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Evolving improvised ideation from humour constructs: A new method for collaborative divergence

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This paper reviews and applies key principles from improvised comedy ("improv") to overcome common barriers in effective group ideation, resulting in the formulation and presentation of a new creative idea generation method. The emergence of an innovative product design can be compared to the telling of a funny joke: both combine seemingly unconnected ideas in a way that is both surprising and satisfying. Our research expands upon this link between humour and creativity, and operationalizes the improv principles best suited to the conceptual design process. A workshop-based methodology was used to select, develop, and refine the method protocol and facilitation technique. Participant feedback and observations have demonstrated how this approach can expand the solution space to support the generation of bold, innovative ideas. Finally, we present a step-by-step guide for the new "design improv" method and discuss its potential value in the generation of creative ideas in a group ideation context.

1 | INTRODUCTION

Creativity is often cited as one of the greatest assets a company can have in the development of innovative and competitive products and services; but fostering and leveraging team creativity is also one of the greatest challenges. It has been described as a skill that may be honed and a process that can be followed by individuals and teams to produce novel and useful ideas (Amabile, 1983; Howard, Culley, & Dekoninck, 2008; Lubart, 2001; Sternberg, 2006). While some engineering creativity research has focused on an assessment of the creativity of the outputs of an ideation session (Shah, Smith, & Vargas-Hernandez, 2003), others have sought to evaluate and define the creative process that can lead to such outputs. A creative ideation process has been described as unpredictable yet inter-connected, involving both divergent and convergent thinking, and having a clear structure, showing cycles of thought (Goldschmidt, 2014; Kan & Gero, 2008). It has been demonstrated that such processes can lead to creative outputs (Kan & Gero, 2007; Van der Lugt, 2003).

Group and team work is a necessity of contemporary organizational strategy, culture, and communications, and designers are expected to work together creatively to generate ideas that meet customer needs in novel, useful, and surprising ways. There is logic behind this expectation of collaboration. Nijstad and Stroebe's (2006) "Searching for Ideas in Associative Memory" (SIAM) cognitive model scaffolds experimental study results into explanations as to why group ideation participants may feel more engaged and productive than when generating ideas alone. The sense of engagement is substantiated where group dynamics appear to often provide stimulation to sustain idea-generation session lengths beyond the point where individuals may fatigue and submit to "failure", unable to generate any new ideas. However, the model also explains that social environments are also often responsible for the failure to convert the potential of pooled knowledge, experience, social stimuli, and sustained engagement of the group, into more productive ideation sessions that produce better ideas.

Perhaps the most ubiquitous method for creative group ideation is "brainstorming", developed by Alex F. Osborn for use in the advertising industry in the early 1950s (Osborn, 1953). The brainstorming rules normally applied to a design ideation session still largely follow Osborn's original method: 1. Aim for quantity, 2. Avoid criticism, 3.

Build on ideas, and 4. Wild ideas are welcome (Van Boeijen, Daalhuizen, Zijlstra, & van der Schoor, 2013). Socio-cognitive theories retrospectively make sense of Osborn's intuitive rules as a reasonable proposal to organizing productive group idea generation. However, the literature covers a variety of challenges to an effective creative process that often still persist in the brainstorming paradigm, including:

- Fear of judgement: Despite the "no criticism" rule, participants fear others will be judging their ideas internally, and self-censor as a result (Isaksen & Gaulin, 2005; Paulus, 2000).
- Unequal contribution: More extrovert or opinionated team members dominate the discussion. Additionally, "social loafing" describes when one or more participants lowers their effort due to reduced personal responsibility (Paulus, 2000; Stroebe, Nijstad, & Rietzschel, 2010).
- Premature rejection of ideas: Although ideas may not be openly criticized, unconventional or surprising ideas may be inexplicitly rejected when participants do not give them the chance to be built upon and developed into practical solutions.
- Idea fixation: When the group focuses on and reiterates one idea too early in the process and fails to explore the full potential of the solution space. Similarly, "cognitive inertia" occurs when a desire for cohesion means that the group struggles to break from a collective line of thinking (Isaksen & Gaulin, 2005).
- Production blocking: Participants must take turns to speak, and therefore cannot always express ideas at the moment they occur. While waiting their turn, they may forget ideas or self-censor (Diehl & Stroebe, 1991; Nijstad & Stroebe, 2006).

Paulus and Brown (2007) expand the cognitive model of brainstorming to more explicitly include interacting social and motivational factors. They propose that where idea generation productivity issues have existed for both laboratory and long-term workplace idea generation teams, teams "under the right motivational conditions and with procedures that optimize the exchange of ideas they can be quite effective" (p. 261). There is therefore a research interest in managing creativity within design teams, and finding new ways to approach design problems that challenge perspectives and extend the solution space (Gero, 2011; Guo, Su, & Zhang, 2017).

