

The best form of medicine? Using humour to enhance design creativity

As well as playing an important role in social bonds and group dynamics, humour has a long association with creativity and creative thinking. This study attempts to utilise this relationship in the context of design by enhancing brainstorming with the use of humour. The theories of Incongruity, Superiority and Relief are central in the creation of humour. This research hypothesises that these can be applied to enhance creative performance in brainstorming by (1) inducing a humorous atmosphere through stimuli, and (2) applying jocular structure to the brainstorming process itself. A study of three brainstorming methods (classical, silent structured and video-enhanced) was undertaken, the results analysed using the Torrance Test of Creative Thinking, and possible influences of humour on levels of creativity evaluated. The results in this indicated that using a humorous stimulus did not have a positive effect, although there remains a strong case in the literature for further investigation. Structuring the brainstorming session did increase fluency and originality, and a number of insights for creative team formation and working are outlined.

Keywords: creativity; humour; design methods; brainstorming

1 Introduction

In the product development process, the concept design phase typically encompasses the generation of ideas through to the selection of an embodied concept (Cross, 1994; Pahl & Beitz, 1995; Pugh, 1991; Ulrich & Eppinger, 1995). Generating a diverse range of creative ideas is recognised as a fundamental part of this design phase, and although it is typically an informal process based around sketch work and group discussion, a number of formal tools and methods have been developed to formalise and support the process (Leenders, Engelen, & Kratzer, 2007; McAdam, 2004; Paulus, 2000).

Despite the development of many structured approaches, brainstorming (Osborne, 1953) remains the most popular way for design teams to rapidly exchange ideas and to produce a high volume of conceptual output (Sutton & Hargadon, 1996). Indeed, studies consistently show that in comparison with more formal methods, brainstorming continues to perform more highly against a range of measures, including quantity, creativity and diversity (Chulvi et al, 2012a, Chulvi et al, 2012b; Vidal et al, 2004). Brainstorming has, however, become shorthand for meetings where designers attempt to generate ideas in relation to a particular problem (Buggie, 2003) without necessarily following the associated rules. Matthews (2009) describes how participants can lapse back into social conventions that inhibit the effective use of the method. Design consultancies such as IDEO (Kelley, 2006; Kelley & Littman, 2001) recognise this issue and place great emphasis on the need for brainstorming to be an immersive experience, with participants energised and engaged, for it to work effectively and produce a good range of creative ideas.

Humour, with its reliance on drama, engagement and surprise, has been long associated with creativity (Malone, 1980; Romero and Cruthirds, 2006) and, furthermore, has been fundamental through our evolutionary history in forming and maintaining social bonds (Ziv, 1976; McGee, 1989). This research therefore aims to understand how the power of humour can be harnessed to positively impact the effectiveness of brainstorming when generating new concept ideas. The work begins by investigating the ‘science’ of humour and the cognitive processes involved in creating it. The results of this investigation are used to propose an augmented approach to brainstorming which incorporates enhanced humorous elements.

2 Humour

Humour and the accompanying physiological expression of laughter is a psychological phenomenon which appears to be unique to humans and fundamental in how we relate to others (Coser, 1959; Ziv, 1976). Intentional humour created by people involves three elements; a communicator, a listener and a message (Coser, 1959; McGee, 1989). A ‘sense of humour’ is something which is present in every healthy human to some extent: people will admit to many shortcomings, but will rarely admit to having no sense of humour (Martin and Lefcourt, 1984). The study of humour can generally be divided into three branches: Superiority Theory, Relief Theory and Incongruity Theory. Superiority Theory suggests that a person laughs in order to express their superiority over another (Mihalcea, 2007). Freud (1976) proposed and supported much of the research into Relief Theory, where laughter is described as a ‘substitution mechanism’ which unconsciously converts aggressive impulses into more acceptable social functions and is followed by a feeling of relief (Kirkmann, 2006).

Incongruity Theory accounts for the largest body of modern humour research and is the basis for most jocular structure theories (Mihalcea, 2007). Koestler (1964)

defined the theory of incongruity as “bisociation”, when two seemingly incompatible frames of reference unexpectedly overlap in a momentary circumstance. In its simplest form, it consists of an incongruity being presented in the form of a question that appears to have an easy answer but is resolved in a surprising way (Richie, 1999). This can be illustrated by the following example:

“What is grey, has four legs, and a trunk? A mouse on vacation.” (Rothbart, 1977)

In this case, the listener of the joke initially assumes that the answer will be an elephant, but a less likely frame of reference is revealed in the shape of the mouse. It is also possible to present the listener with a question that seems to make no sense until it is resolved. For example:

“Why did the cookie cry? Because its mother had been a wafer so long.” (Shultz, 1976)

Here, the answer itself is also initially incongruous, with the wafer seemingly described as a cookie. Resolution quickly follows with the recognition that wafer is used in place of “away for”. While there can be variations in presentation and format, incongruity in essence must be capable of being resolved in order to be considered humorous (Hillson and Martin, 1994). In resolving the incongruity, the listener feels the emotions of surprise and satisfaction which results in laughter. Figure 1 represents how the degree of incongruity of a joke will affect its reception. If the association or required resolution is too broad or abstract, the listener may not ‘get’ the joke, conversely the joke may be perceived as too obvious. Of course, each individual has their own sense of what is funny, and it has been suggested that factors including age, sex, education, language and culture have a role to play in the appreciation for incongruity resolution (Malone, 1980; Romero and Cruthirds, 2006; Ruch et al, 1990).

