by recoding time-point responses into their corresponding experimental conditions and computing composite scores for multi-item scales. Mood responses, registered as coordinates, were translated into two categorical variables: mood regions and mood labels. Additionally, mood labels were converted into dimensional scores of valence and arousal based on validated mean values from the PAM manual (Desmet et al., 2016, p.262), enabling complementary quantitative analyses. No missing data or outliers were identified. Given the small sample size and non-normality in some variables, nonparametric analyses were applied at the individual level, using exact two-tailed significance values, and descriptive analyses at the group level. To examine mood changes across conditions, Fisher's exact test (due to low expected cell counts) and Friedman's test were used for categorical and numerical variables, respectively. Differences between conditions in PES, IOS, and self-perceived creativity were assessed with Wilcoxon signed-rank tests, and their associations examined using Spearman's rank correlations. All analyses were conducted using SPSS 27.

Qualitative Component

With focus on RQ 2 and 3, focus group discussion transcripts and sticky notes were analyzed using deductive thematic analysis (DTA)**.** Therefore, preliminary codes and analysis were informed by existing theoretical frameworks, and refined through the data (Braun & Clarke, 2006; Pearse, 2019). The coding process was manually conducted in Excel. Analysis was guided by a constructivist-interpretivist epistemological perspective, treating participants' narratives as co-constructed and situated expressions of meaning, and codes as conceptual lenses to explore participants' experience (Lincoln et al., 2018).

Two themes were developed**:** *Signs of Synchronization*, and *Out of Sync*. Their codes stem from the cognitive, behavioral, and emotional components that theories of social synchronization and group flow describe for the emergence of emotional synchrony (Collins, 2020; Páez et al, 2015; Wlodarczyk et

al., 2020; Lavoie et al., 2024). They were applied to identify indicators of group synchronization or disconnection in the participants' accounts of tasks and their interactions during the discussion, and examine how these components interrelate to shape shared experiences. The complete coding frame can be found in Appendix C. Coding decisions and the emerging codebook were reviewed and discussed with supervisors, who provided feedback to enhance consistency and rigor. Direct quotations are included, ensuring the data were accurately represented in the analysis (Lincoln et al., 2018).

Mixed-Methods Integration

The two components were integrated using a convergent design: quantitative and qualitative data were collected concurrently and analyzed in parallel, then compared and combined narratively during analyses and in the discussion to deepen interpretation (Creswell, 2009; Fetters et al., 2013). Triangulation of descriptive results and DTA findings within and across cases allowed for a pragmatic and holistic approach to understanding participants' subjective experiences and interpersonal dynamics, as well as contributing to the legitimation of this study (Creswell, 2009).

Results

Individual Level

Mood Change

Significant changes in mood region (positive-high, positive-low, negative-high, negative-low) distributions were found from pre- to post-task under both control ($p = .021$), and Moody ($p = .001$) conditions, but not between them ($p = .466$). Mood region frequencies and proportions are presented in Table 2. The most frequent moods within regions were: *nervous/tense* before the task (40%, $n = 6$), *cheerful/glad* after the control (40%, $n = 6$), and *loosen/relaxed* after the Moody condition (60%, $n = 9$), indicating a trend towards mood improvement.

Further examination of mood dimensions indicated no significant differences for arousal, $\chi^2(2) = 2.58$, $p = .283$, whereas valence showed significant differences across conditions, $\chi^2(2) = 7.42$,

p = .023, with mean ranks of pre = 1.47, control = 2.30, and Moody = 2.23. A post hoc Wilcoxon signed-rank test confirmed no significant differences between control and Moody, Z = –.67, p = .500 (Bonferroni-adjusted α = .017), suggesting that participants experienced more positive moods after collaborative creative activities regardless of condition.

Table 2

Mood Region x Condition Cross tabulation

Condition	Pre		Control		Moody	
	N	%	*N*	%	*N*	%
Mood Region						
Negative-High	7	46.7%	1	6.7%	0	0%
Negative-Low	2	13.3%	0	0%	0	0%
Positive-High	4	26.7%	8	53.3%	6	40%
Positive-Low	2	13.3%	6	40%	9	60%
Total	15	100%	15	100%	15	100%

Perceived Emotional Synchrony and Feelings of Connection

Participants reported moderate levels of PES in both the control (M = 3.83, SD = 1.00, Mdn = 3.67), and the Moody (M = 3.87, SD = 0.93, Mdn = 4) conditions, and no significant difference between them was found, Z = –.13, p = .917. Likewise, IOS showed moderate levels in the control (M = 4.07, SD = 1.33, Mdn = 5) and the Moody (M = 4.33, SD = 1.29, Mdn = 4) conditions, and no significant difference, Z = –.90, p = .405. A strong positive association was reported between PES and IOS, $r_s(28)$= .57, p < .001, indicating these variables tended to co-occur. These results suggest that while collaborative creative activities fostered moderate PES and IOS, the use of Moody did not significantly enhance this experience compared to the control task.

Self-perceived Creativity

Descriptive statistics of these items are presented in Table 3. No significant differences between conditions were found for product creativity, Z = –1.34, p = .244; or task smoothness, Z = –.72, p = .617. However, satisfaction with product was significantly higher after the control task, Z = –2.18, p = .045.

Considering antecedents of shared positive affect's influence on creativity self-evaluations, associations with PES and IOS were examined at the aggregate condition level (N = 30). PES strongly correlated with product creativity, $rs(28)$ = .50, p < .001; and moderately with task smoothness, $rs(28)$ = .37, p = .047, and satisfaction with product, $rs(28)$ = .39, p = .034. IOS strongly correlated with product creativity, $rs(28)$ = .68, p < .001; and moderately with satisfaction, $rs(28)$ = .46, p = .011.

Table 3

Descriptive Statistics of Self-perceived Creativity Items across Conditions

	Control			Moody		
Variable	*M* (*SD*)	*Mdn*	Min–Max	*M* (*SD*)	*Mdn*	Min–Max
Product Creativity	4.20 (1.08)	5.00	2 – 5	3.87 (.83)	4.00	3 – 5
Task Smoothness	4.20 (.94)	4.00	2 – 5	4.00 (.65)	4.00	3 – 5
Satisfaction with Product	4.47 (.74)	5.00	3 – 5	3.87 (.52)	4.00	3 – 5

Note. N = 15.

