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Relational creativity and improvisation in contemporary dance

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ABSTRACT

In a study combining methodological elements from cognitive psychology and social anthropology, we worked with professional contemporary dancers making choreographic movement material to investigate the effects of working with others during improvisation. Dancers improvised alone, in pairs, and in a trio, they self-reported the number of new movement ideas created within two and four minutes, and self-rated ease, interest, originality, and clarity. Within two minutes, higher ratings were assigned in the unfamiliar pair than the familiar pair condition but there was no effect of group size on the number of ideas created. Within four minutes, more ideas were created in the solo condition than the pair condition with no effect of group size on ratings. Open-ended responses suggested that the quality and relevance of the ideas increased in the duo and the trio conditions. The conclusions point to emergent aspects of relations between persons as fundamental to creativity.

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Highlights

While more ideas may be generated while improvising alone, the quality and relevance of improvised ideas were increased when working with others. Where quality and interest of creative output is paramount, results indicate that emergent aspects that are dependent on specific relations between persons contribute significantly to a successful process.

Introduction

In this paper, we relate research outcomes from an enquiry into innovation and creativity, addressing empirically questions such as how, and under what

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conditions, they arise (e.g. Amabile 1983; Boden 2004, 2009; Csikszentmihalyi 1996; Sawyer 2012)? We undertook a mixed-methods approach, combining quantitative and experimental techniques with qualitative data gathering, working with dancers at the Australian Dance Theatre.

Choreographers and performers in contemporary dance collaborate in generating and exploring, editing, and combining ideas through movement. Our study focuses on the specific genre of dance-making that relies on improvisation to make movement material from these ideas, and on the part of the making process itself when improvisation is key.

The contemporary dance ensemble affords analysis of collaboration and distributed cognition situated in the ecologically valid setting of the studio (Kirsh 2011). Looking carefully at studio work offers a natural laboratory that might throw light on improvisation as a mode of creativity more generally. Creativity has often been assumed to be of an individual (e.g. Amabile 1983; Taylor and Littleton 2012; and see Leach 2007) and based in a set of cognitive processes including problem-solving and decision making, with an emphasis on internalized and individual cognition (Finke, Ward, and Smith 1992; Runco 1994; Sternberg 2003). However, contemporary conceptions of human creativity acknowledge the interplay of individual with social and situational factors (Cattani, Ferriani, and Colucci 2013; Fischer et al. 2005; Paulus and Dzindolet 2008; Perry-Smith and Mannucci 2015; Sawyer and DeZutter 2009). There are also arguments for considering the way that improvisation is an everyday aspect of human social and environmental perception (Ingold and Hallam 2007, 6–9). In light of this, further investigation of improvisation, taking account of social relationships with proximate (or even imagined) others, offers potential insights. A broad hypothesis examined here is that human creativity is collaborative and social (Cattani, Ferriani, and Colucci 2013; Perry-Smith and Mannucci 2015). A narrower hypothesis is that the emergence of ideas and actions takes account of social others in active ways that shape artistic outcomes.

Cognitive psychologist Mihali Csikszentmihalyi has argued that instead of asking what creativity *is*, we should ask *where* it occurs (Csikszentmihalyi 1996). For many, this is (perhaps) a surprising question. That is, the assumption that creativity is something that individuals possess inherently, or utilize at specific moments, is deeply embedded in artistic institutions, laws of property, and in our academies (see e.g. Biagioli and Galison 2003; Hirsch & Strathern 2004). It is usually conceptualized as internal to the individual. Although attention has been paid to the complex contextual factors and enablers of creative thinking or action, the ‘social psychology of creativity’ advanced by Amabile (1983), Brass (1995) and Simonton (1999), for example, or Csikszentmihalyi’s own model of ‘symbolic rules and procedures, fields of individuals who act as gatekeepers ... , and individual creative persons’, maintains a fundamentally individualistic sense of what the person is (Moeran 2014, 21), thus where creativity is located. Given the hypothesis that creativity is collaborative and social,

one valid question is where we might locate creativity if we do not assume this individualistic sense of the person, a conception that has been shown to be ethnocentric (e.g. Latour 2004; Strathern 1980; and see Leach 1998). A second question, and one which follows, is what we mean by collaborative, and by social?

We briefly list some relevant literature before proceeding to a description of an experiment in collaborative methodology. The results of this are outlined prior to a discussion of the implications that point to the importance of relationships themselves as an emergent ground for creative exploration. We point to more nuanced ways we can understand collaboration and the social when approaching creativity. Our study is thus of the everyday creativity of persons improvising together (rather than of genius or flashes of inspiration), creativity that brings people as well as artistic ideas and material into mutually constitutive configurations.

Early research in psychology pointed to situations where ‘two heads are better than one’. For example, bicyclists performed better when there were other cyclists riding alongside than riding alone (Triplett 1898) and social influences on cockroaches have been demonstrated (Zajonc, Heingartner, and Herman 1969). These studies have been interpreted to suggest that simple tasks tend to be performed better with co-actors, whereas complex tasks are generally performed better alone (Lamm and Trommsdorff 1973 but see Jackson and Williams 1985). Building on this tradition, it has been asserted that the exception to the rule is where the actors involved are working on complex tasks from subject areas in which they are experts (Amabile 1983). Brainstorming is most creative when there is diversity among group members, i.e. varied knowledge or experience (Paulus and Dzindolet 2008). However, fewer ideas can be generated in groups than alone, with social forces apparently inhibiting rather than facilitating group creative processes (Jackson and Williams 1985; Lamm and Trommsdorff 1973; Osborn 1957; Paulus et al. 2002). When creativity is distributed and social, co-creation can come about through sharing of emotion, experiences, and representations (Whitehouse 2001). ‘Breakdowns’ during open-ended and complex tasks, however, can provide unique opportunities for reflection and learning. Interaction around boundaries rather than external objects themselves can create and communicate knowledge (Fischer et al. 2005).