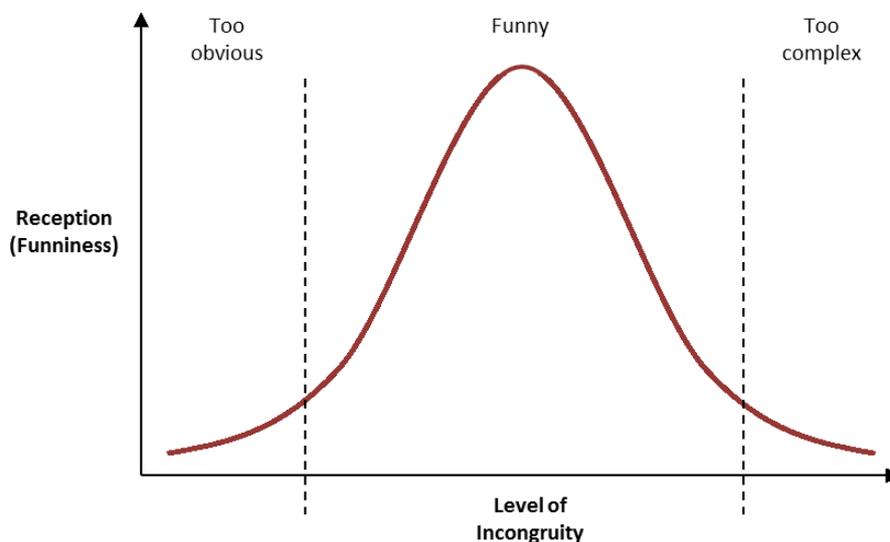


Figure 1: Illustration of the effectiveness of a joke in relation to its incongruity

3 Humour and design creativity

Design is a creative process, particularly in its early, open-ended stages. This can be an unpredictable process, however, and to help ensure more consistent results a number of tools have emerged. The most popular of these is brainstorming. The term was coined by Osborn (1953) to describe the practice of: “a conference method by which a group

attempts to find a solution for a specific problem by amassing all the ideas spontaneously contributed by its members". In analysis of its effectiveness, a number of variables have been identified, including: group size (Buggie, 2003); leadership approach (Proctor, 1995); 'personnel mix' (Colwell, 2004); conflict avoidance (VanGrundy, 1984) and; the introduction of participants from outwith the organisation (Buggie, 2003).

The variable most relevant to humour, and of specific focus for this research, is the mood or atmosphere present during a brainstorming session. This has been described as critical to the success of idea generation success (Mcfadzean, 1998; VargasHernandez et al, 2010) as it allows participants to speak more freely and without fear of criticism (Stroebe, Nijstad and Rietzschel, 2010). We therefore propose that humour can be used in two ways to encourage design creativity: to enhance *mood* and to *structure* idea generation.

3.1 Mood

The French philosopher Penjon noted in the 19th century that laughter was an expression of freedom which allowed a person to escape rational thought and play with new ideas (McGee, 1989). Coming to a similar conclusion, McGee (1989) conducted an experiment involving children to assess the effects of a humorous environment on the children's level of creative output. In one trial the "fun mood" was created by showing videos and cartoons, noting that laughter can be contagious. The results suggested that:

"...creating a humorous atmosphere, letting people laugh together not only improves their mood but probably also their willingness to be more free in expressing their original idea." (p. 112)

Research has demonstrated that having a humorous atmosphere, whether verbally through effective leadership or visually through videos and pictures, can lead to increased creativity in business environments (Osborne, 1953; Watson et al., 2006; Ziv, 1976). It has been suggested that as part of the cognitive process there is an element of "playfulness" that gives people the ability to change frames of reference, whether for a jocular purpose or for expressing more novel and adventurous ideas (McGee, 1989).

By providing humorous stimulus for participants that make use of Incongruity, Superiority and Relief Theory elements of humour, it may be positively enhance the mood and creativity of the session.

3.2 Structure

The unreal situations proposed when humour is used loosen the rules of rational thinking can increase the chance of divergent or lateral thinking (Ziv, 1976). The cognitive process involved in having a creative thought is very similar to that of producing a joke (Koestler, 1964), and in studies of humour production in college students, Treadwell (1970) found that those with a higher degree of creativity were better at producing humour. Both involve making a random association, whether it is a problem solution or punch-line, which means that they both require divergent thinking. By adapting the brainstorming process to encourage disconnects or unusual combinations that are characteristic of Incongruity Theory in humour, it may positively enhance the creativity of the session.

Brainstorming has been compared to a 'chain reaction process' in which the problem is continually redefined by the different perspectives of the group members

(Henry, 2006; Proctor, 1995; Vangrundy, 1984). While this is generally a positive force, it can also induce an element of competition – personalities can dominate and participants can become attached to their own ideas. This tendency can be aligned with Superiority Theory, in terms of the selection or prioritisation of ideas at the end of a session.

In contemplating a set of random ideas, the process of resolving these in an unexpected way is similar to Relief Theory – seemingly incompatible components suddenly fit together in a satisfying way. This is the basis of producing a joke, where seemingly random or unexpected situations are resolved in a satisfying way (Beattie, 1776; Nerhardt, 1970).

4 Focus of work

On this basis, two hypotheses on the role of humour in brainstorming were developed:

- (1) Creating a humorous mood during a brainstorming session can positively influence creativity.
- (2) Applying the cognitive process of producing humour to the brainstorming process can positively influence creativity.

Hypothesis 1 suggests that applying humour directly in a brainstorming session will induce more creative moods in the participants. This could create benefits such as a more open and comfortable atmosphere in which to suggest wilder ideas. In addition humour may stimulate neurological pathways which are related to creative thought and divergent thinking. The stimulus used in the

Hypothesis 2 suggests that the similarities between the cognitive processes involved in the production of humour and creativity can be utilised to improve the structure of the brainstorming process. If the design problem represents the initial frame of a joke, participants can provide random associations and utilise them to arrive at a solution, or punchline. This process may result in more unexpected and novel output.

5 Study

A study was designed in order to evaluate the two hypotheses. Three sessions were carried out using different idea generation formats, each aligned with the hypotheses of the research. Table 1 sets out the method that was used, the hypothesis that was tested and the brief that was used for each session.