Group Level

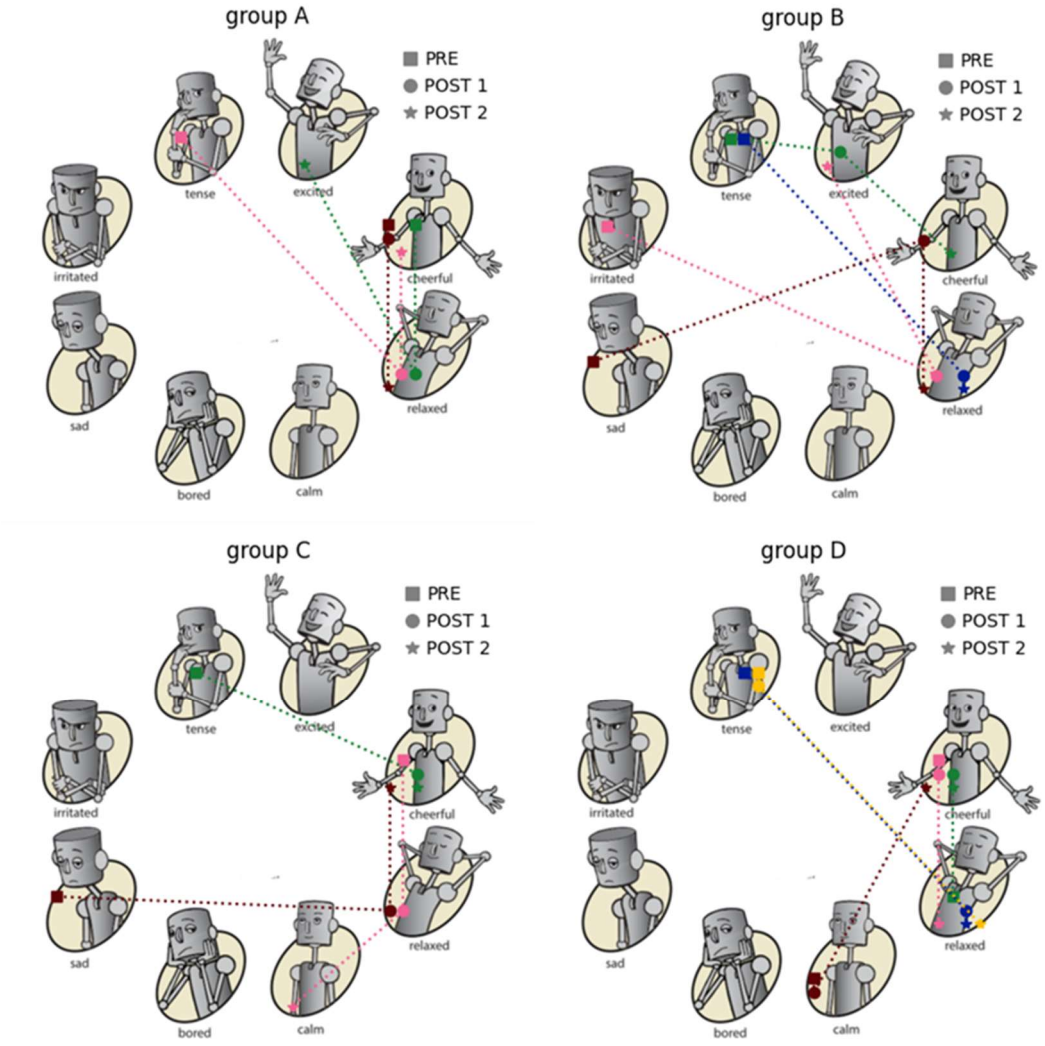
Mood change trajectories clustered by group are presented in Figure 3. While the main statistical analyses compared conditions, these plots depict chronological sequences, illustrating their original flow of convergences and divergences over time, to provide complementary contextual information for group comparisons. For example, differences can be observed in the initial distribution of moods: all participants in Group B began with negative moods, and Group C had more participants in negative moods than positive ones. For the remaining variables, descriptive statistics are presented in Table 4. Observation of within-group descriptives indicated that:

- Group A reported higher scores in the control condition compared to the Moody condition, except for IOS, where no meaningful differences were observed.
- Group B, in a similar pattern, consistently scored higher in the control condition, including a strong agreement between participants in task smoothness and satisfaction with product (*SD* =.00).

- Group C presented an inconsistent pattern, however, the Moody condition showed slightly higher scores or higher agreement (including an *SD* = .00 in task smoothness and satisfaction). Product creativity was the exception, scoring higher in the control condition.
- Group D reported higher scores and agreement in the Moody condition for PES, IOS and product creativity, while obtaining similar high scores with no meaningful differences for task smoothness and satisfaction with product.

Figure 3

Mood Change Trajectories per Group



Note. For groups A and C (left) POST 1 = Moody. For groups B and D (right) POST 1 = Control. Adapted from "Pick-A-Mood pictorial tool for mood measurement" by P. Desmet, M. Vastenburg and N. Romero, 2019, Delft University of Technology. CC BY-NC-ND 4.0.

Table 4

Descriptive Statistics of Dependent Variables across Groups and Conditions

	Group A (*n* = 3)				Group B (*n* = 4)				Group C (*n* = 3)				Group D (*n* = 5)			
Variables	*M*	*SD*	*Mdn*	Min-Max	*M*	*SD*	*Mdn*	Min-Max	*M*	*SD*	*Mdn*	Min-Max	*M*	*SD*	*Mdn*	Min-Max
PES																
Control	4.39	1.25	4.33	3.17 - 5.67	3.91	.80	3.83	3.17 - 4.83	2.94	.92	2.50	2.33 - 4.00	3.97	.98	3.67	3.00 - 5.17
Moody	3.94	1.18	4.17	2.67 - 5.00	3.63	.93	3.67	2.50 - 4.67	3.39	.79	3.67	2.50 - 4.00	4.33	.94	4.83	3.17 - 5.33
Total	4.17	1.12	4.25		3.77	.67	3.67		3.17	.80	3.08		4.15	.93	4.25	
IOS																
Control	4.67	.58	5.00	4 - 5	5.00	.82	5.00	4 - 6	3.33	1.52	3.00	2 - 5	3.40	2.30	3.00	2 - 5
Moody	4.67	1.16	4.00	4 - 6	4.25	1.50	5.00	2 - 5	3.33	1.15	4.00	2 - 4	4.80	1.30	5.00	3 - 6
Total	4.67	.82	4.50		4.63	1.19	5.00		3.33	1.21	3.50		4.10	1.52	4.50	
Creativity																
Control	4.33	1.15	5.00	3 - 5	4.75	.50	5.00	4 - 5	3.67	1.52	4.00	2 - 5	4.00	1.22	4.00	2 - 5
Moody	4.00	1.00	4.00	3 - 5	3.50	.58	3.50	3 - 4	3.33	.58	3.00	3 - 4	4.40	.89	5.00	3 - 5
Total	4.17	.98	4.50		4.13	.83	4.00		3.50	1.05	3.50		4.20	1.03	4.50	
Smoothness																
Control	4.00	.00	4.00	4 - 4	5.00	.00	5.00	5 - 5	2.67	.58	3.00	2 - 3	4.60	.55	5.00	4 - 5
Moody	3.67	.58	4.00	3 - 4	3.75	.96	3.50	3 - 5	4.00	.00	4.00	4 - 4	4.40	.55	4.00	4 - 5
Total	3.83	.41	4.00		4.38	.92	5.00		3.33	.82	3.50		4.50	.53	4.50	
Satisfaction																
Control	4.67	.58	5.00	4 - 5	5.00	.00	5.00	5 - 5	4.00	1.00	4.00	3 - 5	4.20	.84	4.00	3 - 5
Moody	4.00	.00	4.00	4 - 4	3.50	.58	3.50	3 - 4	4.00	.00	4.00	4 - 4	4.00	.71	4.00	3 - 5
Total	4.33	.52	4.00		4.25	.89	4.50		4.00	.63	4.00		4.10	.74	4.00	

Note. Interquartile ranges are not reported because small group sizes prevented consistent calculation.

Across groups, distinct patterns emerged when comparing aggregate scores. Consistent with individual-level results, PES levels were moderate across conditions, with groups A and D reporting the highest scores and group C the lowest. IOS presented slightly higher values overall, with groups A and B showing higher scores and consistency. Group D reported a similar median (*Mdn* = 4.50) but greater variability, while group C again scored the lowest. Product creativity scores were similarly high for groups A, B, and D, but comparatively lower for group C. Task smoothness presented the highest scores in groups B and D, while a clear pattern was observed: for groups A, B, and C, the highest scores showed full participant agreement (*SD* = .00). Satisfaction with product presented similar positive scores across groups and conditions, notably, group B obtained both the highest and lowest ratings.