Increased specificity of the brainstorming and facilitation rules (Putman & Paulus, 2009), method variants such as brain-sketching (Van der Lugt, 2002), and deliberate introduction of creative stimuli and knowledge to brainstorming sessions (Howard, Culley, & Dekoninck, 2011) have all been studied with reports of potential benefits over the stock method. Our research aims to address further calls for new approaches to establish design-led cultures within engineering organizations who need "to step beyond their comfort zone, embrace new possibilities, and adopt new ways of thinking" (INNOVATE UK, 2015). Recognizing earlier prominent work in the design field that finds descriptive power in humour theory for creative development in design (Gero, 1996) and following earlier investigations of "humour enhanced" brainstorming (Wodehouse, Maclachlan, & Gray, 2014), our proposal is to operationalize constructs of humour within creative design practice.

1.1 | Humour, improv and creative design

Although rarely applied directly to the design process, humour has long been associated with creativity. Humour can be defined as the quality of being amusing or comedic (relating to a person, an idea, a performance, etc.); or as a mood or state of mind in which an individual is receptive to comedic content or interactions ("a sense of humour"). Like creativity, a sense of humour is inherent in human behaviour. Both an appreciation of humour and humour-generation abilities have been found to be associated with, and even able to enhance, an individual's creativity and problem-solving abilities (Humke & Schaefer, 1996; Isen, Daubman, & Nowicki, 1987; Treadwell, 1970; Ziv, 1976). The link between a humorous or playful atmosphere and creativity has also been recognized specifically within design teams (Kudrowitz, Alfalah, & Dippo, 2016; Sonalkar, Jung, & Mabogunje, 2011; Yi, Nguyen, & Zeng, 2013). Similarly, play and playfulness within organizations can have a positive influence on team creativity and innovation (Dougherty & Takacs, 2004; Mainemelis & Ronson, 2006).

Our work is founded on the concept of "humour constructs"; the models and theories that aim to define and explain humour. Specific connections have been made between the emergence of an innovative product idea and creation of a humorous joke or scene (Gero, 1996). One of the broadest and most commonly cited humour theories is the incongruity-resolution theory. It proposes that humour arises when two seemingly incompatible references overlap, in a way that is both surprising and satisfying (Koestler, 1964; Ritchie, 1999). For example, in verbal humour, a joke is often expressed as a question with a seemingly obvious answer that is resolved in an unexpected yet logical way, if viewed from an unusual perspective. Likewise, an innovative product design resolves a problem in a way that is both surprising and satisfying (Hatcher et al., 2016b). Disruptive innovations in particular match this definition—unpredictable solutions to problems that satisfy a new user demand.

This paper presents a new creative idea generation method for use in the early phase of the design process. We begin by discussing the links between improvised comedy and creativity in design, and outline the improv principles that may be allied to the design process. We then describe how workshops were used to develop and refine the method protocol and facilitation guidelines. Finally, we present a step-by-step guide for the new "design improv" method and discuss its potential value in the generation of creative ideas in a group ideation context. The theoretical contribution of this paper is to advance a view of idea generation which challenges the traditional "referent" of Osborn's rules in brainstorming by drawing on the generative rules of improvised comedy. The referent in improvisation is "a set of cognitive, perceptual, or emotional structures (constraints) that guide and aid production" (Pressing, 1998, p. 52). This new referent has potential to reduce the cognitive loading of session participants, promote that participants listen to one another, and to foster the development of a shared and converged mental model; collaborative divergence. It has been proposed that when teams demonstrate Shared Mental Models, this is linked to improved group performance, satisfaction, and creativity (Santos, Uitdewilligen, & Passos, 2015). Methods that generate such a state may address productivity issues highlighted within the brainstorming paradigm and unlock the true potential of group ideation.

2 | EVOLUTION OF IMPROV

As with group idea generation and brainstorming, general theories of improvisation also feature constructivist models of long-term and associative memory (Magerko et al., 2009; Pressing, 1998). The prominent brainstorming frameworks have tended to focus on representations of individual cognitive or socio-cognitive systems, which interact with both productive and non-productive consequences. Many examples of collaborative improvisation relate to performance (musical, theatrical, dance, etc.), where all participants have shared performance goals, and as a result improvisation models have often presented the idea of a shared and emergent memory between performers (Magerko et al., 2009; Stevens & Leach, 2015). The process towards shared mental models in improvisation includes the idea of cognitive convergence. Convergence is the desired state for productivity (Magerko et al., 2009; Stevens & Leach, 2015) and divergence is a state that requires to be "repaired" through the actions of players, with respect to the referent, throughout the performance towards convergence (Magerko et al., 2009).