Session	1	2	3
Method	Classic brainstorming	Silent structured method	Video-enhanced brainstorming
Hypothesis	Reference	Hypothesis 2	Hypothesis 1
Brief	Brief A: Anti-tangle headphone cable	Brief B: Portable outdoor loudspeaker	Brief C: Speaker positioning

Table 1: Structure of the study, showing different methods, hypotheses and briefs

The sessions consisted of twenty three participants, working in five teams of four and one of three, with one acting as a nominated facilitator while still participating in the design activity. All participants were undergraduate Product Design Innovation students, giving them a similar degree of experience with brainstorming sessions. After

undertaking the sessions, each participant was asked to individually complete a feedback sheet. In order to ensure that there was a similar degree of difficulty involved in each session, design briefs were based on basic mechanical challenges, and were centred on the theme of audio equipment:

- Brief A – Earphones are something that many people carry and use every day in conjunction with their mobile electronic equipment. After being stuffed into a pocket, users often find them tangled when they wish to use them. Your challenge is to design a device to ensure that earphones with up to a 1m cable can be easily stored in the pocket and retrieved for use without the pain of having to untangle knot by knot.
- Brief B – It is often desirable to have music played at outdoor parties and barbeques. Large, floorstanding speakers give optimum bass performance in sound reproduction but their bulk makes them impractical to use in this environment. Your challenge is to redesign cabinet speakers of a 0.5m^3 volume for outdoor use addressing the following functional areas:
- Brief C – When listening to music, it is desirable to position loudspeakers so that the user is in the audio ‘sweet spot’. It is therefore important to have an element of adjustability to accommodate different seating positions in a domestic living room. Your challenge is to design a speaker mounting that will easily allow 90° of rotation around the y axis and 50cm of movement in any direction on the x-z plane.

The design teams were organised as shown in Figure 2. Any objects or features which could act as distractions or inspiration removed. Each participant sketched ideas on Post-It notes, and these were added to the supplied templates for each session.

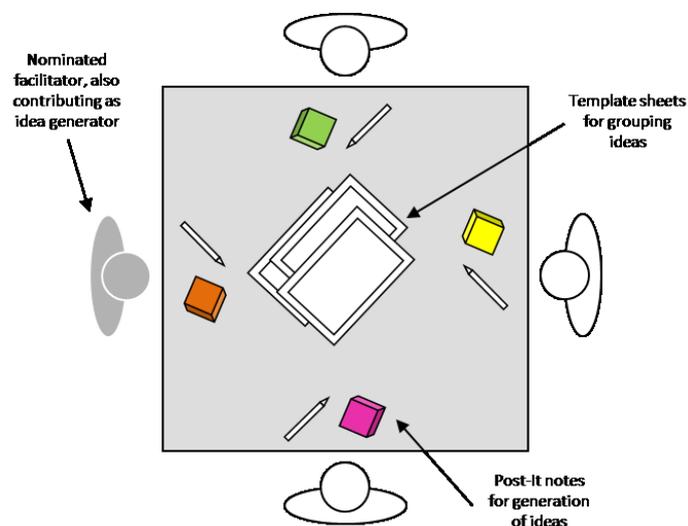


Figure 2: Layout for the sessions

5.1 Methods

The first session was *classic brainstorming* based on Osborne’s (1953) original four rules (1 – Criticism not permitted; 2 – Free-wheeling welcome; 3 – Quantity required; 4 – Combine and improve where necessary). The purpose of performing this session was to act as a datum which the later sessions could be marked against in terms of output. The session consisted of an open discussion where participants were asked to

communicate their ideas via verbal, written and/or sketch descriptions. Ideas were captured on Post-It notes and added to the team's shared template sheet, with the development of ideas where appropriate encouraged.

The second session was a *silent structured method* which was based on the process of contemplating seemingly random associations (Incongruity), selecting the most promising for use (Superiority) and then resolving them into unexpected concepts (Relief). This format attempts to follow the cognitive process of producing humour in a step-by-step basis, with the intention of producing more novel solutions. Similar to Morphological Analysis (Pugh, 1991), the design problem was broken into its key functional requirements, i.e. transport (how to move the speakers from location to location), stability – (how to mount the speakers on grass and uneven surfaces), and storage (how to collapse or pack the speakers). Participants added their Post-Its to appropriate columns on the template sheet (Figure 3) and then combined them in complete concepts. The main differences with traditional Morphological Analysis were that participants were encouraged to exaggerate, extrapolate and reframe within each functional area, and then 'force-fit' disparate ideas into coherent concept solutions.