Overall, groups A and B scored higher under the control task, whereas groups C and D performed better under the Moody installation. This distribution aligns with individual-level findings, where no significant condition effects were found. In three groups (B, C, D), the condition with higher PES rating also showed lower within-group variability, indicating stronger agreement among participants. Although measures of central tendency and dispersion provide only descriptive indications due to the small sample and repeated-measures design, the results suggest meaningful variability in case-specific factors and collaborative dynamics, further examined in the qualitative analysis.

Qualitative Analysis

Findings are presented on a case-by-case basis, followed by a cross-case synthesis. Within each case, tasks are described individually before being compared and integrated in the analysis section, triangulating qualitative and quantitative findings. This structure combines recommendations by Adams et al. (2022) to treat single cases as complete mini-reports in multiple case studies, and by Fetters et al. (2013) to systematically integrate mixed methods strands. Analyses focused on identifying theoretical indicators of emotional synchrony (Signs of Synchronization) and disconnection or thwarted synchronization (Out of Sync), as well as exploring their interconnections and potential influences. While

still theory-informed, the latter theme emerged more strongly from participants' accounts, reflecting experiences that extended beyond the mere absence of synchrony.

Group A: From Flat Responses to Finding a Groove

During their first task (Moody), the dominant theme was Out of Sync. While participants described awareness of similar reactions to the prompt, potential indicator of Synchronization, these were characterized by a subdued tone, or emotional flatness. They experienced difficulties integrating their ideas, as well as hesitation to take initiative, indicating divergent interpretations. As A1 expressed, "It felt a little bit daunting to put the first things on the paper, because that's like committing to the idea". This led to behavior misalignment, described as unrelated individual actions because "the different pieces weren't relying on each other" (A3), and an overarching sense of disconnection reflected in moments of uncertainty and slow progress: "We had some moments of *we don't know, what can I do*, […] in some part of the time we were blocked" (A2).

In contrast, during the second task (control), Signs of Synchronization became the dominant theme. Participants highlighted a collaboratively built idea, or shared interpretation, which enabled their behavior alignment through complementary actions and additive contributions: "Everything we drew, was still the same world that we drew. That's an interesting thing that we did" (A1). Emotional alignment and higher arousal were observed, as the group exchanged laughter and affirmations:

> A1: You [to A2] were the one who said, like, the McDonald's drive-in. I thought it was super funny, and I was like *I am going to draw that*, right?
>
> [A2 laughs]
>
> A1: […] in the second one I felt very confident in that the two of you were going to come up with something that's gonna be something fun.
>
> A3: Yeah, more trust.
>
> A1, A2: Yeah.

Participants also described a sense of attunement, or the gradual improvement of their connection, defined by two participants as *finding* or *getting into* a "groove" (A1; A3), which they considered to be reflected in the paintings' composition:

A2: You don't feel it's as separated as before. I think if I see this, I don't say *ah, this is mine, and this is yours* [A1: yeah, indeed].

A3: Ours, yeah.

A2: Yeah, it is *ours*.

Discussing the end of task, emotional effervescence, the positive affect that accompanies emotional synchrony, was identified. As A1 reflected: "I do feel like we connected a little bit, and I feel a bit of gratitude, I guess."

Case Analysis. This group's transition across tasks from emotional flatness, distraction and disconnection to increased coordination and positive affect, was marked by the development of a shared interpretation of the prompt at the beginning of the second task. Consistent with Salmela and Nagatsu's (2016) view, this likely became a shared intentional object ("the same world"), a common goal in which participants feel emotionally invested, incrementally and similarly. In this way, their contributions become more purposeful and mutually reinforcing, consequently leading to improved coordination and a stronger shared experience (Páez et al., 2015). This would reflect the group's higher scores under the control condition, including their full agreement around task smoothness.

Group B: From Group Flow to Distraction

During their first task (control), the dominant theme was Signs of Synchronization. The group described a process characterized by mutual awareness, shared attention, and emotional alignment. Participants reported high emotional arousal from the beginning, which translated into collaborative idea building, decisiveness, and a shared interpretation that quickly led to action, as B1 recounted: "But then it was just like [*snaps fingers*], in one second, and we started working, which was nice". Group

descriptions of their progress also indicated behavioral alignment through both parallel actions and quick additive contributions: “If I drew water, you were *Oh! Can I do more with yours?* Or you add trees, […] everyone is like really working with each other” (B3). Participants’ positive descriptions of this fast-paced rhythm indicates it fostered their emotional alignment, which was experienced as: “It was something like a vibe and that feels good” (B4). Discussing the end of the task, emotional effervescence, an indicator of successful interpersonal synchronization, was identified in participants’ expressions of collective pride and satisfaction, including sticky notes: “proud”, “happy”, and “joy”.

In the second task (Moody), Out of Sync was the dominant theme, as the group experienced an important decline in coordination. Some mutual awareness remained, as participants reported continuing to monitor each other’s actions. They described a shared interpretation, however, it required comparatively more effort and failed to sustain emotional arousal: “I think the opposites attract was like something we just had to kind of grasp, and think about. And we didn't have this, like, big idea, like in the other, but we had to come up with this stuff” (B2). Participants described feeling distracted and introspective, and comparing tasks revealed a common perception of weaker coordination. Accordingly, behavioral misalignment was identified, in what B4 eloquently described like a “*staccato*”: “there were breaks to think about what to do next and stuff, rather than necessarily moving on or adding”. By the end of the task, participants indicated a sense of disconnection and emotional flatness: “I think it's just fine […] I don’t know, I wish we would’ve done something more… together” (B4).

Case Analysis. Group B’s performance during the first task is consistent with descriptions of group flow states: effortless attention, additive contributions, and shared enjoyment (Lavoie et al., 2024; Łucznik et al., 2021). Accordingly, participants unanimously rated this task’s smoothness and satisfaction with the highest score, and reported the highest IOS group score in the sample. While this perceived success may have motivated deliberate coordination efforts on the second task (Madrid et al., 2023), distractions slowed down group interactions, disrupting their rhythm, which seems to have

hindered their connection (IOS) and self-perceived creativity ratings. The group's contrasting experiences illustrate the situational quality of interpersonal synchronization. As Collins (2020) explains, certain conditions and thresholds must be met—such as whether a task prompt generates shared enthusiasm or not—confirming that prior success of an interaction ritual does not guarantee that the experience will be repeated.

Group C: From Disrupted Synchronization to Disconnection

The dominant theme in the first task (Moody) was Signs of Synchronization; however, the group ran out of time to finish, disrupting the process. The group collaboratively built a shared interpretation of the prompt, sustained by shared attention and positive evaluations, which was reflected in mutual affirmations during the discussion:

C2: There was a very easy agreement [C1: Yeah!]. And we all were thinking something similar. So at the moment that someone was doing something, I was in full agreement.

C1: Definitely!

They divided tasks and sections of the painting, resulting in parallel actions, but maintaining mutual awareness, as participants agreed that "We knew what each one of us were doing" (C2). This behavior alignment was also observed in relation to the few emotional alignment indicators that could be identified. Participants' only gave brief descriptions of enjoyment and positive affect, such as "We were all smiling, we were talking in between as well" (C1). No indicators of emotional effervescence were reported.

