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Investigation of the Relationship between Mood and Divergent Thinking

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Abstract

This study investigated the link between mood which was induced with music and facial expression, and divergent thinking. A total of 377 participants from two different universities and one company in Germany were allocated to either the control group or to one of the two experimental groups “happy” or “sad”. Participants in the happy and sad group watched a power-point presentation including pictures of facial expressions while listening to music and doing a facial feedback exercise to induce happy or sad mood. Afterwards participants were asked to complete the Unusual Uses Test (UUT) for a brick and a paperclip. Participants from the control group only answered the UUT which measured divergent thinking and can be seen as a useful estimator to predict creativity. The results underlined that the mood manipulation was successful. In addition, the study found evidence that an increasing mood score leads to a higher creativity score, indicating that a pleasant mood fosters creativity, whereas an unpleasant mood decreases creativity. Overall the findings imply that there is a weak relationship between mood and creativity, measured with the UUT.

Keywords: mood, divergent thinking, creativity, music, facial feedback, facial expression

Investigation of the Relationship between Mood and Divergent Thinking

Creativity can be seen as a driving force for the development of new innovations that improve human life in the twenty-first century (Ritter & Ferguson, 2017). Without creativity it would not be possible to fly to the moon, to develop self-driving cars or to cure diseases (Ritter & Ferguson, 2017). However, creative performance is not only recognized to develop innovative products, creativity has also an important role in everyday lives. Creativity helps to solve problems, to remain flexible in thinking and to adapt constantly to changes in the environment (Cropley, 2000). Nowadays creativity can be seen as a necessary trait that increases organizational growth and promotes individual success (Mynbayeva, Vishnevskay, & Sadvakassova, 2016; Zhang & Bartol, 2010). Thus organizations want to foster the creative performance of their employees, but also the individual's pursuit to be creative. One domain that has received a lot of attention during the last years is the relationship between affective states and creativity. Several researchers found that creative performance is mood sensitive which assumes that creativity can be promoted actively (Callaghan & Growney, 2013; Chermahini & Hommel, 2012; J. I. Davis, Senghas, & Ochsner, 2009; De Dreu, Baas, & Nijstad, 2008; Forgeard, 2011; Ritter & Ferguson, 2017; Yamada & Nagai, 2015). However, the findings from various studies show contradictory results regarding the direction of the relationship between mood and creativity which underlines that there is a need for future investigations. Based on this debate, the present study aims to examine the effect of mood on creative performance, measured through divergent thinking tasks.

Theoretical Background

Conceptualization of Creativity

In comparison to other phenomena in science, creativity is rather difficult to define and measure because it interacts with intellectual abilities, knowledge, styles of thinking, personality, motivation and environmental factors (Kharkhurin, 2014; Runco, 2004; Sternberg, 2012). People are perceived as creative when they produce unique ideas that are somehow different from others (Runco, 2004; Sternberg, 2012). Often these ideas encounter resistance at first because they are unknown or not favored by others (Sternberg, 2012). A creative performance is the result of a creative process, in which the individual produces new and original ideas (Amabile, 1983; Kaufman, Plucker, & Baer, 2008; Runco, 2004, 2007a). Thus "Creativity is the interplay between ability and process by which an individual or group produces an

outcome or product that is both novel and useful as defined within some social context” (Plucker & Beghetto, 2004, p. 156). Studies about creativity are interdisciplinary because creativity can be considered from a behavioral, developmental, clinical, educational, evolutionary, organizational, personality, cognitive or social perspective (Runco, 2007b). Most of the theories about creativity focus on thinking skills and the intellectual process because there seems to be a connection between intelligence and creativity (Runco, 2007b). The most well-known models are Guilford’s *structure of intellect model* and the *model of creativity* which are both interrelated (Guilford, 1957; Sternberg & Grigorenko, 2001). The structure of intellect model supposes that there are 120 underlying mental abilities or factors of intelligence which can be represented along three main dimensions (1) Operation, (2) Content, and (3) Products with its subcategories. The first dimension focuses on general intellectual processes and abilities for example the divergent and convergent production. The second dimension includes information processing (Varela, 1969). In addition, the third dimension can be seen as the result of the first and second dimension (Varela, 1969).