Interpersonal synchronization and joint action are two settings where distributed cognition has been explored experimentally. For example, the ability to entrain to a rhythmic beat, as we see in some musical and dance behaviour, encourages interpersonal coordination. This kind of coordination has been associated with group cohesion and social bonding (Cirelli, Wan, and Trainor 2014; Kirschner and Tomasello 2009). Some evolutionary accounts of the adaptive purposes of music, for example, have linked musical behaviour with social bonding (e.g. D’Ausilio et al. 2015; Tarr, Launay, and Dunbar 2014).

Famously, Hutchins (2001) has provided a framework for a relational and contextualized or ‘situated’ view of cognition.¹ Hutchins theorizes that cognitive

processes may be distributed across the members of a social group; the operation of the cognitive system involves coordination between internal and material/environmental structure; and products of earlier events can transform the nature of later events. Distributed processing occurs, he argues, when the processors are neurons, areas of brain, whole persons, groups of persons, or groups of groups of persons. He notes too that the cognitive properties of a group can differ from the cognitive properties of the members of a group. This is pertinent when considering human cognitive capabilities. The possibility of a creative outcome is made possible by group and distributed processes.

The 'relational' in Hutchins' words refers to the relationships of the social and the material to cognitive processes that take place inside individual human actors. Social organization, plus the structure added by the context of activity largely determines the way information flows through the group. Social organization may then itself be viewed as a form of cognitive architecture (Hutchins 2001).

More recently, factors that have been considered influential include the role of social networks (e.g. Kilduff and Brass 2010), the strength of ties or relations between individuals (Perry-Smith and Mannucci 2015) and the importance of trust between network members (Krackhardt 1990; Lorenzoni and Lipparini 1999). Considering the 'relational dimension', the strength of the relationship includes how frequently individuals interact with each other and/or how long they have known each other (Perry-Smith and Mannucci 2015). Empirical studies have reported benefits for innovation and creativity when there are strong ties between members of the network or group while others report benefits from weak ties (e.g. Delmetsi, Montanari, and Usai 2005; Mueller and Kamdar 2011). Interpersonal ties that are weak can be beneficial for creativity because they are associated with access to different types of knowledge and individuals who differ from each other. Groups with strong ties, on the other hand, 'involve dense clusters of redundant ties where information circulates and repeats itself' (Perry-Smith and Mannucci 2015), but this can be beneficial for creativity as individuals are motivated to help each other and engage with a problem (Sosa 2011). Dyadic trust also increases the sharing of information (Hansen 1999), and perceived credibility of information (Levin & Cross 2004).

Whether or not such studies move definitively away from underlying assumptions about individuals and the internal sources of their creativity is debatable. Often the focus is still on interactions between pre-given entities (individuals constituted outside their creative work or relations with others) rather than as emergent from the process of relating to others. Perhaps more in line with Moeran's concern, 'that we should locate creativity not in individuals, but in the material, aesthetic, situational, organizational, symbolic, and economic; in short, in the *social*' (2014, 21), is work that looks at the on-going formation of self and other, and of identity, in creative practice. Taylor and Littleton argue

¹As has Barsalou (2008).

that ‘attention to this on-going process of “becoming”, which is contextually and historically situated, occasioned, dynamic, relational, fragmentary, and plural (Moran and John-Steiner 2003)’ (2012, 18) is the key to actually establishing an alternative to positivism in the understanding of creativity. Building on the foundation that perception and cognition are relational (see e.g. Ingold 2000) the picture becomes more interesting when we consider cognition as distributed and social in the sense of an emergent and transformational process. In other words, the relation that is cognition can be extended and multiplied through interaction, collaboration, and co-operation. Creativity in groups is more than just an agglomeration of individual inputs. It is an emergent aspect of relations between entities that are also transformed in their capacities or potential in the process itself (Ingold 2011, 69–73).

In a different register but on the same theme, social anthropologists considering ethnographic material from Melanesia describe social and conceptual systems in which people explicitly place value and prominence on shaping and manipulating relationships that give form to entities (Strathern 2012), that is, on the form of interactions, and on specific transactions which result in changes in people’s capacities and social/political positions (e.g. Bonnemère 2017). Many of these scholars develop descriptions of things, including persons, that are emergent from social processes themselves rather than vice versa (Leach 2003). The idea of the generativity of relationship itself is central here. Reminiscent in psychology of Ivinson’s concern with the wider ‘social’ person in any moment of (creative) action (2004, 96), and Littleton and Miell’s stress on the ongoing formation of identities in interaction (2004), it is clear that many Melanesian people acknowledge the necessary mutual constitution of the meanings and capacities of the body in their relations to one another (Strathern 1988), and the transformative power of relational forms on emergent persons’ selves and capacities (Crook 2007, 8–11). Underlying this is a sense that the essence of what is human is not given in properties that individuals carry internally, as it were, irrespective of their relations to others (Strathern 1999). Instead, particular forms of person (gendered, skilled, etc.) are made present, elicited by, the actions and intentions of social others. This might be characterized as an anti-essentialist notion of the person (Leach 2009). The person is understood as an outcome of relationships with others.