During the second task (control), the dominant theme was Out of Sync. Participants experienced difficulties agreeing, maintaining divergent interpretations of the prompt throughout the task, as they expressed: "the idea of someone else didn't match immediately for my concept" (C2), and "me and C3, we had both struggled a bit with your idea" (C1). Distraction was also identified, as they reported heightened time awareness and self-consciousness, product of how the prior task ended. This

combination led to behavior misalignment and disconnection, reflected in participants' divergent opinions:

> C1: We were working on the outside […]. Maybe that's the most coordinated thing there, I think. Maybe? I'm not sure how you…
>
> C2: I think it's kind of the same all over the task. […]We didn't communicate that much about what should be the final results.

References to emotional responses were absent, however overall accounts reflected low affective arousal.

Case Analysis. Group C's trajectory showed a shift from emerging synchronization to a general sense of disconnection. Their first task was described with shared enjoyment, effortless attention, and reduced time awareness, suggesting a potential group flow experience (Łucznik et al., 2021), and aligning with their task smoothness evaluation (M= 4.00, SD = .00). However, the unexpected ending may have disrupted the emergence of emotional synchrony (Collins, 2020). It is likely that this event hindered their sense of collective efficacy, becoming a source of distraction during the second task (Madrid et al., 2023). Paired with divergent interpretations, participants may have lost the resources to mutually reinforce an intentional object, causing their actions to feel disconnected, and collaboration labored, explaining their drop in task smoothness (Salmela & Nagatsu, 2016; Lavoie et al., 2024). Reflecting their dynamics, this group reported the lowest mean scores for task smoothness, PES, and IOS across cases.

Group D: From Smooth Coordination to Freedom and Connection

In this case, Signs of Synchronization was the dominant theme across tasks.

At the beginning of the first task (control), participants described closely observing and adapting to each other's actions, signaling mutual awareness. According to them, this facilitated agreement and establishing a clear common goal to guide their attention and actions, indicating a shared interpretation.

In this way, their process was characterized by parallel actions and a steady rhythm, indicating behavioral alignment: “the first was more structured [D1: Yeah]. We were more focused on bringing the result, but it was also because it was a theme that we could all come together and be more decisive” (D2). Participants collectively perceived their collaboration as efficient and successful, expressing satisfaction: “We managed to work as a team, and we, I think, we were all happy with the result [D1, D5: Yeah]” (D4), and indicating emotional alignment.

The second task (Moody) initially revealed divergent interpretations, as participants indicated they “never agreed on anything […]” (D4). However, the group successfully *reinterpreted* this divergence, framing their goal around self-expression, as D5 noted: “we still have a theme and an idea, but it's just a creative freedom”. Their redefinition allowed a more flexible framework, expanding their shared attention from painting to “getting to know each other a bit more” (D2). This provided them with a sense of attunement, or mutual adjustment, increasing their emotional and behavioral alignment, as participants described complementary actions and the progressive convergence of their painting styles. Finally, throughout the discussion, participants’ repeated references to *freedom*—including several sticky notes—indicated expressive alignment and the emergence of emotional effervescence:

> D2: The level of communication and connection we had with each other, to either agree on something, or how we're going to do, or not agree on anything, and give permission to feel *free*.
>
> D1, D5: Yeah!

Case Analysis. Across both tasks, Group D showed clear indicators of effective interpersonal coordination and emotional synchrony, likely rooted in successful shared meaning-making. This observation is supported by Wilson and MacDonald’s (2017) reasoning that shared understandings in improvisational creative contexts foster trust and coordination by reducing uncertainty. During the second task, the group collaboratively broadened their interpretation, which enabled agreement on a common goal, inclusion, and sustained focus, facilitating participants’ attunement. At the same time,

another interpretation may apply: it was shared positive affect that facilitated relaxing their definitions. This is consistent with Vass et al. (2014), who argue that aligned emotions helps connecting participants' ideas and actions, enabling the co-construction of interpretations. Following Páez and Rimé (2014), and Collins (2020), these perspectives may, in fact, connect in a positive feedback loop: a shared interpretation fostered attunement, while shared affect reinforced shared meanings. Supporting these theoretical interpretation, while the group's self-perceived creativity scores align with two successful tasks, PES and IOS reflect increased shared affect in the second one.

Cross-case Synthesis

Both the quantitative and qualitative data suggest mixed effects across conditions and task order, indicating that characteristics of interactions beyond the environment influenced participants' experiences of emotional synchrony and connection during collaborative creative activities. Patterns observed across groups within the two overarching themes clarify dynamic processes that either facilitated or hindered the emergence of coordination and shared affect.

Signs of Synchronization. Across tasks where this was the dominant theme, a shared interpretation of the prompt consistently emerged as a key step toward emotional synchrony. Whether through spontaneous convergence or deliberate negotiation, participants collaboratively constructed a common understanding, forming a shared intentional object and focus of attention, signaling the establishment of intersubjectivity (Vass et al., 2014; Shteynberg, 2018; Salmela, 2021). Building on collaborative emergence (Sawyer & DeZutter, 2009), which requires unpredictability to produce novelty, a shared interpretation also appears as a relevant initial step, helping participants manage uncertainty and sustain the rhythm of the creative process (Wilson & MacDonald, 2017; Allsop et al., 2016). As one participant noted, "There was no worry or concern that we were building on top of each other" (B4).

Reaching consensus seemed to foster emotional alignment, consistent with social appraisal theory (Manstead & Fischer, 2001) and the idea that shared understanding enhances coordination by

eliciting positive, convergent emotions (Aoyama-Lawrence & Weinberger, 2022). Extending Salmela's (2021) argument, this may correspond with the initial shared positive affect required for an interaction ritual of artistic improvisation. As the collaboration progressed, participants frequently described behavioral alignment in the form of additive or complementary actions—experienced as a smoother process—resembling what Sawyer and DeZutter (2009) termed "moment-to-moment contingency." According to Vass et al. (2014), in creative contexts, this seamless concatenation of actions may arise from shared *affect linking*, where ideas are connected through emotions, allowing for unexpected yet coherent associations (e.g. Group A's "McDonalds drive-thru"). In this way, emotional and behavioral alignment appeared to form a positive feedback loop: progress on the shared product, as a sign of effective interactions, elicited positive emotions, which in turn reinforced coordination (Collins, 2020; Lavoie et al., 2024). This dynamic was described as progressively smoother collaboration, indicating the experience of attunement, as reflected in one participant's remark: "the coordination was evolving according [to] [w]hat we were seeing [t]hat the others were doing" (D3).

In several groups, this process culminated in emotional effervescence (Rime & Páez, 2023), evidenced by references to freedom, connection, or collective pride, signaling a successful shared affective experience (A-2, B-1, D-2), consistent with Collins' (2014) and Páez et al.'s (2015) models. Notably, when behavioral alignment was reported primarily through parallel actions (C-1, D-1), no indicators of emotional effervescence were identified, despite observing positive shared emotional responses. It is worth noting the case of Group C's first task, where an external factor—its premature interruption—appeared to inhibit closure and disrupt the trajectory of emotional synchronization (Collins, 2020).

Out of Sync. By contrast, tasks where this was the dominant theme were characterized by the difficulty or failure to develop a shared understanding and sustain shared attention, revealing conditions that undermined synchronization. Divergent interpretations of the task prompt and the presence of

distractors became obstacles for both behavioral and affective coordination (Allsop et al., 2016; Shteynberg, 2018). The absence of agreement and of a motivating shared intentional object likely resulted in subdued or less positive emotions, leading to emotional flatness (Collins, 2020) and preventing the use of shared affect linking to connect creative contributions (Vass et al., 2014). As one participant reflected: “I think part of that was based on the prompt […] I don't think any of us had a lot of inspiration from it” (A3).