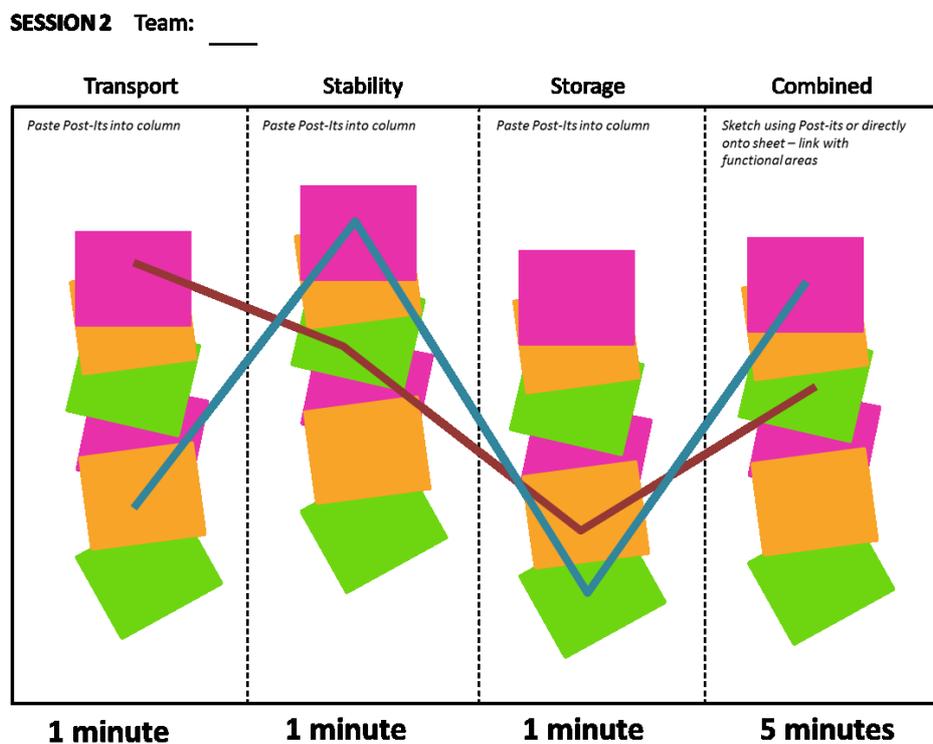


Figure 3: Template used in the silent structured method

The final session of each trial attempted to influence the moods of the participants by directly applying humour in the form of a *video-enhanced brainstorming*. The purpose of this session was understand whether a 'fun mood' can make participants more open to creative thought and create an environment in which wilder ideas are welcome. This is in line with suggestions put forward by Cade (1982), McGee (1989), Osborne (1953) and Ziv (1976). Prior to the session commencing, participants were shown 2 minutes of humorous video in an attempt to change their mindset before any conceptualising. The video used was 'You've Been Framed Funniest 100: Best Bits', which is 10 minutes in its entirety and available on youtube.com (<http://www.youtube.com/watch?v=A3jgWnstJJU>). There were several reasons behind using this particular video, including:

- The style of humour is generally ‘absurd’ meaning it can be enjoyed by all and does not target any demographic group, i.e. age, gender, culture.
- The video is made up of several short ‘clips’ meaning the humour is fast pace with very little build-up.
- The clips support the idea of Incongruity, where the ending of each clip is sudden and unexpected. There were, however, aspects of Relief and Superiority depending on the clip.
- The video involved visual humour as opposed to verbal, which is more likely to enhance visual creativity (Watson et al, 2006; Ziv, 1976).

After the 2 minute ‘warm-up’ video showing, the brainstorming session commenced with the video still running in background. Participants were told that if they could not think of any ideas or got too focused on any one concept at any point during the session, to watch the video briefly and take their mind off the design problem. The purpose of this was to sustain a more objective view of the problem, and allow them to be more spontaneous with their ideas. Other than the video running in the background, the structure of the session was identical to Session 1.

6 Results

The outputs from the study were gathered in the form of the template sheets on which teams grouped their Post-Its and the individual feedback sheets. A mix of quantitative and qualitative analysis was used, with triangulation providing a more thorough understanding of the problem under investigation (White, 2003). A sample of output from the session is shown in Figure 4.

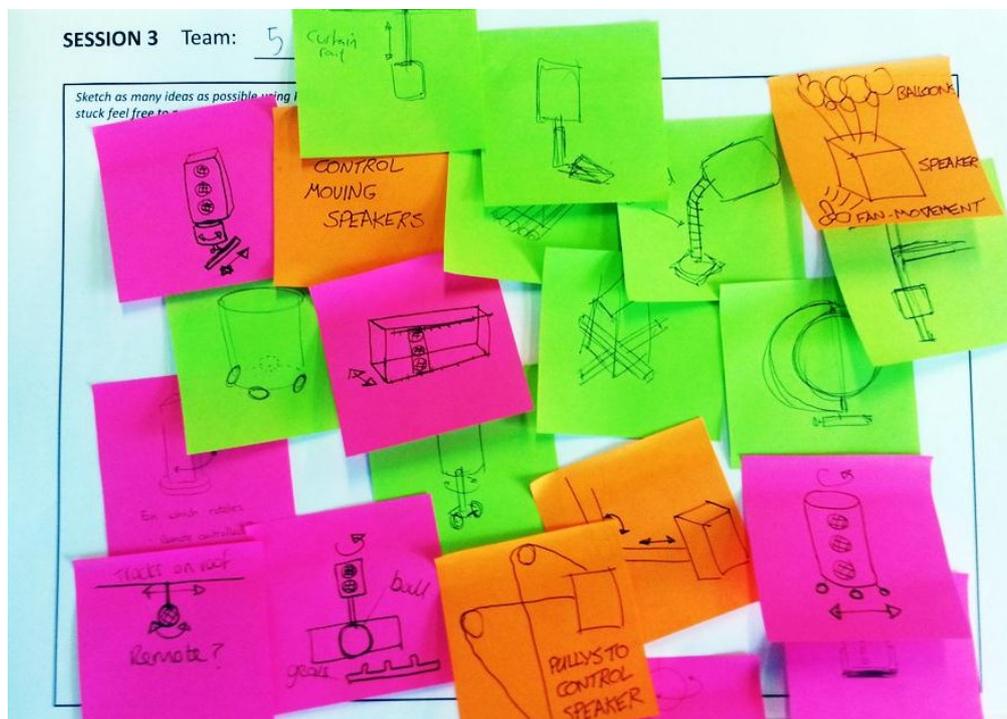


Figure 4: Example sketch output from Team 5, Session 3 (video enhanced brainstorming)

6.1 Session output

In evaluating creativity, the Torrance Test of Creative Thinking (TTCT) identified four key characteristics of fluency, flexibility, originality and elaboration (Torrance, 1974). This work has been widely utilised for use in assessing design creativity (Sarkar and

Chakrabarti, 2011; Shah and Vargas-Hernandez, 2003) and a number of suggestions made in how measures can be adapted for more sophisticated analysis (Piffer, 2012; Verhaegen et al., 2013). In this instance, Torrance’s original factors have been utilised and calculated as follows:

- Fluency – The total number of responses. Assessed for each session by simply counting the number of ideas noted on the associated template sheet.
- Flexibility – The number of different categories of relevant responses. Assessed by clustering by mechanical similarity to give a number of categories and dividing by the total number of ideas for each session.
- Originality – The statistical rarity of the responses. For each idea, the number of times a mechanically similar idea appeared in other sessions was counted. The sums were inverted so that higher answers indicated higher originality.
- Elaboration – The amount of detail in the responses. Assessed by assigning a rating of between 1 and 5 (1 – minimal detail, 5 – very detailed) to each idea.

Scores for the four different measures were transformed with a maximum value of 10 prior to analysis for ease of presentation. While fluency is an objective measure and easily determined, there is a level of subjectivity associated with the other three. To address this, the output was assessed independently by two appropriately qualified judges. A reliability procedure associated with the Consensual Assessment Technique (CAT) was employed to review the correlation of the two judges (Amabile, 1983), which involved running a Pearson correlation on the scores. It was found that while the flexibility and originality measures were satisfactory (0.76 and 0.80 respectively), the detail ratings were outside of the acceptable range. Three additional judges were therefore asked to complete detail ratings on the ideas (Kaufman et al, 2008) and the scores across all five were averaged to provide the final values for further analysis.