Even if Guilford’s structure of intellect model might not represent the current state of research within the area of intelligence, his distinction between divergent and convergent thinking is still used nowadays (Sternberg & Grigorenko, 2001). As mentioned above, the process of divergent production and convergent production is part of the human intelligence (Sternberg & Grigorenko, 2001). Hence these processes are active, while solving problems, divergent and convergent processes are obvious indicators of creativity (Guilford, 1957). Divergent thinking tasks focus on the ability to respond to problems in several different ways, indicating that there is not just one right answer as in convergent thinking tasks (Guilford, 1957). The process of divergent production is most important to creativity because it is necessary to generate new ideas that are unexpected, whereas convergent thinking enhances the effectiveness and the ability of solving problems logically (Cropley, 2006).

Thus Guilford (1957) suggested in his paper that especially the measurement of divergent thinking provides useful estimates to predict creativity. Other studies support this approach and show that there is evidence for the validity of divergent thinking tasks which explains their wide use to quantify creative performance (Acar & Runco, 2012; Hass, 2017; Kaufman et al., 2008). One of the best examples for measuring divergent thinking is the Unusual Uses Test (UUT), formerly constructed by Guilford (1967). Participants are asked to give as many alternative uses for an object for example a brick within a three minute time frame

(Acar & Runco, 2012; Beaty, Silvia, Nusbaum, Jauk, & Benedek, 2014; Hass, 2017; Silvia et al., 2008). The task performance is traditionally scored by the number of responses to a given stimuli (fluency), the uniqueness of the responses to a given stimuli (originality) and the number of category switches among the responses (flexibility) (De Dreu et al., 2008; Guilford, 1957; Hass, 2017; Kaufman et al., 2008). Thus, there is a very high relationship ($r = .82$) between the quantity of ideas (fluency) and the number of high-quality ideas (originality); fluency can be seen as an estimate for the evaluation of divergent thinking tasks (Diehl & Stroebe, 1987).

There is evidence that the ideas produced in divergent thinking tasks tend to be more original and creative as time passes which would indicate that unique ideas appear later on, whereas at the beginning the production of creative ideas is inhibited (Beaty & Silvia, 2012). Hence it is important to instruct the participants to be creative, especially because participants with an instruction produced significantly more uses and fewer uncreative uses in comparison to participants without an instruction (Harrington, 1975). Furthermore, it seems to be unclear if creativity is somehow affected by gender differences. A recent study found that women are more creative in comparison to men (Dimitriadis, Anastasiades, Karagiannidou, & Lagaki, 2018). However, the study measured creativity with a self-report measurement (Dimitriadis et al., 2018). In contrast, a study which investigated the relationship between mood and creativity found no gender effects (De Dreu et al., 2008).

Conceptualization of Mood

For a comprehensive understanding of mood it is useful to know the difference between mood and other emotional phenomena such as emotion, feeling and affect. Emotions are always object-directed and personally meaningful which means that they are reactions to and about an object or event (Sizer, 2000). Furthermore, emotions are closely linked to one's own beliefs and are only changeable when the beliefs or the understanding of a certain situation is different than before (Sizer, 2000). In comparison to other emotional phenomena, feelings are not just about emotional states, but also about physical drive states like hunger, pain and fatigue (Thoits, 1989). Just as feelings, affective states are a more general term for a spectrum of different experiences, encompassing mood and emotions (M. A. Davis, 2009; Sizer, 2000; Thoits, 1989). When comparing mood and emotion they both lead to changes in people's physical and mental states and thus have an impact on their thoughts and behaviors

(Sizer, 2010). Sizer (2000) also mentioned that mood and emotions are connected to each other and that an increased mood leads to a higher likelihood of certain emotions and that strong emotions can even change the mood. In comparison, mood is not as emotions related to any object, it is independent from our beliefs and expectation (Sizer, 2000). According to emotions, moods are regarded as less intense and to have a longer duration (Morris & Reilly, 1987).