Accordingly, participants noted increased self-consciousness and evaluative thinking, consistent with attentional disruptors described by Lavoie et al. (2024). Even though tasks were completed, interactions required greater effort and progressed more slowly, leading participants to report feelings of disconnection and loss of purpose. These dynamics illustrate the concept of failed interaction rituals, as well as the central role of shared attention in binding individual experiences, as emphasized by interpersonal synchronization models (Collins, 2014, 2020; Páez & Rimé, 2014), which is also consistent with the lower PES, IOS, and task smoothness observed.

Discussion

This study aimed to explore the affective and interpersonal processes involved in collaborative creative activities—specifically, their influence on mood and perceptions of emotional synchrony and connection—and to examine whether the art installation Moody would enhance these effects and self-perceived creativity. Overall, findings indicate that mood improved after the activities, participants reported moderate levels of PES and IOS, and these were positively associated with self-perceived creativity measures. In contrast, no significant differences between conditions were observed, suggesting that Moody did not significantly enhance these effects. At the group level, no consistent condition effects emerged; however, an interesting trend was observed: tasks with higher PES tended to show more consistent and positive evaluations across the other measures. Qualitative findings

supported these patterns, highlighting the key role of shared interpretations and the dynamic interplay of factors involved in collective experiences of interpersonal synchronization, as well as disconnection.

Together, these results offer new insights into affective and interpersonal dynamics in collaborative creative activities with visual media, suggesting that such contexts support both mood improvement and social connection—two established antecedents of psychological wellbeing (Acar et al., 2020; Brown & Fredrickson, 2021). Possible explanations and implications are discussed below, along with reflections on the study's limitations and directions for future research.

Answering the first research question, participants' mood improved significantly after engaging in collaborative painting, regardless of condition. This finding extends prior evidence that creative social programs enhance positive affect and wellbeing (e.g. Pearce, 2016; Camic et al., 2014) by showing that even short, one-off creative encounters with unfamiliar partners can yield measurable benefits. Both creative self-expression (De Petrillo & Winner, 2005; Holt, 2018) and collective experiences (Bouchat et al., 2024; Brown & Fredrickson, 2021) have been found to drive mood improvement, among other reasons, because they satisfy personal needs for autonomy, competence, and relatedness (Hollinger & Kaufman, 2023; Putney et al., 2024). These processes likely reinforce one another (Hollinger & Kaufman, 2023): individual enjoyment could be transmitted and amplified throughout the group (Kelly et al., 2014; Shteynberg, 2018), while shared affect develops in response to a successful creative collaboration (Salmela & Nagatsu, 2016). This raises questions about the weight and nature of their relative contributions; however, a small sample did not allow for systematic analyses of these effects.

Regarding the second and third research questions, participants reported moderate PES and IOS across conditions. The scores observed in this study resemble those reported by Páez et al. (2015) and Bouchat et al. (2024), indicating that collaborative creative activities can promote emotional synchrony and connection levels comparable to events such as political demonstrations, sport games, or religious rituals. Moreover, reflecting the positive correlation between these variables observed here, both

studies found that PES mediated the effects of collective gatherings on IOS, arguing that through shared affect, individuals experienced a reduction of their differences, leading to a stronger sense of unity with the group (Páez et al., 2015; Bouchat et al., 2024; Lavoie et al., 2024). These findings reinforce the applicability of interpersonal synchronization models to collaborative creativity and their potential to strengthen social bonds (Salmela, 2021; Wood et al., 2023). At the group level, descriptive results reflected the absence of condition effects. Despite this, across groups, tasks rated highest in PES, also showed higher or more consistent IOS and creativity scores, suggesting convergent individual experiences and resonating with Shteynberg's (2018) ideas of intersubjectivity and the establishment of a shared reality.

Qualitative analysis helped explain this convergence by identifying shared meaning-making as a key cognitive and affective anchor for coordination during collaborative creativity. When groups successfully co-constructed an intentional object (e.g., shared interpretation of the theme), their attention, actions, and emotions became mutually reinforcing, facilitating attunement and, in some cases, stronger experiences of emotional synchrony. Conversely, divergent interpretations and scattered attention disrupted interactional rhythms and emotional alignment. These patterns illustrate the situational and reciprocal nature of interpersonal synchronization (Collins, 2020; Páez & Rimé, 2014), as well as its mechanisms for providing shared intentionality and sustain creative momentum (Sawyer & DeZutter, 2009; Salmela, 2021). Despite providing insight into within-group score differences, qualitative findings could not explain the magnitude of scores. Similar group PES values (3.91–3.97) represented divergent experiences—from emotional synchrony to disconnection or predominant behavioral synchronization—showing that comparable quantitative scores can mask distinct group dynamics. Such variation may stem from unaccounted individual differences that influence emotional processing or social interaction, such as baseline affect, personality traits, personal needs strength, or self-construals (Kelly et al., 2014; Leroy et al., 2015).

Concerning the absence of significant Moody effects, qualitative reports offer a possible explanation. Direct questions were necessary due to a lack of spontaneous remarks, revealing low engagement with the installation. Participants often forgot its meaning and that they were wearing the ear device or described it as a source of distraction, suggesting it may have competed for attention rather than facilitating synchrony. The high cognitive and attentional demands of collaborative painting likely left little capacity to process its cues (Drake et al., 2023; Di Pompeo et al., 2025). Considering Moody's novelty, future studies could enhance its impact by extending familiarization time or by employing less visually demanding media.

Accordingly, in response to the fourth research question, no significant condition effects on self-perceived creativity were observed. Although higher satisfaction was reported under the control condition (p = .045), this result was not considered strong evidence due the study limitations addressed below. Correlation analyses indicated that participants who experienced stronger emotional synchrony and connection with their group also perceived their creative process as smoother and the final product as more creative and satisfying, suggesting that affective alignment supported metacognitive evaluations of the collaborative activity (Kreitler & Casakin, 2009). Integrated with qualitative results, these findings align with Efklides´s (2006) notion that emotions function as feedback (e.g. feelings of difficulty or satisfaction) during task monitoring, offering an additional perspective of the positive feedback loop dynamic between affect, cognition and behavior leading to emotional synchrony (Collins, 2020; Lavoie et al., 2024). However, qualitative reports suggest that satisfaction with the product could also derive from personal enjoyment of the creative activity, regardless of the result (Hollinger & Kaufman, 2023), which would explain cases where "lower-PES" tasks showed high satisfaction.

The observed associations between affect and creativity provide empirical support for Salmela's (2021) adaptation of interaction ritual theory to explain successful experiences of group improvisation. While Sawyer and DeZutter's (2009) model of collaborative emergence emphasizes unpredictability,

coordination and contingency, it does not address the affective processes that sustain them. Shared emotions appear to play this missing role: they enable affect linking (Vass et al., 2014), binding individual creative ideas (cognition) and collective actions (behavior), allowing a smooth, intuitive coordination and the emergence of unexpected yet coherent outcomes. From this perspective, PES—and IOS—is not just an outcome but the mechanism that transforms group interactions into collaborative emergence, explaining its strong association with product creativity. Furthermore, from the qualitative findings, complementary, rather than parallel, actions appeared to contribute more to PES, echoing prior work showing that the kind of coordination that facilitates the sensation of synchrony is largely determined by task demands (Fusaroli et al., 2016; Llobera et al., 2016), which would add nuance to this theoretical integration (Salmela, 2021; Liu & Tao; 2019).