Brainstorming's referent could be identified as Osborn's original rules and variations or expansions of these. In theatrical forms of improvisation, including humour and comedy, the base referent includes that players should accept the statements of others and to build upon these. In improvisation, the referent can have an effect of reducing cognitive load (Magerko et al., 2009) where there is already a trust in how improvisers will normally behave. Such a reduction in processing may allow more cognitive resources for other aspects of the creation process, such as the likelihood of "synergistic serendipity" between players (Pressing, 1998). Stevens and Leach (2015) studied improvising dancers. Those with familiar partners appeared to be more productive than individuals, but only when using rule-based non-expressive dance forms rather than more freeform expressive dance. Changes to the creative referent appeared to alter, and potentially improve, collaborative creative improvised performance.

Improvised comedy, also known as "improv", is a performance style in which the dialogue, characters, and scenes are created entirely in the moment, with no pre-planning or script writing. Unlike other kinds of comedy, the improv process is not about crafting witty jokes. Instead, performers should focus on following the process and allowing surprising and incongruous humorous ideas and scenarios to occur (Besser, Roberts, & Walsh, 2013; Halpern, Close, & Johnson, 1994). In other words, improvisers should rely on spontaneous intellectual connections to create humour, not scripted jokes (Fotis, 2014).

The Upright Citizens Brigade (UCB) theatre and training school promote a referent for improv that is specifically designed to create humorous (as opposed to theatrical) scenes founded on two key principles: "Yes And" and "heightening". "Yes And" is the most fundamental principle of all improv: performers must be in agreement with one another at all times and always build on each other's ideas (Besser et al., 2013; Fotis, 2014; Halpern et al., 1994; Johnstone, 2012). In the UCB model, performers use "Yes And" to quickly build a "base reality" for a scene (the who, what, and where). They must then focus on finding "the unusual thing" (the idea that makes the scene unusual and funny) and "heighten" it for comedic effect, i.e. explore and stretch that unusual idea as far as it can go. It is at this heightening phase that humour is most likely to occur. Players are encouraged to think "If Then"—*if the unusual thing is true, then what else is true?* The unusual thing, and the way it is heightened for humorous effect, can often be linked back to some of the comedic devices explored in phase 1, such as misunderstandings, hyperbole, absurdity, or callbacks to earlier scenes (i.e. making surprising connections). Our initial proposal of how the UCB model could be adapted to a design ideation context is presented in Figure 1.

"Applied improvisation" is not a new idea, and many improv theatres and practitioners have recognized the potential to take the principles and values of the art form and apply them to other industries. There are many commercial courses, training events, and books offered for businesses and professionals, particularly in the United States (Leonard & Yorton, 2015; Sweeney, 2004). Although anecdotally very successful, these methods and guidance have rarely been tested in academia (Anderson, 2008).

Previous studies on the application of both comedy and theatrical improvisation to industrial settings can be found in the literature (de Vries, 2014; Gerber, 2009; Kudrowitz & Wallace, 2010; Ludovice, Lefton, & Catrambone, 2013; Magerko et al., 2009; Medler & Magerko, 2010; Moshavi, 2001; Vera & Crossan, 2005). These studies highlight the potential to generate creative design ideas through the use of improvisation. To date they have largely involved engaging designers in shortform exercises prior to a regular brainstorming session, or as part of more general teambuilding and training. Instead, our work attempts to adapt and integrate the rules and techniques of improvised comedy directly into a new ideation approach specifically for the purposes of design problem-solving. Our reasoning follows that if the emergence of an innovative product resembles the cognition behind a funny joke or scene, then designers following a creation process designed for comedian groups could be more effective idea generators. This study is unique because, while previous studies of applied improvisation have focused on the benefits of "Yes And" and building on ideas, the concept of heightening an unusual idea for comedic effect, and its potential to be applied to design ideation, has received far less attention to date.

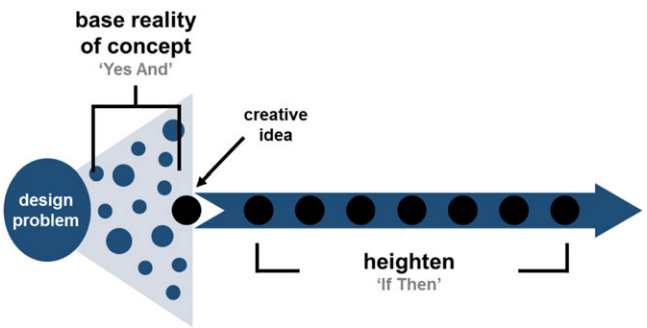

FIGURE 1 UCB improv model (Besser et al., 2013) adapted to a design ideation context (Hatcher et al., 2016b) [Colour figure can be viewed at wileyonlinelibrary.com]