Before reviewing the performance of the different idea generation methods, variation across the teams was examined. While it can be expected that some teams will be more productive than others, it was expected that the pattern of response would be consistent across the measures. It can be seen from Figure 5 that this was the case across Teams 1, 4, 5 and 6. Team 2 scored strongly across the flexibility, originality and detail scores, while Team 3 created significantly more ideas than the other teams (fluency). They can therefore be considered to be exceptional in their quality of design work (Team 2) and productiveness (Team 3). It should be noted that Team 4 was a team of three, and while they produced the lowest number of ideas their scores across the other measures followed a similar trend (if more accentuated) to the others.

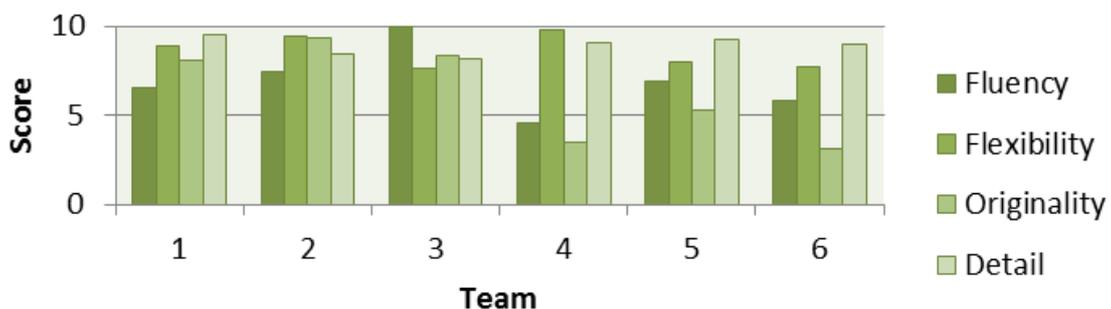


Figure 5: Average quantitative results by team for the three sessions

The average scores for the TTCT factors for each style of brainstorming session were then calculated in order to interpret which was the most effective (Figure 6). Session 2, the silent structured brainstorming session, provided the highest degree of consistency across the measures, indicating the most creative output overall. Session 1 scored poorly on detail and originality, although the high score in flexibility shows that a range of concepts were explored. Session 3 produced the fewest concepts, but they did contain the highest level of detail.

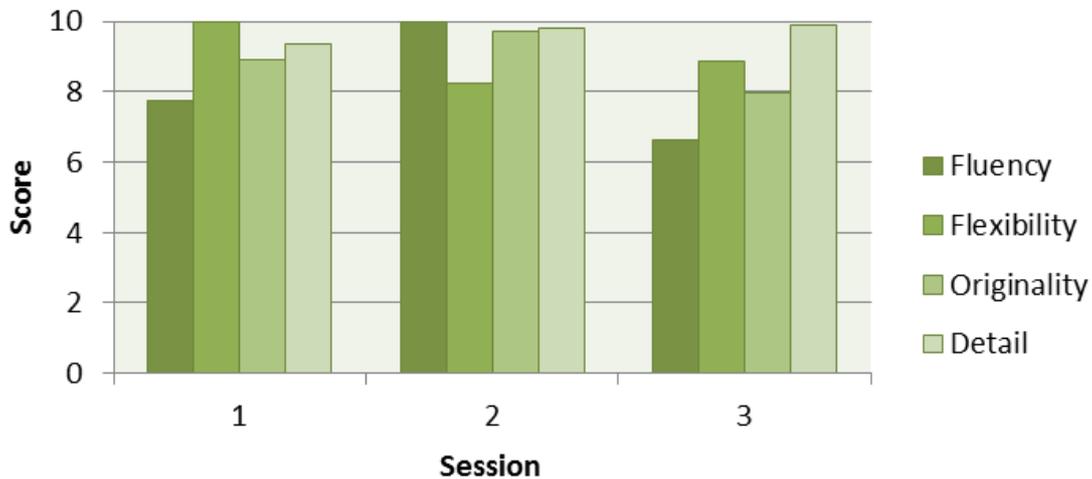


Figure 6: Average quantified score for TTCT factors for Session 1 (classic brainstorming), Session 2 (silent structured method) and Session 3 (video-enhanced brainstorming)

6.2 Session feedback

During the debrief interviews, participants were asked two questions:

- (a) Which style of brainstorming session did you most enjoy and would prefer to take part in again?
- (b) Which style of brainstorming session did you feel was the most successful in terms of output?

Figure 7(a) shows the response to question one (which session was most enjoyable) and Figure 7(b) shows the response to question two (which session was perceived as most successful). Figure 7(a) shows that the structured silent video-enhanced methods were equally popular, with 39% responding positively for each. The classic brainstorming still received significant support, with 22% of participants rating it as their most enjoyable. Figure 7(b) shows that the silent structured method was clearly perceived as the most successful, with 70% of participants indicating they thought it was the most productive. 26% felt that the classic brainstorming session was most successful, with only 4% selecting the video-enhanced brainstorming.

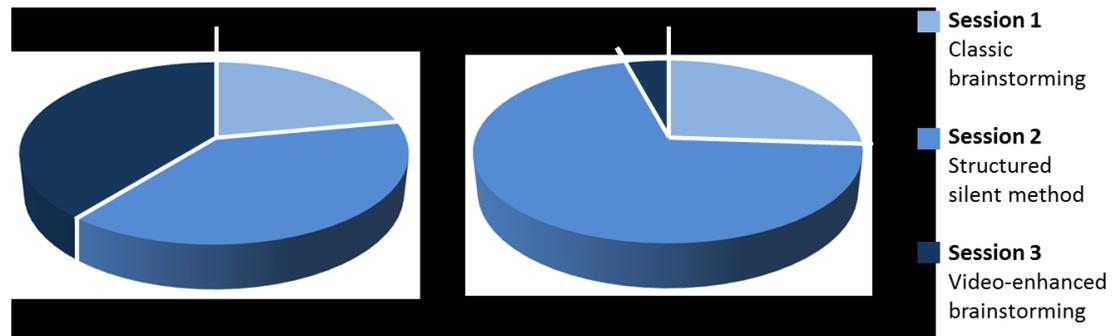


Figure 7: Feedback from the sessions showing the level of enjoyment and perceived success for the three sessions

During Session 1, there was consistent feedback that it felt “natural” in that there were “virtually no constraints”. This open ended format proved enjoyable but was also deemed productive in that it allowed a wide range of ideas to be explored. Another important aspect was the fact that it was collaborative. Participants enjoyed “being able to discuss ideas with the team” and also felt this was beneficial in developing ideas.