The main limitations in this study arise from its exploratory design and small sample, which constrain statistical power and generalizability; the results should be interpreted cautiously. Additionally, findings are context-specific to small groups engaging in collaborative painting and may not extend to other creative modalities, cultural contexts, or group compositions. Future research should include larger, more diverse samples, measure individual differences moderators, and employ longitudinal or multisession designs. Allowing participants to define their own creative prompts or use abstract painting may yield richer expressions of shared meaning-making. Designs comparing collaborative and individual creative tasks performed collectively, could clarify the effects of different types of behavioral alignment on PES and creativity. Across these possibilities, it will be important to consider that technological augmentations require thoughtful integration in the design, as this could clarify how tools like Moody can influence emotional synchrony without imposing cognitive load.

Despite these limitations, this research offers methodological and conceptual contributions. To our knowledge, it is the first to employ a mixed-methods approach to study PES in collaborative creativity. By applying the framework across quantitative and qualitative components, the study

contributes to expand how collective affective processes can be operationalized and explored. Unlike prior work focusing on longer-term wellbeing outcomes (Wood et al., 2023), this study captured the immediate dynamics of synchrony, demonstrating that PES can be meaningfully assessed within brief creative encounters. It also expands evidence that visual media can afford interactional forms of art-making and processes of collaborative emergence equivalent to performing arts, while accommodating different skill levels and populations (Abraham et al., 2022; Sawyer & DeZutter, 2009). Collaborative painting thus emerges as a promising context for studying emotional synchrony—accessible, flexible, and offering tangible visual records of shared creative experiences.

Conclusion

In sum, with this study we have found further evidence of the affective dynamics involved in collaborative creativity, and revealed that even brief art-making encounters can offer wellbeing benefits. Collaborative creative activities can improve mood and foster a sense of connection among previously unfamiliar individuals through experiences of emotional synchrony. Although the art installation Moody did not significantly enhance these effects, findings highlight the essential role of shared affect in linking individual cognition and creative collective behavior, sustaining the intuitive coordination that enables collaborative emergence. Integrating quantitative and qualitative data in a mixed-methods design, this research provided empirical support for extending interpersonal synchronization theories to collaborative emergence, offering preliminary evidence that PES is not only an indicator but also a mechanism of creative improvisation. Beyond its theoretical contributions, this research demonstrated the feasibility of studying collective experiences with visual media, opening new avenues for investigating how emotional synchrony unfolds and evolves in longer-term or technologically augmented creative settings.

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Appendix A

Moody – Qualtrics Questionnaire

Intro & CI. You have been invited to participate in our study because of your interest in artistic expression and creative activities. With this research, we seek to learn more about emotional and physiological responses in collaborative art creative experiences. The research plan has been evaluated by the ethics committee of the Faculty of Behavioural and Social Sciences (BSS) of the University of Groningen (the Netherlands). If you have any questions not addressed in this form, please do not hesitate to ask one of the researchers on site.

The study consists of 3 parts:

1. a. Individual preparation: We will ask you about your mood. (~1 min). During this stage, you will be asked to put on the Polar waistband under your clothes in a changing room.

1. b. Group preparation: As a group you will be assigned to a creative task and receive the instructions for it.

2. Performing a collaborative creative task.

3. Focus group on the experience.

Please, carefully read the Information Form for further details. You can download and keep a copy of the Information Form. For any additional information, you can reach out to the research team at the following address: r.f.a.cox@rug.nl

You can stop participating without any consequences at any time and you can withdraw your consent at any time. Also, you can ask to have your data erased by 01/09/2025.

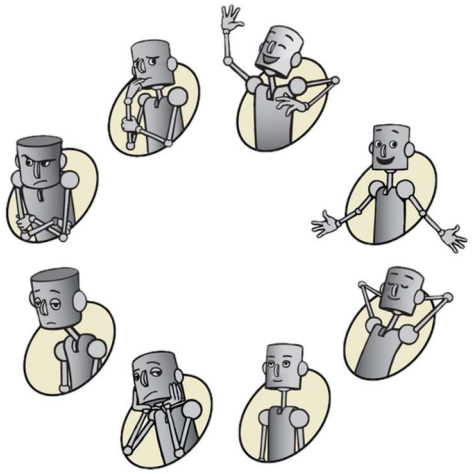
Do you consent to participate in the research project?

- Yes, I consent to participate; this consent is valid until 01-10-2025 (1)
- No, I do not consent to participate (2)

Mood before

Instructions. Thank you! You will now be asked some questions about your current mood and how familiar you are with the group.

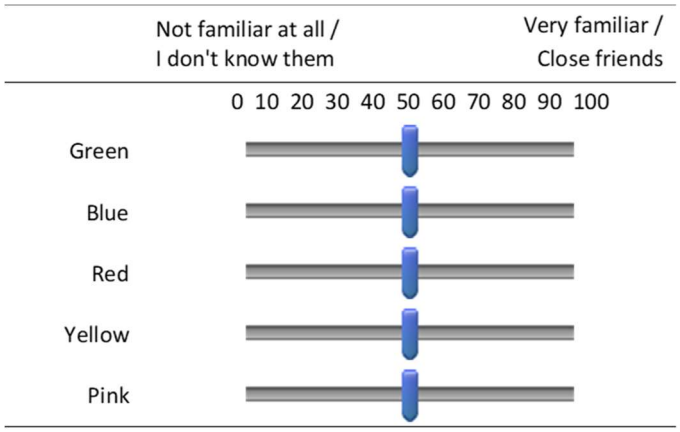
Pick-a-mood PRE. Please select the character that best represents your current mood state. We are interested in how you are thinking or feeling right now as you are filling out the questionnaire.



Color. What is the color of your sticker?

▼ Green (1); Blue (2); Red (3); Yellow (4); Pink (7)

Familiar. How familiar are you with the participants (based on the color of their sticker) in your group?

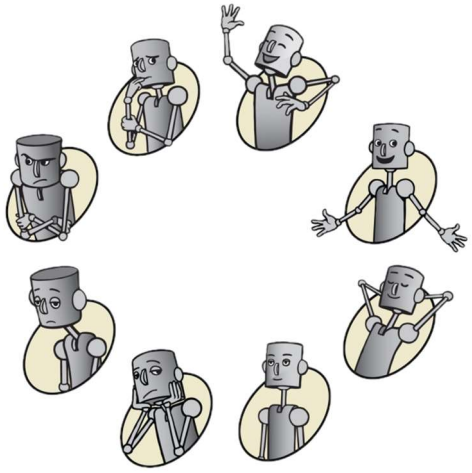


Switch to task. Great! Now, please follow the instructions of the researcher as you are about to perform your collaborative creative task!

After Task 1

Instructions. Well done! Now you will be asked again some questions about your mood and experience with your group.