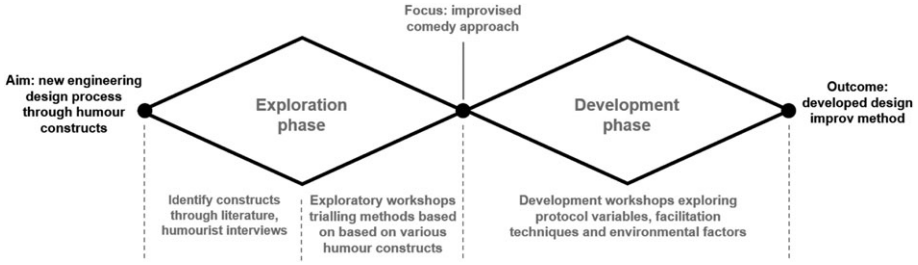

FIGURE 2 Research methodology for a humour-based approach to design ideation

3 | METHODOLOGY

The methodology that was adopted for identifying and developing a humour-based approach to design ideation is outlined in Figure 2. The research began with an understanding of various humour constructs gained through a literature search and complemented by consultations with humourists (including improvisers, stand-up comedians, and cartoonists) and the researchers' own personal experiences with performing stand-up comedy and creating humorous comic strips. This resulted in a large range of ideas on how humour may be applied to the design process, in ways that modelled humour creation processes, utilized comedic devices, and/or enhanced participants' sense of humour or humorous mood (Hatcher et al., 2016b).

As the research began with a very broad aim of applying humour constructs to the design process, a workshop-based methodology was adopted as a practical way of exploring and developing ideas with a number of participant groups and design challenges. This methodology follows a user-centred approach to new method development, involving designers at every stage of the process. The research also resembled a mixed "action research" methodology. Action research is a recognized methodology in design research (Blessing & Chakrabarti, 2009), but the approach taken is also informed by pedagogical action research cycles (Norton, 2009). All workshops were facilitated by one or two researchers, who were able to use their experiences and journal reflections to improve the method protocol in an iterative fashion as well as hone the appropriate facilitation and learning technique.

In the exploration phase, initial indicative workshops with senior design engineering students enabled the researchers to trial a wide variety of ideas on how specific humour constructs could be applied in practice (Hatcher et al., 2016a). These ranged from methods that used "comedic devices" to change perspectives on the design problem, creating humorous comic strips to explore possible solutions and using short improv games as a creative stimulus; as well as applying techniques based on longform improvised comedy. The workshops were evaluated through a combination of researcher field notes, observations from audio and/or video, and feedback from semi-structured interviews with participants.

Once longform improvised comedy had been identified as having high potential to foster a creative ideation process, a further series of workshops enabled the method and its delivery to be refined through an iterative process (Figure 2, development phase). The workshops explored a number of iterations relating to the method protocol, workshop structure, facilitation techniques, and the workshop environment in order to refine the delivery and execution of a design improv session. For example, the workshops trialled several variations on how the "Yes And" technique could be utilized. With novice idea generation participants, stating "Yes And" out loud combined with reiterating the previous idea was found to be most effective in ensuring participants followed the rules, listened to their colleagues, and built upon the previous idea.

An overview of each development phase workshop and its variables is shown in Table 1. The workshops were conducted with a variety of participants, from students to professional humourists to engineering practitioners (A). After experimenting with a large-group format in Workshop 1, the participants were divided into smaller groups depending on the number of attendees (B, C). Some had previous experience working together on a design project, others were newly formed for the workshop (D). In some cases, one or more of the participants had prior experience of the design improv method through participation in earlier workshops (E). This was particularly insightful as these participants were able to comment on both the progression of the method's development and their own aptitude for using "Yes And" and "If Then" thinking with practice.

Like the initial exploratory phase workshops, participants in the development workshops were asked to generate ideas for a range of "blue-sky" and adaptive design challenges, which were selected to suit their background and experience. In some cases, the teams were highly familiar with the specific design problem domain, in other cases less so (F–H). For example, Workshop 6 was conducted at an event for designers with a specific interest in cycling, working on design challenges they had selected themselves. Workshop 3 was conducted with a mixed group of engineering design students who were assigned a design challenge which required less specific background knowledge (reducing water usage in the home).