As mentioned above, Sizer (2010) combined emotions and moods within one framework that distinguishes local and global happiness. Local happiness can be identified with positive emotions, whereas global happiness can be compared with a positive mood, thus local and global happiness influence each other in both ways (Sizer, 2010). Research shows that mood can differ on two dimensions: positive affect and negative affect, whereas positive affect refers to all affective states that are pleasant and negative affect refers to all affective states that are unpleasant (Russell & Carroll, 1999; Watson, Clark, & Tellegen, 1988). However, pleasant and unpleasant mood can vary in level of activation or arousal for example the word upset as an example for unpleasant mood implies activation, whereas the word depressed implies deactivation (Russell & Carroll, 1999). Thus it is important when measuring mood with a scale to consider that mood appears on the pleasant-unpleasant dimension and the arousal-calm dimension (Mayer & Gaschke, 1988). A widely used example based on this approach is the Brief Mood Introspection Scale (BMIS; Mayer & Gaschke, 1988).

Broaden-and-build theory. To understand the beneficial role of positive mood it is useful to consider the *broaden-and-build theory* that focuses on emotions and local happiness as seen by Sizer (2010). The theory indicates that positive emotions have an impact on our thoughts and actions, broaden awareness and encourage novelty, whereas negative emotions facilitate performances that avoid harmful situations in the environment (Fredrickson, 2001). Over time positive experiences with the environment assemble several skills and personal resources thus positive emotions have long-term benefits and lead to individual growth and social connection (Fredrickson, 2001). Based on this theory, there seems to be evidence that positive mood might have an impact on thoughts and behaviors and also influences cognition and information processing. A study by Isen et al. (1985) revealed that positive affect has an impact on cognition. More precisely, they found that positive mood like happiness influences the flexibility of the cognition process which fosters the ability to solve problems in a creative way (Isen et al., 1985). Based on the results of the first study, another study by Isen et al.

(1987) showed that positive affect induced by a comedy film or a small gift facilitates creative performance. Thus, there is evidence that creativity can be increased by modifying the environment of an individual, indicating that creativity is not a stable characteristic of a person, but a transient pleasant affective state (Isen et al., 1987).

Mood Induction and Facial Expression

Facial expressions (e.g. smiling or frowning) play an important role in peoples' social interactions because they help to gain information about the emotional state of another person (Kulkarni, Reddy, & Hariharan, 2009). Several studies indicate that facial muscle movements affect the emotional experience of an individual (Andréasson & Dimberg, 2008; J. I. Davis, Senghas, & Ochsner, 2009; Soussignan, 2002; Strack, Martin, & Stepper, 1988). The theory behind this phenomenon is called the *facial feedback theory* which is based on Darwin's (1872) claim that the promotion of facial expression strengthens the experience of emotions, whereas the inhibition of facial expression degrades the experience of emotions (Andréasson, 2010). A more recent approach also supports the facial feedback theory and found that preventing glabellar frown lines in faces reduces negative mood in participants (Lewis & Bowler, 2009).

The classical way to measure facial feedback is to instruct the participants to move certain facial muscles that are associated with emotions and to let them rate their feelings afterwards (as seen by Flack, 2006). The study by Flack (2006) showed that feedback mechanisms are involved in certain expressions like anger, sadness, fear and happiness. This idea has been further demonstrated by Strack et al. (1988) who confirmed the facial feedback theory by using the oral pencil-holding technique. They found that smile-related expressions such as holding a pen between the teeth, enhances the positive affect. In contrast, inhibiting smile-related expressions as holding a pen between the lips, reduces positive affect (Strack et al., 1988). This method has been replicated numerous times with contradictory results (Soussignan, 2002; Wagenmakers et al., 2016). A recent replication study by Wagenmakers et al. (2016) with 1894 participants showed less statistical support for the method used by Strack et al. (1988). In contrast, another study underlined that facial muscles involved in smiling, increased self-report of positive experience in participants (Soussignan, 2002). However, the study by Soussignan (2002) failed to demonstrate that the contraction of the facial muscles (*zygomaticus*) was sufficient to change the positive experience of the participants.