Bringing these perspectives from social anthropology into the frame alongside developments in social and cognitive psychology suggests we might look to how and where we conceive of and acknowledge relationships themselves as the locus of creativity.

The present study – improvisation as creative exploration in dance making

How do dancers in contemporary dance make something from nothing during improvisation? They are often given a task to improvise around with the

intention of generating material for a set work. That material is made using the body in an extended sense, inspired by any or all of the senses, often drawing on conceptual, theoretical or emotional themes. The tasks are approached using physicality to address or engage conceptual problems. Improvising in this mode is often collaborative and often ensemble-based. The creative process utilizes the body in its connection with other bodies including what the body brings with it – its history, and thus reflecting the particular physical and cultural background(s) of the person or group. Bodies thus appear a complex material from which to make art. As Potter states, following Csordas (1993), improvisation is a mode in which not only artistic material is made, but the dancer in a sense comes into being in the flow of action. Improvisation is thus core to ‘creativity’ in both a limited (immediate, artistic) and more pervasive (social person) sense. ‘Thus dancing bodies are not simply there in the world, but are constantly made and re-made in a long series of moments involving collective attention to and with others’ (Potter 2018, 248).

The studio provides an ideal context in which to capture and track idea germination and the development and refinement of that idea (Barnard and deLahunta 2017). Because it is accomplished with the body, exploration of ideas and thinking is made tangible. It is visually accessible to some extent, and it unfolds in time. The process can be recorded and analysed.

What methods of investigation are appropriate when creativity is expressed through and with the body? The approach adopted here is one that brings together observation and interview with some experimental control and manipulation of variables that is characteristic of cognitive psychology. The approach thus combines methods from social anthropology with those from cognitive psychology.

One way experimentally to probe distributed creativity is to compare creative processes and/or outcomes in solitary versus collaborative situations. The design here manipulates solo and group conditions (pair or trio) in which a dancer is asked to improvise. Tie strength will be manipulated in the present study operationalized as the relative frequency of dancers improvising together.

If it is the case that the social relation between dancers contributes to the creative process then we might observe or record greater satisfaction and productivity under the conditions of the pair/trio improvisation compared with solo improvisation. The notion of creativity, particularly originality and value, is contentious in art because of subjective value judgment on the one hand, and the inherent assumption of a need for novelty and expertise on the other. Who the art is for is an apt question with many possible answers and effects on the practice. For these reasons, creativity during each trial was judged by the dancer who had generated the material. It was operationalized as the number of different ideas explored through movement during a trial.

Earlier psychological research on creativity provided a number of different dimensions by which the creative process and outcomes could be appraised

Table 1. Rating scale items after Dean et al. (2006).

	1	2	3	4	5
	Not at all	Slightly	Moderately	Very	Extremely
1. The task was easy.					
2. Performing the task was satisfying.					
3. The outcomes produced were interesting.					
4. Other dancers would find the material interesting.					
5. The material produced was rare.					
6. The material produced was original.					
7. The material produced could be used in a performance.					
8. The movement ideas were expressed clearly.					

such as number of ideas, rarity, originality, novelty, usefulness, workability, specificity, and relevance (Dean et al. 2006; Lamm and Trommsdorff 1973). The data collected here were informed by these dimensions. Specifically, dancers counted ideas they explored through movement. In a Likert rating scale format, eight items were constructed with the first three relating to task ease, satisfaction with performing the task, and interest in the outcome. The remaining five items were constructed from the key dimensions in Dean et al. (2006): rarity, originality, specificity including clarity, workability/feasibility (i.e. ‘the material produced could be used in a performance’) and relevance (‘other dancers would find the material interesting’). The items are shown in Table 1. The two-minute duration of each trial and the form of the choreography task meant that the experiments focussed on ‘P-creative’, to use Boden’s (2009) term. That is, the ideas were new for the individual concerned – psychologically or personally creative. The type of creativity is exploratory (Boden 2009).

In Experiment 1, the independent variables were dance condition (solo, pair), to include variety, instructions (expressive, non-expressive) – within-subjects; and, in the pair condition, dancer tie-strength operationalized as familiarity (familiar, unfamiliar). Social context was the key variable being manipulated. So as to not draw attention to this variable and to avoid carry-over effects, solo improvisations were conducted first by two dancers individually and separately followed by their duo improvisation together, with a new topic for movement exploration. The dependent variables were the self-reported number of ideas, open-ended responses, and self-report ratings of task ease, satisfaction, interest, novelty, originality, and clarity.

Experiment 1 – two-minute improvisations

Method

Participants

The sample comprised 10 professional dance artists from the Australian Dance Theatre (ADT) (Mean age = 25.6 years; $SD = 4.03$; 4 females) with mean years of dance training 13.4 years, $SD = 5.87$.

Stimuli

We piloted a version of the experiment with a Sydney-based choreographer, Sue Healey, and a handful of dancers to check not only that the instructions, task, and procedure made sense, but also to see the kind of process and data that emerge. The experimental task for the ADT dancers was then developed in Adelaide in consultation with the Associate Artistic Director of ADT, Elizabeth Old. The three choreographic tasks were to make choreographic material around the theme or idea of a cube/sphere/cylinder (Forsythe 1999) for two minutes. The three tasks were chosen to be comparable but to have some variety to minimize boredom and constrain practice effects. Tasks were allocated randomly to solo and paired dancers with roughly equal distribution of the different tasks across dancers and solo and pair combinations. During study planning, the Associate Artistic Director advised on forming familiar and unfamiliar pairs of dancers where familiar referred to pairwise combinations of dancers who frequently improvised together in making new material for ADT works, and unfamiliar referred to pairwise combinations of dancers who rarely, if ever, improvised together.