The workshops were audio- and video-recorded to allow content analysis and reflection. Feedback was gathered through semi-structured focus groups and interviews with participants, asking them about their enjoyment and perceived usefulness of the method in terms of both the creative process and its outcomes. Additionally, more specific questions were asked regarding how the design improv method could be improved in terms of protocol, facilitation, and workshop structure. As with the exploratory workshops, field notes and observations were made regarding the level of engagement, energy, and humorous atmosphere during design improv, as well as participants' ability to learn and abide by the rules of the game. Particular attention was paid during Workshops 3–5, which were conducted with the same four engineering design students (recruited from the initial group of 11). The workshops were deliberately run approximately 10 days apart to allow reflection from the team. Changes in the team's energy, momentum, ability to follow the rules, and rate of idea generation were observed,

TABLE 1 Overview of method development workshops

	Participant variables					Design challenges		
	A	B	C	D	E	F	G	H
Work shop	Background	No.	Group size	New team?	Design improv experience	Detail	Solution field	Problem familiarity
1	Design engineering PhD students	15	15	Yes	None	Redesign public drinking fountain	Blue-sky	Low
2	Comic book humourists	7	7	Yes	None	Improve comic event experience	Adaptive	High
3	Product design undergraduate students	11	5/6	Yes	Low	Reduce household water usage	Blue-sky	Low
4	Product design undergraduate students	4	4	Yes	Medium	Reduce supermarket food waste Redesign household refrigerator 3D printing and food waste	Blue-sky Adaptive Blue-sky	Low
5	Product design undergraduate students	4	4	No	High	Improve student studio space 3D printing and food packaging 3D printing and sustainability	Adaptive Blue-sky Blue-sky	Medium
6	Product and service design students and practitioners	31	3–6	No	None	Various relating to city cycling	Blue-sky/ adaptive	High
7	Manufacturing industry representatives	26	4–5	Yes	None	3D printing and sustainability	Blue-sky	Medium

showing improvements with each session. If a new version of a method variable was found to be more effective, it was generally adopted in future workshops unless external factors prevented it, such as time restrictions. For example, in the first few workshops participants were responsible for deciding when it was time to switch from "Yes And" to "If Then". However, they reported that this added extra cognitive strain on them as they worked together to generate ideas. From Workshop 4 onwards, the facilitator took on this role. The outcomes of these workshops helped shape and refine the protocol and the recommended structure, facilitation, and environment for the final proposed method, which is presented in Section 4.

4 | RESULTS

4.1 | Design improv method

"Design Improv" was developed and refined through a series of iterative workshops, resulting in a protocol for both learning the new method and using it effectively. As discussed earlier in this paper, the method facilitates group ideation by utilizing two key principles of longform improvised comedy: "Yes And" and "heightening the game". The refined design improv method is presented in Figure 3.

The method is designed to be carried out by 4–8 participants with one dedicated facilitator and note-taker. It involves following a set of steps as outlined below.

1. Warm-up: Short activities designed to accustom participants to speaking out loud spontaneously and making surprising connections. They can be tailored to the particular group and environment and should involve an element of physical movement, verbal expression, memory recall and an introduction to the concept of "Yes And". It is also important what any warm-up activities help create a humorous atmosphere, in which participants feel relaxed, energized, and open to expressing bold ideas.
2. Discussion: The group has a brief, informal discussion around the design challenge, during which humour is welcomed and encouraged. This is a chance to share thoughts, personal anecdotes or knowledge from past projects or existing solutions. Similarly, an improv troupe will often begin a performance with an open discussion about the one-word suggestion, as a way to generate content that can be mined for ideas during improvised scenes.
3. "Yes And": At this stage the design improv begins. One participant states an idea. The group will then rapidly build up the base reality of a concept by stating "Yes [previous idea] and [new idea]". The new idea will build directly on what was said before, often resulting in surprising and incongruous connections being made. Repeating the previous idea was found to be important in ensuring participants listened to one another and truly built on each other's ideas. Although comedians would not literally state "Yes And" aloud when performing, this technique is commonly used as a training exercise. An example of "Yes And" is shown in Table 2(a) on the topic of future 3D printing in the home. This activity is stopped after approximately 60 seconds.

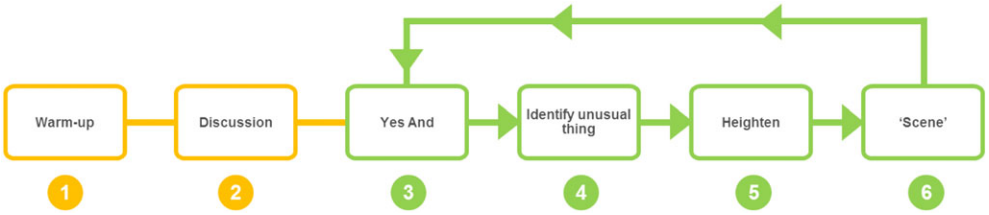

FIGURE 3 Refined design improv method [Colour figure can be viewed at wileyonlinelibrary.com]