Most of the reviewed studies manipulated facial expression via the activation or inhibition of the zygomaticus muscle. Another method for the manipulation of facial expression is also called *mirroring mechanism* since perceiving others affective experience activates the same neural structures as experiencing the emotions oneself (De Vignemont & Singer, 2006). In a study by Kleinke et al. (1998) participants were instructed to look at pictures of people with various facial expressions (happiness, sadness, fear, anger) and to communicate them accurately in a video camera while seeing themselves in a mirror or without seeing themselves in a mirror (Kleinke et al., 1998). The results underline that participants experienced increased positive mood when they engaged in positive facial expressions and decreased positive mood when they engaged in negative facial expressions (Kleinke et al., 1998). In general the effects were stronger when participants viewed themselves in a mirror because of the participants heightened awareness of their behaviors and moods; however, no effects of facial expression on negative mood were found (Kleinke et al., 1998).

Inspired by the pencil-holding technique by Strack et al. (1988), there seems to be evidence that mood can be induced by manipulation of the zygomaticus major muscles used for smiling. Furthermore, there is a connection between the perception of others affective states and one's own, thus mood can be induced by the presentation of pleasant and unpleasant facial expressions (see mirroring mechanism above).

Mood Induction and Music

The use of music to influence the emotional state has been used for centuries and is in comparison to facial expressions a more common strategy to induce the mood of an individual (Garrido & Davidson, 2013). Music is one of the most important and most time consuming leisure activities and plays a major role in peoples' lives (Rentfrow & Gosling, 2003). In addition, people believe that the music people listen to provides information about their personality and regulates their emotional states (Rentfrow & Gosling, 2003). Juslin & Laukka (2004) found that the ability to evoke strong emotions is one of the primary motives for listening to music. One reason could be that the same brain areas are active while listening to music and while doing rewarding activities like eating food, playing games, taking drugs and having sex (Brown, Martinez, & Parsons, 2004).

Several studies reported that listening to sad music results in a short-term mood degradation (Callaghan & Growney, 2013; Sandra Garrido & Schubert, 2015; Mokhtari & Buttle, 2015; Rowe, Hirsh, & Anderson, 2007), whereas people listening to happy music experience greater short-term mood improvement (Callaghan & Growney, 2013; Sandra Garrido & Schubert, 2015; Sandra Garrido, Schubert, & Bangert, 2016; Mokhtari & Buttle, 2015; Rowe et al., 2007; Yamada & Nagai, 2015). Most of the reviewed studies (e.g. Callaghan & Growney, 2013; Mokhtari & Buttle, 2015; Rowe et al., 2007; Yamada & Nagai, 2015) used instrumental music because vocal music contains lyrics, language, vocal techniques and thus seems to be more subjective than tempo and composition style (Jeong et al., 2011). However, other studies used self-chosen or given vocal music to influence the mood of the participants (Garrido & Schubert, 2015; Garrido et al., 2016).

Although the manipulation of mood was successful in most studies for both the happy and sad condition, the *mood-congruency theory* should be considered. The theory states that people who are in a happy mood are more likely to recall happy memories, whereas people in a sad mood are more likely to remember sad experiences (Hunter, Schellenberg, & Griffith, 2011). Based on this approach researchers showed that people in a sad mood were more responsive to sad music and happy people more sensitive to happy music (Hunter et al., 2011).