The instruction variable was blocked with all non-expressive instruction trials conducted before the block of expressive instruction trials for all participants. Within the blocks of non-expressive and expressive trials, dancers completed their solo improvisation with authors JL and CS observing out of sight of the other nine dancers. After two solos, those two soloists then paired for their joint improvisation. The choreographic task was cycled so that a dancer never improvised the same choreographic tasks as a soloist and in a pair. For example, the dancers Kyle and Amber who improvised together frequently formed one of the familiar pairs. Kyle's solo was in response to the sphere choreographic task, Amber's solo was in response to the cylinder concept, and their pair task was in response to the cube concept. The three different concepts for the choreographic task – sphere, cylinder, cube – were distributed across the dancers and trials in accordance with the rule that the same task was not performed twice in two dancer conditions.

In the two instruction conditions, there were each 14 trials. In non-expressive instruction, eight were solo trials, three familiar pair trials, and three unfamiliar pair trials. In the expressive instruction condition, there were seven solo pair trials, three familiar pair trials, and four unfamiliar pair trials.

Equipment

Improvisations were recorded using on a JVC Everio full HD camcorder mounted on a Manfrotto tripod; the camera was fitted with a RØDE external microphone.

Procedure

Participants received an information sheet and provided written consent (Western Sydney University Human Research Ethics Committee Approval

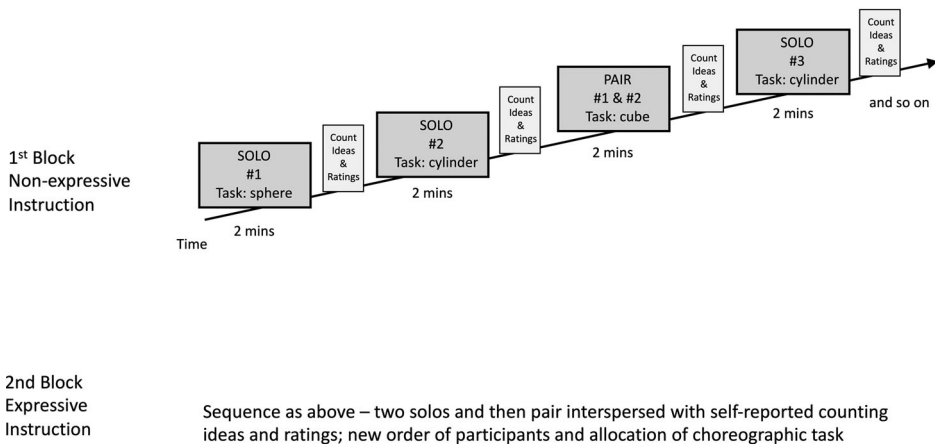


Figure 1. Illustration of the experimental sequence. The non-expressive instruction condition took place as the first block of trials. Within an instruction block, two solo trials were conducted first followed by the two soloists then forming a pair, and so on. Ideas were counted and ratings self-reported after each trial.

No. H10527). In the main studio at ADT in Adelaide, dancers were given two minutes for each improvisation task. Tasks were undertaken without any accompanying music or soundscape. Figure 1 shows an example of the sequence of trials and tasks in the non-expressive instruction condition. Dancers completed a mix of trial types with most participating in solo, familiar pair and unfamiliar pair conditions. They created material first according to non-expressive or ‘movement-based’ instructions and the second block of 14 trials according to expressive or ‘state-based’ instructions. After each trial, the dancers completed a questionnaire wherein they self-reported the number of new ideas they had produced during the trial, completed the rating scales and answered two open-ended questions: (i) Describe how it felt doing the task. (ii) How many different movement ideas did you express? The entire experiment session for all participants lasted for two hours plus debrief and discussion time.

Results

Number of self-reported movement ideas

Members of the dance company are familiar with choreographic tasks that can be used to stimulate improvisation. In asking dancers to count the number of ideas generated in two minutes they would recognize the end of an idea when they had exhausted all possibilities or become bored or stale with the way it developed, or there was a break or change in intention, tempo, scale, and so on. Dancers estimated the number of new movement ideas for a particular task immediately after each trial was performed. Eight data points or four unfamiliar pair trials were removed because of missing data and removing pair trials

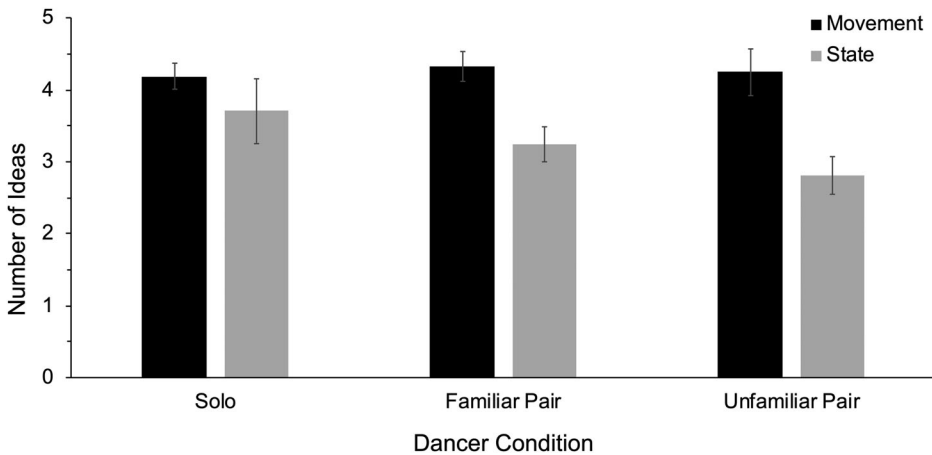


Figure 2. Experiment 1 mean number of self-reported new movement ideas by dancer condition and instructions. Error bars show standard error of the mean.

involving a visitor to the company who was not a professional member of the company. Twenty-eight trials remained after these data were removed.