4. Identify the unusual thing: At this stage the designers will very quickly review the ideas generated during the "Yes And" phase and select "the unusual thing"—the idea that stands out as being most surprising, interesting, or creative. In improvised comedy, performers will intuitively identify the unusual thing and begin to heighten it automatically, and it is envisioned that with practice designers could reach this level of expertise. However, as a new ideation method, this step-by-step approach was found to be most effective in maintaining group focus and pushing the best ideas forward. Again, this technique can be found in improv training.
5. Heightening: Once the unusual thing has been identified, the focus switches to developing that idea further using the "If Then" technique. Designers will ask themselves "*if the unusual thing is true, then what else is true about this product?*" Instead of building on the previous idea, the group will now repeatedly heighten the unusual thing, again leading to surprising connections as well as exaggerations, absurdity and callbacks to earlier ideas. When performers in an improvised comedy scene identify the unusual thing (the idea that makes the scene funny), the focus of that scene switches from reality-building to exploring that funny idea in more detail. An example of heightening is shown in Table 2(b) where dinner parties were identified as the unusual thing for 3D printing at home.

TABLE 2 Examples of (a) the "Yes And" step and (b) the heightening step of design improv

(a) "Yes And" step: Future 3D printing in the home	(b) Heightening step: 3D printing for a dinner party
You can use your oven to cook food and heat filament at the same time	*If there is a 3D printed dinner party, then more people will eat together, saving electricity*
Yes, you can use your oven to heat filament, and it has a separate section that is connected to a 3D printer	*If there is a 3D printed dinner party, then plates can be fed back into the printer with no washing up*
Yes, there is a separate section, and the 3D printer is connected to a laptop which can operate the printer, or suggest recipes	*If there is a 3D printed dinner party, then everyone brings their own share of filament*
Yes, it's connected to a laptop, and it pings to let you know when your chicken is ready	*If there is a 3D printed dinner party, then any non-reusable utensils can be fed back into the oven*
Yes, it lets you know when your food is ready, and you can use the 3D printer to package up leftovers	*If there is a 3D printed dinner party, each person's plate is printed to correspond to the amount of food they want to eat*
Yes, you can 3D print packaging, and extra plates and cutlery for a dinner party	*If there is a 3D printed dinner party, then the dinner plates can be re-printed for dessert*
Yes, you can 3D print a dinner party, and have a creative happy hour where everyone 3D prints before their shared meal	*If there is a 3D printed dinner party, then you can make customized place names*

6. "Scene": Once the unusual thing has been thoroughly heightened and explored, it is the facilitator's role to call "scene". Like an improv scene, ideally this should be called while the group still has sufficient energy and momentum. Once "scene" has been called, the group return to "Yes And" with a brand new idea (step 3).

In terms of expressing and sharing ideas, design improv is a largely verbal idea-generation method. The spontaneous and impermanent nature of verbal expression was found to help facilitate free expression and reduce self-censorship. However, unlike an improvised comedy performance, it is important that any ideas generated during the session are recorded for future reference. Turn-taking was considered highly important in ensuring that team members listen to each other and build upon ideas effectively. However, to help alleviate the problem of "production blocking", in later workshops participants stood around a table with sticky notes and pens to allow them to record any additional ideas while other team members were speaking.

The environment in which design improv takes place will be dependent on available space and resources. Our participants generally expressed a preference for standing because it made them feel more open, alert, and able to think clearly. A study by Knight and Baer (2014) found that non-sedentary group working can lead to increased psychological arousal as well as improved collective problem-solving. Participants also expressed a preference for standing around a tall table. This set-up enables participants to easily note down any additional ideas or sketches, with the additional benefit of drawing participants closer together while making them feel less exposed (see Figure 4).

The role of the facilitator is key to implementing design improv, particularly as the method was new to the majority of participants throughout the study. The facilitator is responsible for coordinating the warm-up activities and leading the discussion of the design problem. They will time the "Yes And" phase and guide participants through selecting the unusual thing and heightening. They will make the judgement on when to edit a scene and begin a new concept. Although the facilitator's role is impartial and their primary responsibility is coordinating, they may contribute ideas at any time if deemed appropriate. In our workshops, the facilitator occasionally offered ideas to fill gaps and keep up momentum. The facilitator could also provide additional support by throwing in wild or humorous ideas to empower groups that were approaching the new task with caution.

4.2 | Early performance indicators

The performance of design improv as a group ideation approach was evaluated through qualitative means: Researcher field notes and

FIGURE 4 Design improv workshop conducted while standing round a tall table [Colour figure can be viewed at wileyonlinelibrary.com]

observations, video review, and participant feedback with regard to the quality of the creative process. Some of the most common themes to arise suggest that design improv has the potential to facilitate highly energized, collaborative, and divergent ideation process, as discussed in Section 5. Table 3 focuses on a comparison of selected workshops representing the main thread of our method development. We include a brainstorming activity and one of our first trials of the UCB improv referent as an idea-generation method from the exploratory phase of our research. These are compared with the design improv development workshops 3–5 which are also detailed in Table 2 as workshops 3–5.