Mood and Creativity

Several researchers explored the interaction between mood and creativity and have shown that positive mood fosters creative problem solving which is also referred to as divergent thinking, but not convergent thinking (Chermahini & Hommel, 2012; J. I. Davis et al., 2009; De Dreu et al., 2008; Ritter & Ferguson, 2017; Yamada & Nagai, 2015). However, there are also studies with contradictory results, indicating that positive affect does not result in greater divergent thinking (e.g. Clapham, 2001). Another study showed that negative emotions enhance the performance on creativity tasks (Forgeard, 2011). Callaghan & Growney (2013) found that people in congruent sad conditions (e.g. sad video combined with sad music) gave more responses on creative problem solving tasks in comparison to people in an incongruent sad condition (Callaghan & Growney, 2013). The different results indicate that there is still a need for research in this area. Even if the methodological design of each reviewed study seems to be suitable for the particular purpose, it is noticeable that the sample sizes are too small and not diverse enough to generalize the results.

An observation of the recent literature demonstrates that the main challenge of researchers is to induce the desired mood in participants. The reviewed studies had different approaches to manipulate the mood: auditory stimulation via music (Mokhtari & Buttle, 2015; Ritter & Ferguson, 2017; Yamada & Nagai, 2015), imagination of a situation (Chermahini & Hommel, 2012; Yamada & Nagai, 2015), visual stimulus of a schematic figure similar to a real face (Mokhtari & Buttle, 2015) or a short video clip (Callaghan & Growney, 2013; Forgeard, 2011). However, in none of the reviewed studies the mood of the participants was manipulated by using facial expression, even if this method seems to be promising.

Present Study

The present study aims to examine the effects of mood on creativity by manipulating the mood with a combination of three different methods. This study implies that emotions cannot be evoked by just presenting pictures of facial expressions alone, but only by the simultaneous activation of facial muscles and corresponding music stimuli. This combination could give a new insight into the research field of mood on creativity, in particular, because the effects of chosen vocal music and facial feedback on mood are unexplored fields. This study also examines employees to increase diversity of the participants, whereas most of the reviewed studies involved only students as participants.

The study hypothesizes that positive mood can be successfully manipulated by activating the zygomaticus major muscles by holding a plastic straw between the teeth, while watching a power-point presentation with pictures of happy faces and listening to pleasant and happy music (H1). In contrast to that, negative mood can be successfully manipulated by inhibiting the zygomaticus major muscles by holding a plastic straw between the lips, while watching a power point-presentation with pictures of sad faces and listening to unpleasant and sad music (H2). As mentioned above there is evidence to expect that positive mood enhances creative performance in divergent thinking tasks (H3), whereas negative mood is supposed to inhibit creative performance in divergent thinking tasks (H4). However, no gender effects are expected (H5).

Method

Design

The study is divided into two parts, indicating that the study design at first is based on a quasi-experimental design. The mood of the participants is measured before and after the treatment which has the aim to induce happy or sad mood. The independent variable is the type of treatment (happy, sad or control), whereas the dependent variable is the mood after the treatment. The second part of the study is a correlational study with the purpose to identify whether there is a relationship between mood (independent variable) and creativity (dependent variable), measured with divergent thinking tasks. For that reason it is important to have varying mood scores from very low values to high ones. Thus the experimental part of the design was a necessary requirement, otherwise the variety of mood values might not be given and the values might be more or less equally distributed. If the manipulation of mood is successful, it would be expected that the values are either low (unpleasant mood) or high (pleasant mood), so that there is a need for a control group, representing values in between. However, the participants were not randomized, instead they were assigned to the lecture or event they took part in, thus all participants in one location were part of the same group (happy, sad or control). The applied treatment was chosen by the investigator with the goal to equalize the sample size for each group.

Participants

A total of 377 participants were recruited from different universities (Hochschule Niederrhein and International University Bad Honnef (IUBH)) and one company (The Adecco Group) in Germany. The data of 346 participants were useable. The sample consists of 165 women and 181 men. The average age was 23.8 years ($SD = 5.3$), whereas the youngest participant was 17 years and the oldest one 50 years. The participation was voluntary and each participant got sweets at the end of the experiment. The groups were nearly equally distributed with 114 participants in the control group, 124 in the happy group and 108 in the sad group. In general, most of the participants were students from IT or Management related subjects e.g. Aviation Management and 43 participants were employees. The study was conducted in English at IUBH and in German at Hochschule Niederrhein and Adecco. It took place in either a lecture hall (Hochschule Niederrhein, IUBH) or in a meeting room (Adecco). The study was conducted with respect to the research ethics of Lund University in Sweden.