The data from pair trials yielded a number reflecting the quantity of ideas from each of the two dancers whereas solo trials yielded one number-of-ideas data point per trial. In the original analysis of data (not reported here), data from the members of a pair were averaged. This severely limited the number of data points for analysis and veiled the variability in the sample. A technique developed in studies of collective memory (e.g. Barnier, Klein, and Harris 2018) was used subsequently (and reported here) to ensure inclusion of the maximum number of data points from the point of view of statistical power while enabling the fair comparison of solo and group data. In the collective memory studies 'nominal' groups were compared with 'collaborative' groups to test whether recall output of collaborating groups is literally more than the sum of individual members' recall (Barnier, Klein, and Harris 2018, 80). Thus, the number of ideas reported in solo and pair trials was thought of as pooled groups including the solo; that is, the pooled performance of the same number of people recalling alone. The data points then in the non-expressive instruction condition were 20 comprising 8 solo, 6 familiar pair, and 6 unfamiliar pair data points and in the expressive instruction condition a total of 21 comprising 7 solo, 6 familiar pair, and 8 unfamiliar pair data points.

Values were analysed in an Instructions (2) \times Dancer condition (3) analysis of variance. Descriptive statistics are shown in Figure 2. Results failed to reject the null hypothesis for dancer condition. There was a main effect of instructions in both parametric $F(1,35) = 4.31$, $p = 0.05$ and non-parametric, $p = 0.01$ analyses. There was no dancer condition \times instructions interaction. The correlation between dancer reported number of ideas in the familiar pair condition was 0.64 compared with 0.13 in the unfamiliar pair condition.

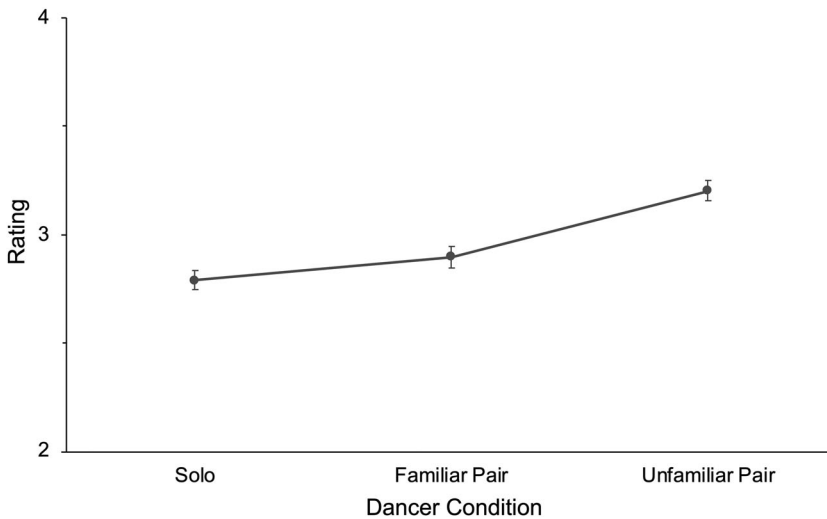


Figure 3. Experiment 1 mean self-reported ratings as a function of dancer condition. Error bars show standard error of the mean.

An independent observer was engaged to view the video and count the number of new movement ideas they identified on each trial. *t*-tests revealed that there were no significant differences between the number of movement ideas reported by the dancers and by the independent rater in the non-expressive instruction condition, $t(13) = 2.04$, $p = 0.051$ and in the expressive instruction condition, $t(13) = 0.898$, $p = 0.376$. Using the independent rater's scoring of the number of ideas, there was also no significant difference between solo and pair conditions (collapsed across instructions), $t(18.71) = -1.67$, $p = 0.11$ or between familiar and unfamiliar pairs (collapsed across instructions), $t(12.59) = -1.42$, $p = 0.18$.

Self-report ratings

Self-reported ratings from each dancer captured after each trial formed the dependent variable in a 3-way analysis of variance (Instructions, Dancer Condition, Rating Item). The hypothesis that dancer condition would influence ratings was supported $F(2,27) = 5.28$, $p < 0.001$ with significantly higher ratings indicating positive experiences in the unfamiliar pair than in the familiar pair condition, $p = 0.03$, **Figure 3**. Item was also significant as a variable, $F(7,279) = 5.49$, $p < 0.001$. **Figure 4** suggests originality and rarity of material were judged more poorly than other items and the satisfying nature of the experience judged relatively highly. The main effect of instructions was not significant, $F(1,279) = 2.41$, $p = 0.12$ and there were no significant interactions. The two significant main effects were also significant when analysed using non-parametric analyses.