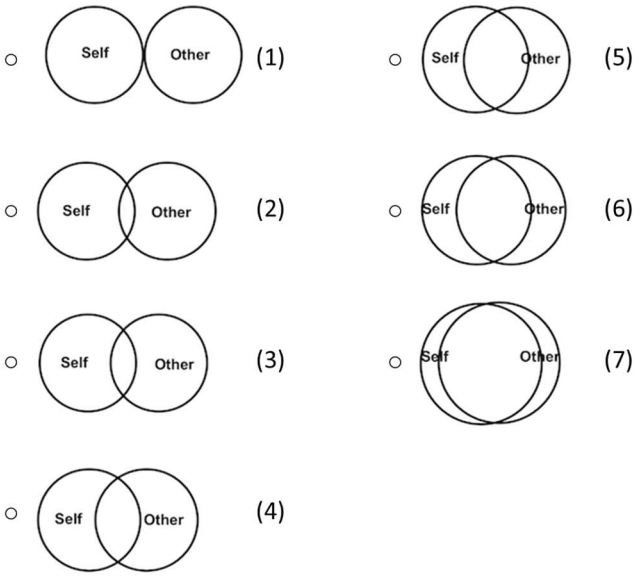
Pick-a-mood POST1. Please select the character that best represents your current mood state. We are interested in how you are thinking or feeling **right now** as you are filling out the questionnaire.



PES 1. Please indicate, during the previous collaborative creative task, to what extent have you felt:

	Nothing (1)	Very little (2)	A little (3)	Moderate amount (4)	Quite a bit (5)	A lot (6)	A great deal (7)
We performed as one, like a single person (1)	O	O	O	O	O	O	O
It seemed to me as if we were a single person (2)	O	O	O	O	O	O	O
We felt that we were one (3)	O	O	O	O	O	O	O
We felt more sensitive to emotions and feelings that others feel (4)	O	O	O	O	O	O	O
We felt a strong shared emotion (5)	O	O	O	O	O	O	O
We felt stronger emotions than those we normally feel (6)	O	O	O	O	O	O	O

IOS 1. Please select the picture below that best describes your relationship with your group during the previous collaborative creative task:



SAC 1. Please rate the following aspects of your group's work for the previous collaborative creative task from 1 star (very low) to 5 stars (very high):

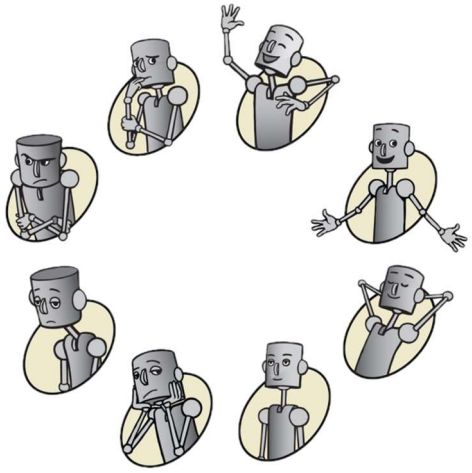
How creative is your group's final product? (1)	☆ ☆ ☆ ☆ ☆
How smoothly did the task flow? (4)	☆ ☆ ☆ ☆ ☆
How satisfied are you with the final product? (5)	☆ ☆ ☆ ☆ ☆

Switch to 2nd Round. Perfect! This was the end of the First Round, now it is time for a short break.

After Task 2

Instructions. Well done! Now you will be asked one last time some questions about your mood and experience with your group.

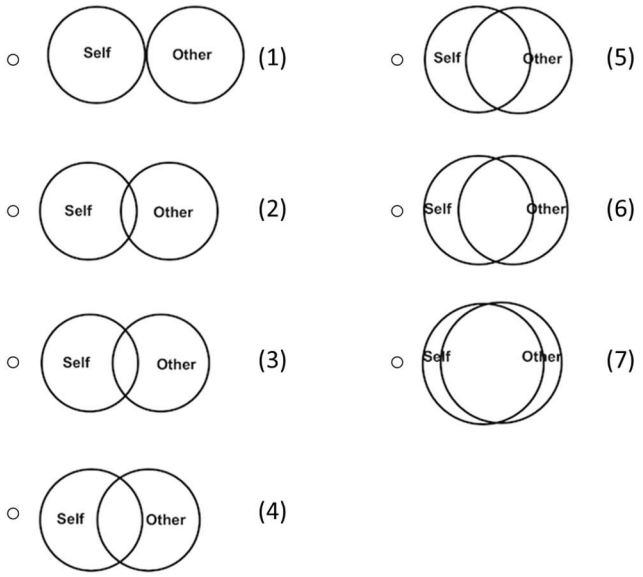
Pick-a-mood POST2. Please select the character that best represents your current mood state. We are interested in how you are thinking or feeling **right now** as you are filling out the questionnaire.



PES 2. Please indicate, during the previous collaborative creative task, to what extent have you felt:

	Nothing (1)	Very little (2)	A little (3)	Moderate amount (4)	Quite a bit (5)	A lot (6)	A great deal (7)
We performed as one, like a single person (1)	O	O	O	O	O	O	O
It seemed to me as if we were a single person (2)	O	O	O	O	O	O	O
We felt that we were one (3)	O	O	O	O	O	O	O
We felt more sensitive to emotions and feelings that others feel (4)	O	O	O	O	O	O	O
We felt a strong shared emotion (5)	O	O	O	O	O	O	O
We felt stronger emotions than those we normally feel (6)	O	O	O	O	O	O	O

IOS 2. Please select the picture below that best describes your relationship with your group during the previous collaborative creative task:



SAC 2. Please rate the following aspects of your group's work for the previous collaborative creative task from 1 star (very low) to 5 stars (very high):

How creative is your group's final product? (1)	☆ ☆ ☆ ☆ ☆
How smoothly did the task flow? (4)	☆ ☆ ☆ ☆ ☆
How satisfied are you with the final product? (5)	☆ ☆ ☆ ☆ ☆

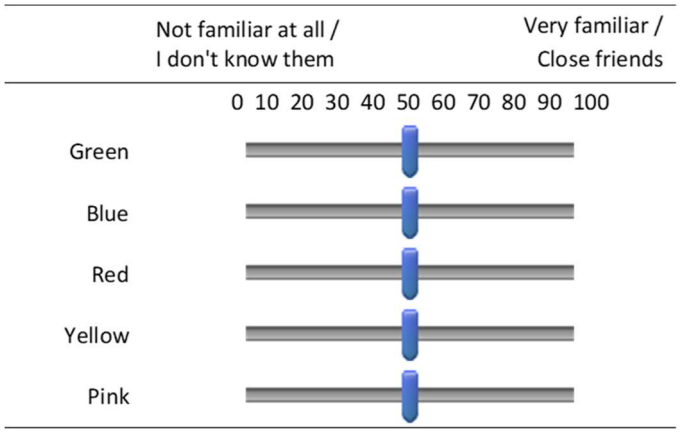
Age. How old are you?

- Under 18 (1)
- 18-24 years old (2)
- 25-34 years old (3)
- 35-44 years old (4)
- 45-54 years old (5)
- 55-64 years old (6)
- 65+ years old (7)

Gender. What is your gender identity? (You can select one, all, or a combination of these)

- Prefer not to say (11)
- Prefer to self-describe (12): _____
- Woman (13)
- Man (14)

Familiar2. How familiar are you with the other participants (based on the color of their sticker) in your group?



Switch to FG. Perfect! This was the end of the Second Round, now please follow the researcher's instructions that will guide you through the last part.

Appendix B

Focus Group Protocol

Materials: Sticky notes of different colors (one color per participant), markers, board or flip-over.

Introduction

As explained in the beginning, we are focusing our research on the collective experience of collaboration in creative and artistic activities. This is why, in addition to the questionnaires, we would like to now hear from you, and in your own words, how did you experienced the two creative tasks, in terms of how each of you felt, how you interacted, the results you achieved, and if you feel or think there were any differences between the two rounds.