The structured nature of Session 2 proved popular, with teams appreciating the opportunity to “think individually and then discuss”. This format allowed an internal and considered approach to be combined with the benefits of brainstorming. The perceived productivity of the method was particularly high: the requirement to address different functional areas was felt to “focus creative thinking”, and when it came to combining them it provided “many possible combinations”, even if for some teams this proved challenging.

Session 3 was distinctive in that the video-enhanced method was clearly popular but was not perceived as being as effective. A number of comments indicated that the video was fun and made participants “more relaxed”, but there was a concern that there was a tendency to “focus on enjoying the video itself” rather than using it as inspiration. While some participants felt that “watching the funny video encouraged creative and funny ideas”, a more common response was that it led to the team being “too distracted”.

7 Discussion

In response to the findings of the literature review, two hypotheses were developed prior to experimentation:

- (1) Creating a humorous mood during a brainstorming session can positively influence creativity.
- (2) Applying the cognitive process of producing humour to the brainstorming process can positively influence creativity.

The quantitative results of the experiment do not support Hypothesis 1, but there is evidence that Hypothesis 2 was held. The possible reasons and qualitative issues associated with each of these are discussed below.

7.1 Creating a humorous mood during brainstorming

Session 3’s video-enhanced brainstorming performed poorly in in analysis of the creative output. While participants tended to laugh at the short, more abrupt clips with a higher degree of incongruity, there was less evidence of this translating to effective

design ideas. The fewest ideas were produced and scores for flexibility and originality were low. Despite this, the level of detail of ideas was highest for the three sessions.

To an extent, teams had to exclude the video in order to concentrate on ideas that met the design criteria. Indeed, it was noted that several teams paid little attention to the video and would often look away from the screen when attempting to conceive ideas. It was during this period that ideas which could be considered as more detailed, such as rail and pulley configurations, were produced.

The stimulus itself could not be classified as exclusively Incongruous. In many of clips shown within the video there are opportunities for the observer to feel a sense of Relief in not being the subject of the clip and indeed potential to simultaneously feel a sense of Superiority. In practice, it is hard to separate these elements to discern which one (if any) is more effective in stimulating creativity.

While teams generally enjoyed the session, there was an element of concern that the video made it seem frivolous or irrelevant. A video with content more directly related to the session, such as clearly applicable technical content, may have been better received but would not necessarily have the same degree of humorous incongruity. Another option may be to establish norms within each team and select humour stimulus based on identified preferences of the team. An individual's lack of appreciation of the humour applied may divide the group – there was evidence of isolated participants becoming 'turned off' and this negatively affected team dynamics. Given that brainstorming is largely dependent on communication for its effectiveness, this needs to be considered when providing a team with external stimulus.

A possible disadvantage of showing the humorous video prior to session was highlighted when teams had to revisit the design brief to re-familiarise themselves with its parameters. Another issue with the brief that became apparent was that it demanded a degree of accuracy in detailing, with angles of rotation and distance of translation specified. This did not marry well with the random nature and levity of the video.

Short brainstorming activities with low stakes are generally enjoyable. While the video-enhanced sessions may have had a marginally livelier atmosphere, with intermittent laughter and discussion over the videos, even within the datum classical brainstorming exercise a buoyant and good humoured atmosphere was observable. Any difference did not translate into participants contributing speculative ideas in a less inhibited way. Indeed, the fact that the stimulated brainstorming session was the last of the three sessions meant that performance could be more influenced by creative fatigue than the humour-based stimulus. A larger and longer term study with a consistent design brief between compared brainstorming sessions, and different participants for each brainstorming session compared, may eliminate some of the potential influences that make it difficult to isolate the influence of the humorous stimulus.

7.2 Structuring brainstorming using humour's cognitive process

The quantitative results indicated that Session 2's silent structured method performed best overall. It had the highest scores for fluency and originality, and the second best for flexibility (classical brainstorming performed best) and detail (video-enhanced brainstorming performed best) and the mix of individual and team working seemed to capture the best aspects of both.

While the structure of the method was based around the concept of Incongruity, it also contained elements of Relief (in the resolution of ideas to concepts) and Superiority (when participants had their own ideas selected for use). Focussing on

different functional areas during the individual phase encouraged originality – participants thought in more depth for each area and this tended to encourage distinctive ideas. The more concentrated approach induced by working individually and in silence may also have contributed to the good level of detail in the ideas. The Incongruity in reviewing the range of ideas produced, and the challenge of resolving them as a team led to a positive team exercise, with the Relief of successfully combining them through negotiation providing a rewarding outcome.

Although Superiority was not relevant to the generation of ideas in the session, it influenced their selection and concept construction. Personal attachment and competition are natural drivers in any team, but in this case it is worth noting that the participants had previous experience working together and had developed positive, comfortable relationships. Brainwriting and other silent structured methods have been shown to be advantageous in situations where there is poor social interaction or cultural and status differences (VanGrundy, 1984). Here, however, the pre-existing cohesion and rapport may have helped ensure that participants were particularly comfortable in exchanging ideas in sketch form.

Despite drawing on the cognitive processes of humour for its structure, the session did not lead to humorous situations in the sense of participants laughing. To incorporate humour more directly, an alternative approach may be to allow participants to spend some time developing humorous elements as part of the design task. Some previous studies have reported positive links between proficiency in humour generation and creativity within product design (Kudrowitz, 2010). It may be that conventional design briefs could be augmented or altered to induce the development of humorous material as part of the idea generation process, e.g. writing a joke or telling a funny story featuring the product or topic of consideration.