The striking aspect of the open-ended comments was the extent of difference in vocabulary used when reflecting/reporting on the solo task and the paired tasks. Whereas for solo, the language is mechanical ('circular', 'business as

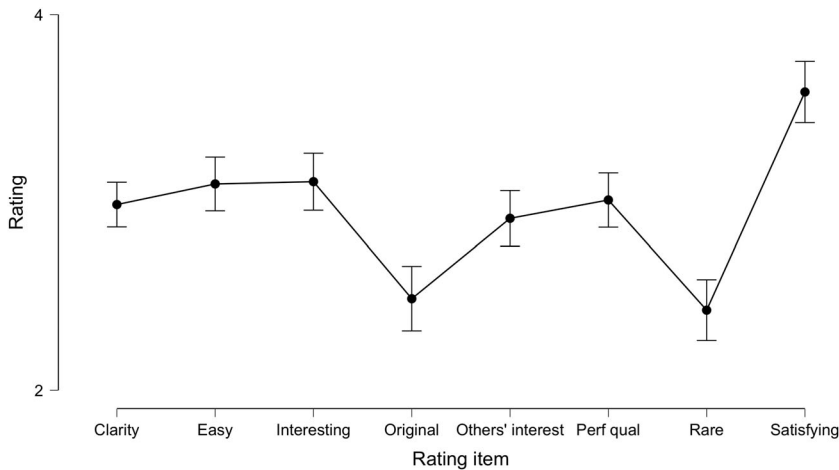


Figure 4. Experiment 1 mean self-reported ratings. Error bars show standard error of the mean.

usual', 'habitual patterns'), the language for unfamiliar pairs revolves around emotions (e.g. anxious, fear, fearless, fun, exciting), novelty (unpredictable, unexpected, wild), and around the exploration of the social qualities of the relationship (tender, nurturing, safe, aggressive, dominating). Similarly, familiar pairs also rated the work based on qualities of relationship (comfortable, trust, cohesive). Overall, the participants found more value, interest, and engagement in material produced in the pairs.²

Discussion

Experiment 1 was designed to investigate the influence of solo versus group improvisation on creating new movement material. In addition, pairs of dancers were either familiar or unfamiliar improvising together and instructions were varied from expressive to non-expressive movement generation. The hypothesis that dancer condition includes the number of movement ideas generated in two minutes was not upheld but there was a significant effect in dancers' ratings of the experience. Dancers in unfamiliar pairs rated the trial more highly than those in familiar pairs. Instructions for non-expressive or expressive mode influenced the number of ideas but not ratings.

The results demonstrate the importance of using different dependent variables to capture dancer experience with ratings sensitive to the effect of pair composition and number of ideas sensitive to manipulation of instructions. The beneficial effect in the unfamiliar pair condition can be explained by the novelty of low ties with individuals differing from each other in, for example, experience, physique, size, technique, preferences, and bringing to the joint

²Unattributed quotations are those of the participant dancers.

task different types of knowledge (Delmestri et al. 2005; Mueller and Kamdar 2011). The effect of instructions is also likely one of novelty but in reverse and impeding creativity. For this company, improvisation is more likely to be non-expressive than expressive and the number of ideas on average produced in the expressive instruction condition suggests a lack of convention and productivity for the group.

The open-ended comments are revealing in what they focus on as different (aspects of emerging social responses and explorations), and what makes that a more interesting and valuable exercise than solo (that there is the possibility for more discoveries, and for the development of ideas that could not have been achieved without the particular qualities and capacities of the particular other person/dancer).

In the debrief session after Experiment 1, the dancers commented that two minutes was too short a period of time in which to create performance quality movement material. In the event that the restricted time was impeding creative processes an experiment was designed that would give dancers twice the amount of time – four minutes – in which to improvise alone or in pairs. The tie strength/familiarity and instructions variables were not further explored in Experiment 2. Instead, the focus intensified on the relational aspects operationalized as dancer condition and now with three levels: solo, pair, and trio. Not only expanding the number of interpersonal relations in a group, the trio condition added further challenge and complexity to the choreographic task that, given the elite performance level of the dancers, should enhance the potential for innovation (Amabile 1983).

Experiment 2 – four-minute improvisations

Method

Participants, stimuli, equipment, and procedure

Four professional dancers from ADT participated in Experiment 2 (mean age = 22.75 years; $SD = 3.09$; 1 female) with mean years of dance training 13.25, $SD = 4.99$. Three of the four dancers had participated in Experiment 1. Stimuli, participant allocation to condition, equipment, and procedure were identical to Experiment 1 except that the time allotted for improvisation was four minutes. Experiment 2 lasted for two hours for all participants and consisted of 13 trials: 4 solo trials; 6 pair trials, and 3 trio trials and where all three-way combinations of the four dancers were realized. As a way to maximize the amount of qualitative data obtained in Experiment 2, on the following day the dancers and researchers as a group viewed the video recording of the experiment session and the dancers asked to think aloud as they reviewed each of their experiment trials.

Results

Number of self-reported movement ideas

The hypothesis that dancer condition influences improvisation was examined in a one-way analysis of variance. There was a significant effect of dancer condition, $F(2,22) = 3.61$, $p = 0.04$ with a significantly greater number of ideas generated in the solo than in the pair condition, $t(22) = 2.43$, $p = 0.02$, [Figure 5](#). The significant main effect was obtained also in a Kruskal Wallis non-parametric one-way analysis.

Self-report ratings

In a two-way dancer condition \times rating item analysis of variance, there were no significant main effects (dancer condition, $p = 0.08$; Kruskal Wallis, $p = 0.06$) and no two-way interaction for the ratings dependent variable. As [Figure 6](#) shows, there was a trend for ratings in the solo condition to be lower/judged as a less positive experience than ratings obtained in the pair condition.