Although a high-quality creative process has been found to be linked to high-quality creative output (Van der Lugt, 2003), the number of variables across the development workshops makes a quantitative measurement of their creative outputs less appropriate. However, there are potentially increases in rate of idea generation as the method was refined. Design improv also scored higher when compared to the earlier brainstorming activity. This session followed the standard brainstorming rules, and was conducted after the group had taken part in a shortform improv game called "Build a Machine". It could therefore be considered comparable to other improv-based interventions described in the literature, which similarly do not apply improv directly to the ideation activity.

The idea rate values, determined from video content analysis, represent just one observation that was deemed indicative of design improv's potential to enhance the creative ideation process. Development workshop 3 had the highest rate of idea generation at six ideas per minute. However, in this workshop, participants were asked to build ideas in pairs, with enforced turn-taking. While this tactic led to a higher quantity of overall ideas, many of these ideas could be considered less feasible than those recorded in later development workshops where participants were free to contribute when they felt confident in doing so. Furthermore, participants reported greater levels of anxiety. It was therefore decided that a more freeform approach would foster an overall higher quality creative ideation process.

In workshop 3 participants focused on a single problem brief of an adaptive type (see Table 1). "Scene" would be called when the participants were perceived to be nearing a state of failure; this lead to five scenes within which an unusual thing was heightened by the group. Workshop 5 was the longest period of idea generation and developed the most scenes from three different briefs. The increase in scenes was determined by the facilitator calling "scene" after a fixed period of 90 seconds prior to an open period of heightening of the unusual thing by the group. Group energy was better than in workshop 4 and sustained across scenes where the time limit would complete before participants began to fail.

TABLE 3 Ideas fluency in selected workshops across the research methodology

Workshop	Mins. active	Group size	Briefs	Scenes	Ideas/min	Total ideas
Brainstorming (benchmark)	7.5	5	1	1	2.8	22
Design improv (exploratory phase)	20.5	4	1	7	3.5	73
Design improv—development workshop 3	10.5	5	1	5	6.0	63
Design improv—development workshop 4	26.5	4	3	7	4.1	111
Design improv—development workshop 5	37	4	3	11	4.2	158

Workshop 4 took place in a small seated meeting room with no natural light. A participant stated that she "needed to stand and move around to think", but the consensus was that standing felt awkward, and generally energy was perceived to be less than previous and subsequent sessions. The setup in Figure 4 for workshop 5 was in response to these findings.

In workshops 4 and 5, three problem briefs were used, each prompting a discussion prior to generation. Whilst changing brief might renew participant engagement and positively affect the productivity of the session, in workshop 4 the adaptive brief reduced the ideas rate to four and was only sustained for 3.5 minutes. The adaptive brief type in workshop 5 produced the lowest number of overall ideas of the three briefs, but had the highest production rate of 6.6 ideas per minute.

5 | DISCUSSION

5.1 | Value of an improv-based approach to ideation

Our results would suggest that design improv has the potential to generate creative ideas in the early phase of the design process. As well as having the potential to enhance creativity by enabling an efficient yet adventurous ideation process, feedback and initial observations suggest design improv presents an opportunity to overcome some of the common barriers to effective group brainstorming identified above.

5.1.1 | Fear of judgement/self-censorship

Like brainstorming, criticism is strictly forbidden during design improv. However, the fun and relaxed atmosphere fostered during the warm-up combined with the fast-paced, game-like structure of the method made it easier for participants to follow this rule. Many of the participants involved in the study admitted to reverting to criticism during regular brainstorming, yet almost no criticism was recorded in any of the workshops. Instead, an enthusiastic "*Yes And*" for even the most absurd idea would generate laughter and enhance the humorous mood of the group. The "no criticism" rule was adhered to more closely, reducing participants' self-consciousness when expressing these wild ideas. Many participants stated that they felt more comfortable expressing ideas because the fast-paced nature of the method and the emphasis on being spontaneous reduced their feelings of responsibility for the ideas they contributed. The fact that all team members were building on each other's ideas created a collective ownership of ideas, reducing the feelings of personal responsibility that can lead to increased inhibitions and therefore self-censorship. A study by Santos et al. (2015) suggests that Shared Mental Models amongst team members can enhance creativity and team satisfaction. Furthermore, the humorous atmosphere made it acceptable to laugh at wild ideas without this laughter being perceived as personal criticism.