7.3 Limitations

Future work may wish to consider dedicating more effort into further validating effective means of measuring creativity. Although the creativity analysis procedure centred on the TTCT and correlated well with the qualitative analysis, it is primarily used for evaluating the degree of creativity present within an individual.

Despite the literature pointing to its potential, it was apparent that the video-enhanced method was insufficient in providing enhanced creativity compared to classical brainstorming. Further work is therefore required to investigate whether more appropriate humorous material or alternative ways to integrate it into the brainstorming format can be utilised with better results.

The use of triangulation proved successful in allowing the quantitative analysis to be validated through a qualitative analysis of participant opinion. In correlating these a close relationship was found, suggesting the quantitative means of evaluation devised was effective. While the experimental numbers were sufficient to provide consistent results, it is desirable to run further tests. In addition, it was noted that some participants responded more positively to the humorous stimuli than others. It is suggested that further work is performed into selecting the humorous stimuli based on the individual's personal appreciation of humour.

Although the briefs were written to try and ensure that ideas would be of a similar mechanical complexity, there remains the potential for an effect on the performance of teams. Since the different methods were linked to a particular brief, it

was impossible to quantify the effect on the results. In future studies it may be desirable to run multiple sessions with briefs rotated to allow their effect to be examined.

8 Conclusion

Creativity is essential during the concept design phase for the generation of a diverse range of ideas. Ensuring brainstorming sessions, the method of choice in design and beyond, run as effectively as possible is therefore critical for success. Humour, with a long history of links with creativity and creative thinking, has been proposed as a potential conduit for enhancing the effectiveness of brainstorming sessions. An experiment was therefore designed, consisting of a control session and two new styles of brainstorming that utilised humour to affect creative performance.

Quantitative analysis of the session outputs indicated that applying a humorous stimulus before and during a group brainstorming session did not have a positive effect on the results. Indeed, fluency and flexibility were considerably lower than for classical brainstorming, with only detail scoring more highly. It is therefore proposed to revisit how the humorous footage is presented and integrated into the brainstorming session. Dangers exist in the stimulus forming a distraction from the core work and causing participants take the brainstorming session less seriously. It is anticipated that this danger could be mitigated through appropriate facilitation of the session. Overall, the potential benefits of using humour in the creative setting based on the literature and positive reaction of the participants in the study make it worthy of further consideration.

The silent structured method mimicking jocular structure provided the best results of the three methods. It was consistently strong across the four measures and was particularly strong in fluency and originality. The basis of the method is supported by the literature advocating the stimulation of related cognitive processes. In this case, the focus was on creating incongruity between the ideas in different functional areas. There was also the opportunity to achieve relief in resolution of ideas and superiority with the selection of a participant's ideas. The format also utilises individual and team working, which both have advantages in idea generation. While the method has been shown effective in this particular instance, further refinement could incorporate a more sophisticated use jocular structures. Additionally, the method does not currently lead to the alteration of mood in the session, which the literature has suggested would be beneficial.

In summary, the two methods proposed have shown the advantages and disadvantages of utilising humorous elements in brainstorming. While only the silent structured method provided positive results against classical brainstorming, both merit further investigation and refinement in an effort to make use of the creative aspects of humour in creative design environments.

References

- Amabile, T. M. (1983) The social psychology of creativity: A componential conceptualization. *Journal of personality and social psychology*, 45(2), 357.
- Attardo, S. and Raskin, V. (1991) Script theory revis(it)ed: joke similarity and joke representation model, *HUMOR*, 4(3/4), 293-347.
- Beattie, J. (1776) On laughter and ludicrous composition, *Essays*, Creech, Edinburgh, UK.
- Buggie, F.D. (2003) How to Hold Effective Brainstorming Sessions, *Handbook of Business Strategy*, 4(1), 120-123.
- Cade, B.W. (1982) Humour and Creativity, *Journal of Family Therapy*. 4(1), 35-42.

- Chulvi, V., González-Cruz, M., Mulet, E., & Aguilar-Zambrano, J. (2012a) Influence of the type of idea-generation method on the creativity of solutions. *Research in Engineering Design*, 1-9. doi: 10.1007/s00163-012-0134-0.
- Chulvi, V., Mulet, E., Chakrabarti, A., López-Mesa, B., & González-Cruz, C. (2012b) Comparison of the degree of creativity in the design outcomes using different design methods. *Journal of Engineering Design*, 23(4), 241-269.
- Colwell, B. (2004) Brainstorming, Influence, and Icebergs, *Computer*, 37(4), 9-12.
- Coser, R.L. (1959) Some Social Functions of Laughter: A Study of Humour in a Hospital Setting, 12(2), 171-182.
- Cross, N. (1994) *Engineering Design Methods, Strategies for Product Design*. Chichester, UK, John Wiley & Sons.
- Freud, S. (1976) *Jokes and their Relation to the Unconscious*, Penguin Books, New York, USA.
- Henry, J. (2006) *Creative Management and Development*, SAGE, London, UK.
- Hillson, T.R. and Martin, R.A. (1994) What's So Funny About That?: The Domains-Interaction Approach as a Model of Incongruity and Resolution, *Motivation and Emotion*, 18(1), 1-29.
- Kaufman, J. C., Plucker, J.A. and Baer, J. (2008) *Essentials of creativity assessment*, Wiley & Sons, Hoboken, NY.
- Kelley, T. (2006) *The Ten Faces of Innovation: Strategies for Heightening Creativity*. London, UK: Profile Books.
- Kelley, T., & Littman, J. (2001) *The Art of Innovation*. London, UK, Profile Books.
- Kirkmann, A. (2006) Contemporary Linguistic Theories of Humour, *Folklore*, 33, 27-58.
- Koestler, A. (1964) *The act of creation*, Hutchison & Co., London, UK.
- Kudrowitz, B. M. (2010) *HaHa and Aha! Creativity, Idea Generation, Improvisational Humor, and Product Design*. PhD Thesis, Massachusetts Institute of Technology.
- Leenders, R. T. A. J., Engelen, J. M. L. v., & Kratzer, J. (2007) Systematic Design Methods and the Creative Performance of New Product Teams: Do They Contradict or Complement Each Other? *Journal of Product Innovation Management*, 24, 166-179.
- Malone, P.B. (1980) Humour: A Double-Edged Tool For Today's Managers? *Academy of Management Review*, 5(3), 357-360.
- Martin, R.A and Lefcourt, H.M. (1984) Situational Humour Response Questionnaire: Quantitative Measure of Sense of Humour, *Journal of Personality and Social Psychology*, 47(1), 145-155.
- Matthews, B. (2009) Intersections of brainstorming rules and social order, *CoDesign*, 5(1), 65-76.
- McAdam, R. (2004) Knowledge creation and idea generation: a critical quality perspective, *Technovation*, 24, 697-705.
- McFadzean, E. (1998) Enhancing creative thinking within organisations, *Management Decision*, 36(5), 309-315.
- McGee, P.E. (1989) *Humour and children's development: a guide to practical applications*, The Hawthord Press, London, UK.
- Mihalcea, R. (2007) The Multidisciplinary Facets of Research on Humour, *Lecture Notes in Computer Science*, 4578, 412-421.
- Nerhardt, G. (1970) Humor and inclination to laugh: Emotional reactions to stimuli of different divergence from a range of expectancy, *Scandinavian Journal of Psychology*, 11(1), 185-195.