Open-ended comments

The reporting indicated that in the solo condition, it is easier to move from one idea to another. However, satisfaction and perceived interest were not as high. For example, a dancer reported that in the duo there was, 'more energy to feed off, [it is] always more interesting with another person. [There are] so many more options, a connection is formed between the people in the space, [we] explore the relationship with movement'. She also used the terms 'share', 'explore together', and 'enhanced' about the duo condition. Another dancer said that they 'feed off each other', that is was 'fun'. Dancers 'explore the other person creatively', and in the trio these sentiments were amplified in the commentary: 'such fun', 'exploratory', and 'I love improvising with these dancers'. In the pair improvisation conditions, the dancers commented that there were more options and more choices in the pair context and that this can make it more difficult. Another dancer commented on the pair condition that they felt that 'a connection formed between the two people in the space'. While another noted that within a pair one can 'oppose the other person'. It was noted that the pair condition was 'fun'. Of the trio condition, dancers commented that an idea was more alive with more people in the space and that with three dancers there are more options as well as more risk, and more trust negotiated.

There is also a qualitatively different aspect (we highlight the term 'negotiation' used by the participants below), which is not necessary for working solo on an internal image, and out of the view of a significant observer. The data indicate that although all the tasks required the manipulation of shapes and spatial orientation, the qualities and interest of the movement were focussed on relating to other people. Qualities are not about the shapes or structures but

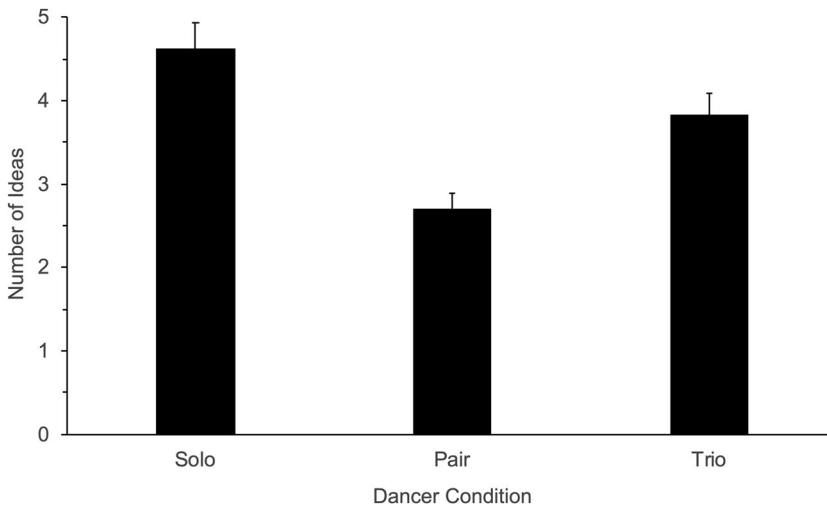


Figure 5. Experiment 2 mean number of self-reported movement ideas created in four-minute trials in solo, pair and trio conditions. Error bars show standard error of the mean.

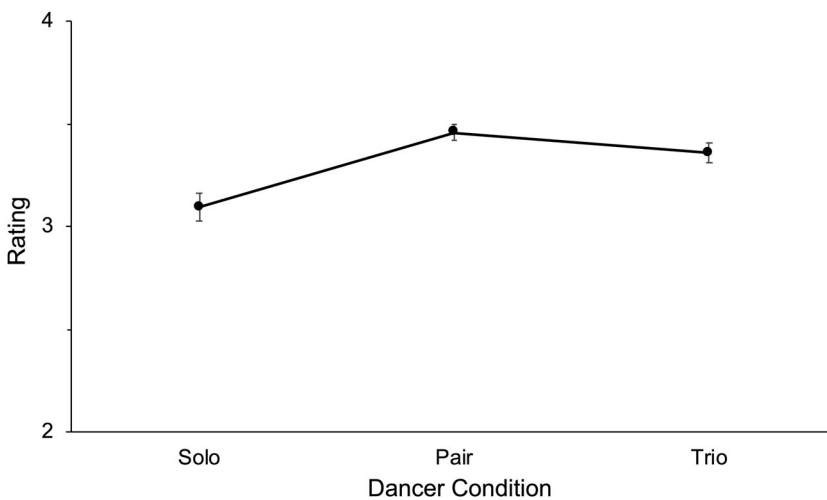


Figure 6. Experiment 2 mean ratings as a function of dancer condition. Error bars show standard error of the mean.

about how those movements became aspects of or indicated various kinds of relationship to other people. This is an indication that what is being attended to and worked upon is not the internally generated image but the qualities of emergent feelings and senses of self. ‘I think it’s more exciting working in a group or in a pair, ... and yeah, it’s like discovering how the other person moves and how that affects your body and ...’

This summary is true both for the self-reporting of solo tasks and for duos and trios. In solo task reporting, emphasis is on how dancers feel and think about

how interesting or not the exploration was for themselves, and also for any viewer. (No one dances alone, even if solo, as there is an inevitable sense of both self and viewer/no viewer). The image manipulation is serving the purpose of exploring a different terrain. In duo reporting, this is more obvious. The terrain is now clearly the relationship and what can be made present by movement.