Each of you will have sticky notes and a marker, and we will use this board to help us visualize your ideas for this discussion.

Process

- How did you feel during the tasks?
  - Please, write on the sticky notes words that describe your feelings, thoughts or ideas during the first task and paste them on the top half of the board.
  - Please, do the same for the second task and paste them on the bottom half of the board.
  - Were you able to *tell/know* if others were feeling the same or something similar? How? How would you compare this between the two rounds?
- How did you coordinate your actions and contributions in the group?
  - On the board you will a line for each task, on these, one end corresponds to “well-coordinated”, and the other to “chaotically (un)coordinated”. Please, paste one sticky note along them, according to what you think best describes your group during each task.
  - What do you think about your answers?
  - Did you experience any sense of *acting as a unit*? When? (specific moments or sustained in time)
- Taking into account your answers on the board, what else can you say about your experience during the tasks? Going from empty canvas to finished artwork, what similarities and differences did you observe?

Results

Now, let us focus on the moments after completing the tasks:

- How did you feel then?

- How satisfied are you with the final results of your group's work for each task?
  - As in the beginning, use your sticky notes to write and paste your thoughts about the results for each task
  - Which one do you prefer? Is there one better than the other?
  - What do you think made the difference?

Closing

- If no explicit mention of Moody: What do you think about the Moody installation? Do you feel/think it had any effect on you or the group during the task? Did it make a difference?
- Is there anything else you would like to comment about your experiences during or after the tasks?

Board Example:

<table>
<tr><td colspan="2">How did you feel during the tasks?</td></tr>
<tr><td>Task 1</td><td>Task 2</td></tr>
<tr><td colspan="2">Group Coordination</td></tr>
<tr><td>Task 1
  </td><td>Task 2
  </td></tr>
<tr><td colspan="2">How did you feel after the tasks?</td></tr>
<tr><td>Task 1</td><td>Task 2</td></tr>
</table>

Appendix C

Deductive Thematic Analysis Codebook

Signs of Synchronization

This theme captures how participants experienced or described moments of interpersonal synchronization. Codes refer to reported and observable signs of the presence or unfolding of emotional synchrony and feelings of connection between participants during tasks and reflection. Considers cognitive, behavioral, and emotional indicators, corresponding with either catalysts or effects of emotional synchrony, according to the theoretical frameworks of interaction rituals (Collins, 2014), multifaceted social synchronization (Páez et al, 2015; Wlodarczyk et al., 2020), and group flow (Lavoie et al., 2024).

Code	Description	Example quote [a]
Mutual awareness	Awareness of each other's attention, expressions, emotions or presence. Noticing someone else's reactions.	C1: "I think we were all smiling, we were talking in between as well." B2: "We were very excited at the start, and then we calmed."
Shared attention	Attention is simultaneously directed to a common target, e.g. the same task, object, or idea, making it a shared intentional object.	A1: "Everything we drew was still the same world that we drew." D4: "Okay, let's do this, the colors, blah, blah, blah, and like, we agreed. And it was quite, uh, like "*This is the task. We do it.*"

[a] Participants are identified by their group's letter and a number.

Code	Description	Example quote [a]
Shared interpretation	Shared cognitive responses. Common understanding or collaboratively built.	C2: "And we all were thinking something similar." C1: "Yeah!" D5: "So, in that sense, I think we still have a theme and an idea, but it's just a creative freedom."
Behavior alignment	Parallel/mirrored, or interactive and complementary movements or actions happening in close succession. Additive contributions, i.e. content that builds upon or extends a previous one.	B1: "...but then it was just like [*snaps fingers*], in one second, and we started working… which was nice." B2: "Yeah!" D5: "Everybody just started interacting with each other's pieces, and starting to build on top of ideas."
Expressive alignment	Coordinated expressive manifestations. Such as shouting or saying particular words or sentences together.	D2: "I really think that I could interpret that the others were *free*…" D4: "Being more *free* was a positive thing, and that's why I prefer the second one."
Attunement	Sense of emerging harmony. Adjusting or positively responding to others' cues. Perceived as (gradual) improvement of group connection or performance.	A3: "As we got into like, the groove of working together it's easier to do that." D3: "The coordination was evolving according that we were seeing what the others were doing."

Code	Description	Example quote [a]
Emotional alignment	Shared emotional responses to an object of attention. Similar emotional states at a time, or recognition of collective feelings.	C2: "I think that we were all having fun. (C1: Yeah) So what I can tell is that… C1: You're enjoying it." B4: "We were like flowing (…) It was something like a vibe, and that feels good. I agree."
Emotional effervescence	Amplified or intensified positive emotions resulting from a successful collective experience, represented by feelings of empowerment, joy, gratitude, satisfaction, enthusiasm, solidarity, or connection, among others (see Rimé & Páez, 2023).	D2: "The level of communication and connection we had with each other (…), and give permission to feel free." A1: "And by the second one, (...) I was fully confident in what you guys were doing, and I was like, I'm just gonna jump in."

[a] Participants are identified by their group's letter and a number.

Out of Sync

This theme was developed during the coding stage to capture how participants experienced or described moments of disconnection or thwarted interpersonal synchronization. Based on the same theoretical frameworks (Collins, 2014; Páez et al, 2015; Wlodarczyk et al., 2020 Lavoie et al., 2024), but formulated as parallel opposites, codes reflect reported and observable indications that synchronization was disrupted, decreased, or not achieved at all, beyond the absence of Signs of Synchronization, including external or internal factors that produce a noticeable delay or gap between contributions.

Code	Description	Example quote [a]
Distraction	Elements that disrupt awareness of others or prevent convergence on a single attentional target, resulting in diverse or competing attention foci. Internal, such as judgmental thoughts; or external, such as unforeseen disruptors.	C1: "The second time, I felt we were more aware of the time." A1: "(...)in the first one, it was kind of, it felt a little bit daunting to put the first things on the paper, because that's like committing to the idea."
Divergent interpretation	Failed attempts to develop a common understanding and shared meaning, or difficulty in overcoming differences. Different interpretations that persist and compete.	C1: "Yeah, yeah. We both had, me and C3, we had both struggled a bit with your idea." A3: "So, yeah that really is like a lot of individual ideas put together instead of one collective."
Behavior misalignment	Movements or actions that are disconnected to the previous ones, either in time or intention. Contributions are not additive or are delayed (Lavoie et al., 2024).	A2: "(...) we had some moments of "*we don't know, what can I do*", (…) and I think it was coordinated, but in some part of the time we were blocked." B4: "And then in the second one it was more like a staccato, and like, I think it´s time for something else."

Code	Description	Example quote [a]
Emotional flatness	Captures a neutral or flat affective tone in participants or group. Boredom, unenthusiastic reactions.	A3: "Well, the first prompt especially; that I don't think any of us had like a lot of inspiration from it, you know? (A1, A2: Mm-hmm)."
		B3: "The second thematic, is very hard to put feeling and emotion in that one (…)"
Disconnection	Sense of lacking or losing coherence, shared direction, or purpose in actions, contributions or interpretations. Perceived as separation, unrelatedness, or misreading cues.	C2: "I think it's kind of the same all over the task. (…) I think that we didn't communicate that much about what should be the final results."
		A1: "And like you said, the drawing itself was a little bit like, we're searching, a little bit, a little bit chaotic."

[a] Participants are identified by their group's letter and a number.