- Nijstad, B.A., Stroebe, W. and Lodewijkx, H.F.M. (2003) Production blocking and idea generation: Does blocking interfere with cognitive processes? *Journal of Experimental Social Psychology*, 39(6), 531-548.
- Osborn, A.F.(1953) *Applied Imagination: principles and procedures of creative thinking*, Charles Scribner's Sons, New York, USA.
- Pahl, G., & Beitz, W. (1995) *Engineering Design, A Systematic Approach*. Bath, UK: Springer.
- Paulus, P. (2000) Teams and Creativity: The Creative Potential of Idea Generating. *Applied Psychology*, 49(2), 237-262.
- Piffer, D. (2012) Can creativity be measured? An attempt to clarify the notion of creativity and general directions for future research, *Thinking Skills and Creativity*, 7(3), 258-264.
- Proctor, T. (1995) *The Essence of Management Creativity*, Prentice Hall, New Jersey, USA.
- Pugh, S. (1991) *Total Design*. Reading, UK: Addison-Wesley.
- Ritchie, G. (1999) Developing the Incongruity-Resolution Theory, *Proceedings of the AISB 99 Symposium on Creative Language: Humour and Stories*, 78-85.
- Romero, E.J. and Cruthirds, K.W. (2006) The Use of Humour in the Workplace, *Engineering Management Review*, 34(3), 18-29.
- Rothbart, M.K and Pien, D. (1977) Elephants and marshmallows: A theoretical synthesis of incongruity- resolution and arousal theories of humour. In Chapman and Foot, 37– 40.
- Ruch, W., McGee, P.E. and Hehl, F.J. (1990) Age differences in the enjoyment of incongruity-resolution and nonsense humour, *Psychology and Aging*, 5(3). 348-355.
- Sarkar, P., & Chakrabarti, A. (2011). Assessing design creativity. *Design Studies*, 32(4), 348-383.
- Saunders, M., Lewis, P. And Thornhill, A. (2009) *Research Methods for Business Students*, Prentice Hall, Essex, UK.
- Shah, J. J., & Vargas-Hernandez, N. (2003) Metrics for measuring ideation effectiveness, *Design Studies*, 24(2), 111-134.
- Shultz, T.R. (1976) A Cognitive-Developmental Analysis of Humour. In Chapman and Foot, 11–36.
- Stroebe, W., Nijstad, B. A. and Rietzschel, E. F. (2010) Beyond Productivity Loss in Brainstorming Groups: The Evolution of a Question, *Advances in Experimental Social Psychology*, Vol. 43, 157 – 203.
- Sutton, R. I., & Hargadon, A. (1996) Brainstorming groups in context: effectiveness in a product design firm, *Administrative Science Quarterly*, 41(4), 685-718.
- Svebak, S (2010) The Sense of Humor Questionnaire: Conceptualization and review of 40 years of findings in empirical research, *Europe's Journal of Psychology*, Vol. 3, 288-310.
- Torrance, E. P. (1974) *The Torrance Tests of Creative Thinking-Norms-Technical Manual Research Edition-Verbal Tests, Forms A and B- Figural Tests, Forms A and B*, Personnel Press, New Jersey, USA.
- Treadwell, Y. (1970) Humor and creativity, *Psychological Reports*, 26(1), 55-58.
- Ulrich, K. T., & Eppinger, S. D. (1995) *Product Design and Development* (3rd International Edition ed.), New York, NY: McGraw-Hill.
- VanGrundy, A.B. (1984) Brainwriting for new product ideas: An alternative to brainstorming, *Journal of Consumer Marketing*, 1(2), 67-74.

- VargasHernandez, N., J.Shah, J., & M.Smith, S. (2010) Understanding design ideation mechanisms through multilevel aligned empirical studies, *Design Studies*, 31, 382-410.
- Verhaegen, P.-A., Vandevenne, D., Peeters, J., & Duflou, J. R. (2013) Refinements to the variety metric for idea evaluation, *Design Studies*, 34(2), 243-263.
- Vidal, R., Mulet, E., & Gómez-Senent, E. (2004) Effectiveness of the means of expression in creative problem-solving in design groups, *Journal of Engineering Design*, 15(3), 285-298.
- Watson, K.K., Matthews, B.J. and Allman, J.L. (2006) Brain Activation during Sight Gags and Language-Dependant Humour, *Cerebral Cortex*, 314-324.
- White, B. (2003) *Dissertation Skills*, Continuum, London, UK.
- Ziv, A. (1976) Facilitating Effects of Humor on Creativity, *Journal of Educational Psychology*, 78(3), 318-322.