There is negotiation or collaboration required. As well as reporting that duos were 'intimate', 'nice', that dancers 'arrived at [the] same idea' it was also noted that options and choices made the situation complex, possibly more difficult, depending on whether one accepts or rejects another dancers 'propositions'. The duo condition becomes an intense negotiation of the direct possibilities of paired movement, while in the trio there are more possibilities and more exploration possible without continual negotiation with one single other person. Discursively, it was reported that the trio offered more possibilities, but also, in line with the above, a likelihood of a 'third' position for one or another dancer who is not involved so closely with developing ideas of a pair. 'Trust' was a central element in the discussion from the dancers. People were clear that more interesting material was possible where physical injury was unlikely.

General discussion

The aim of Experiment 2 was to investigate the effect of group versus solo improvisation. The results show there were more ideas self-reported in solo than pair (significantly) according to Jackson and Williams (1985), Lamm and Trommsdorff (1973), Osborn (1957) and Paulus et al. (2002). There were more in the trios than in pairs, but of less statistical significance, and less than in solo. The qualitative data clearly indicate less interest in material made solo (Paulus and Dzindolet 2008) where diversity in approach or technique is absent. (NB: more is not necessarily the aim of the exercise.) Pair wise and in the trio there are a multiplicity of decisions and options not available on your own (Kirsh 2011; Perry-Smith and Mannucci 2015; Potter 2018; Sawyer 2012). Unsurprisingly in the context, there is a physical aspect to this. The other person jointly makes a relationship that is not the same as manipulating an internal image on the part of one or either dancer. Ideas can develop between and outside the individual, and joint attention is possible. So, rather than two people dancing separately, two different ideas come together to create something else entirely. As has been theorized (e.g. Perry-Smith and Mannucci 2015; Potter 2018), creativity in groups is more than just an agglomeration of individual inputs. It is an emergent aspect of relations between entities that are also transformed in their capacities or potential in the process itself.

Assessment of quality was a complex mix of what feels good and interesting to the dancer, what is new or 'flows', and a responsiveness to what other people in

the space feedback about it. Other people's perception can change the dancer from feeling something was not good or interesting, to a realization it was interesting for an audience. Significantly, and in line with our understanding of the distributed nature of creativity, the identity of the observer is also significant. Positive feedback from another dancer was trumped by positive feedback from the choreographer: 'any of us would probably be over the moon because you'd be getting it from him'. This points to the specificities of actual relations in which material is made, and helps us comprehend the increased interest also reported by the unfamiliar pair condition.

It should be remembered that we were working with highly trained dancers, trained and raised in a tradition that assumes the individual as the centre of creativity, be that the dancer (sometimes with others) or the choreographer. It must also be reiterated that we are looking at a specific element (improvising new material) of a particular dance form (contemporary dance). We have studied 'P-creative' and captured an 'exploratory' type of creativity (Boden 2009). From this, we aimed to add alternatives to conventional notions of the creative individual as a solo genius working on and manipulating an internalized image.

Collaboration and mutual facilitation are fundamental in a group of 10 or more dancers who are given 'tasks' to address in movement. The dance is made together with others. Its quality and form as an art work or a process of research and exploration is a result of the interplay of bodies in the space of the rehearsal studio. In a very straightforward sense, what is made is emergent from the interactions between the people in the space. While one person may 'lead', or one person may pursue an idea independently, 'leading' or 'independence' are also aspects of relationships to others. Relationships between people then appear as a vital element in the coming into being of dancers themselves as creative practitioners, and of the work that they create (Ivins 2004; Littleton and Miell 2004).

What is presented is described using fundamental ideas, and indeed value judgements about how people are and could be relating to one another. Risk and trust are interesting as they combine a vital part of working with people in the studio (avoiding injury). But risk and trust also encompass more subjective concerns such as an artist's sense of self-worth and esteem. There is an emphasis on the playful, the exploratory, the surprising, a significant repetition of the notion of fun, and the potential for enjoyment and satisfaction increasing as more people join. 'I think when it came to three, you constantly are giving and receiving a lot more stimulus than before, because you're aware of two people. We're doing two different things. It might be either giving or receiving.' It is a kind of serious play, where intentional conflict, lack of co-operation, and active opposition are options and potentially increase the interest of the material that is being made. Experiments around oscillations of power also offer different possibilities for material and for the interpretation of movement as aspects of

human relationships. Negotiations around power or leadership provide opportunities for demonstrating or achieving shared action and co-operation. Choosing to dominate or acquiesce highlights aspects of self and other, and the formation or emergence of persons-in-interaction in particular kinds or shapes given to relationships. There is an on going formation of a kind of person here (the dancer artist), and the possibility for persons to change and develop because of what is offered or made possible in a process (Strathern 2012 highlights relations that elicit and give form to entities such as specific persons). Emergent states and forms are the result.

[C]reativity ... is not distributed among all the individuals of a society as an agency that each is supposed to possess a priori ... but rather lies in the dynamic potential of an entire field of relationships to bring forth the persons situated in it. (Ingold and Hallam 2007, 7)

We set out to investigate whether it was possible to make visible the creative aspect of relations between persons, in this case, dancers working to improvise material in a studio setting. ‘The social’ here is shown to be more than an agglomeration of individual inputs. It is an emergent aspect of relations between entities, and figures centrally in what and how those entities can body forth their selves, personalities, and capacities. Creativity then ‘resides’ as much in the process of interrelation as it does in the individual as a part of the process (Amabile 1983; Brass 1995; Cattani, Ferriani, and Colucci 2013; Moran and John-Steiner 2003; Perry-Smith and Mannucci 2015; Potter 2018; Sawyer 2012; Taylor and Littleton 2012, 18).

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