5.1.2 | Unequal contribution

Similar to an improv scene, the whole group is responsible not just for generating ideas but for keeping up momentum, moving the concept forward, and avoiding hesitations. During the development phase, several variations of the method were trialled in which participants either generated ideas through organized turn-taking or were free to build on ideas at any time. While the first strategy ensured an equal contribution from all, many participants reported higher levels of anxiety and fear of judgement. The second strategy, where participants only expressed ideas when they felt confident in doing so, was found to facilitate a more free-flowing, continuous and relaxed stream of ideas whilst maintaining a significant level of contribution from all participants. It appeared essential that focus should be on creating an environment in which all participants felt confident in expressing ideas spontaneously.

5.1.3 | Premature rejection of ideas

Building on ideas creates a more inter-connected ideation process. One of the key differences between brainstorming and design improv is that while building on ideas is simply encouraged in brainstorming, in design improv it is compulsory (at least for a limited period of time). This means that every idea is given a chance to be explored in some detail, often resulting in humorous ideas as well as surprising solutions. Upon reflection, participants were often surprised by how one seemingly absurd or unfeasible idea had steered the ideation in a new and interesting direction. "Yes And" helps ensure no idea is ever immediately rejected. Whilst there is technically nothing to stop a participant stating "Yes And" followed by a completely unrelated idea (there were several instances of this throughout the workshops), being expected to repeat back a colleague's idea and build on it helps ensure team members listen to one another, and gives each idea the opportunity to be developed further, no matter how absurd or unfeasible it may seem.

5.1.4 | Idea fixation

One of the ambitions of design improv is to extend the solution space and facilitate divergent thinking by encouraging "wild" ideas, and to facilitate the exploration and development of these ideas into creative solutions. The relaxed and game-like atmosphere appeared to encourage this. Interestingly, the "unusual thing" selected by groups to heighten was often an idea that had also made participants laugh. During feedback many participants discussed feeling more comfortable expressing wild ideas than they would in a regular brainstorm. However, whilst no idea is fully rejected, the "edit" step of the method also ensures that single ideas do not dominate a session. Ideas are built upon for a very short period of time, before the facilitator calls scene and a completely new ideation begins. This resulted in idea sets that were highly varied yet remained inter-connected.

5.1.5 | Production blocking

Design improv is a highly task-focused approach to idea generation. Following the initial group discussion, only ideas are expressed, ideally with little or no hesitation, and with little scope for the conversation to divert onto tangents or irrelevant subjects. Preliminary results presented in Section 4.2 suggest that design improv might be tuned to increase the output of ideas. This could be done through choice of effective warm-up routines to embed the shared referent, strategically shortening scenes before the group decline into failure, and the facilitator contributing strategic ideas to sustain or further energize sessions and periodically restating or reframing the brief.

Based on the literature discussed previously, a more effective ideation process, in which all participants feel free to express themselves and work collectively to build a series of closely inter-connected solutions, has the potential to lead to more creative outcomes.

5.2 | Limitations

Whilst the workshop-based methodology has resulted in a design method that is user-centred and has been refined at multiple stages, there are a number of limitations to this approach. The design improv method has not yet been tested under experimental conditions, and—like any idea generation method—there were a number of variables relating to the method and design problem to consider when reflecting on each workshop. Human and environmental factors will also create variation amongst the observed group—factors such as individual personality traits, team diversity, team climate, and regulatory focus have all been found to affect group creativity and divergent thinking (Beuk & Basadur, 2016; Guo et al., 2017; Kwon, Lee, & Kim, 2015), and could therefore affect participants' engagement in the workshops. Some of these variables were deliberately altered as a means of exploring the method protocol and recommended delivery, providing rich qualitative data but making direct comparisons between the processes and their outcomes less reliable. Furthermore, in its current format, design improv is a method which requires training, practice, and specialist facilitation. It could be argued that this is true of any creativity method; however, design improv requires a way of thinking and acting that may not come intuitively to all designers, hence the importance of warm-ups to foster a relaxed and humour-friendly atmosphere.

6 | CONCLUSION

This paper presents a new design group ideation method for designers inspired by the principles and processes of longform improvised comedy. The design improv method provides design teams with a structured yet unconstrained approach that seeks to access an extended solution space to generate novel, useful and surprising ideas. Improvisation referents could allow creative collaborators to converge on shared mental models that generate novel, useful, and surprising ideas in line with incongruity theories of humour; collaborative divergence. Contrasting the socio-cognitive models of improvisation with those of brainstorming appears to offer scope to overcome long identified productivity issues within the brainstorming paradigm.

Based on findings from a series of user-centred and iterative development workshops, it has been demonstrated that this new approach can be effectively applied to the generation of creative solutions. Findings also indicate that design improv can result in a highly inter-connected ideation process that alleviates some of the common barriers to effective group ideation such as self-censorship, unequal contribution, premature rejection of ideas, and idea fixation.

Further work in the development of the design improv method will involve additional testing of the creative process and outputs under controlled conditions, with a comparison with the brainstorming method, to gain deeper understanding of its application and value to the engineering design process.

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