Since the used intervention methods to induce the mood (facial expression and music) include only factors that every individual is confronted with on a daily basis, there were no ethical concerns to conduct this study.

Materials

Pictures of Facial Expressions. The pictures of facial expressions where people look happy or sad are from two different sources. The happy pictures are from a data base created by the Lund University and have been used for other studies in the department of Psychology. The sad pictures are part of the Cohn-Kanade (CK/ CK+) database which is a free and validated database with pictures of several facial behaviors e.g. sad, disgust, anger of adults (Lucey et al., 2010). The sad pictures were only available in black and white, whereas the happy pictures were colored. Both power-point presentations consisted of 26 pictures. Each face was presented for 8 seconds, thus the total presentation time was 3.5 minutes. The chosen time for each picture and the number of faces was based on another study by Likowski et al. (2011) who presented 30 facial expressions for 6 seconds each. However, the overall presentation time was about 11 minutes, but additional video sequences were presented only for 3 minutes (Likowski et al., 2011). For copyright reasons the pictures cannot be presented in the appendix. But at least the sad pictures are freely available online in the database.

Facial Feedback. The facial feedback exercise was based on Strack et al. (1988) oral pencil-holding technique. The zygomaticus major muscles were activated by holding a plastic straw between the teeth or inhibited by holding a plastic straw between the lips. For this purpose straws with a diameter of 0.8 cm and a length of 12.5 cm were chosen. The main choice for using straws instead of pencils was hygiene and cost. Besides an introductory instruction, pictures were used to show the participants, how to put the straw accurately in their mouths. These pictures can be seen in the appendix.

Music. The chosen songs for the sad and the happy group were based on a pre-study which included 15 participants. In this pre-study the participants were asked to evaluate how happy or sad each song would make them feel. Answers were ranged from 1 = “not at all” to 5 = ”very happy/sad”. The participants could rate the following songs inspired by a study by Garrido et al. (2016), whereas song number one to three should evoke a positive mood and song number four to six a negative mood (1) *Hung Up* by Madonna, (2) *Mamma Mia* by

Abba, (3) *Hey Ya!* by Outkast, (4) *Go Solo* by Tom Rosenthal, (5) *Only Time* by Enya, (6) *How to Save a Life* by The Fray. The results showed that *Hey Ya!* by Outkast and *Only Time* by Enya were seen as the most happy or sad song. The songs were shortened to 3.5 minutes.

Brief Mood Introspection Scale (BMIS). The BMIS consists of 16 adjectives from eight different mood states: Happy (happy, lively), loving (loving, caring), calm (calm, content), energetic (active, peppy), fearful/anxious (jittery, nervous), angry (grouchy, fed up), tired (tired, drowsy) and sad (gloomy, sad). They are rated from 1 = “definitely do not feel” to 4 = “definitely feel” (Mayer & Gaschke, 1988). Depending on the researchers purpose the mood scale can be evaluated to measure pleasant-unpleasant mood, arousal-calmness, positivity-tiredness and negativity-relaxation (Mayer & Gaschke, 1988). The scales have all a high factorial validity and three scales, except the arousal-calm scale have good reliability values as well (Mayer & Gaschke, 1988). The BMIS is available in English, French, Spanish and Urdu (Mayer & Gaschke, 1988). The scale was used in English, but additional synonyms were mentioned to make sure that non-native speakers understood the adjectives. Furthermore, the scale was translated to German. In a first step all adjectives were translated to German and in the following step German words were translated back to English thus making sure that the translation was close to the original version (see appendix). The mood scale was evaluated on the pleasant-unpleasant dimension.

Unusual Uses Test (UUT). The participants were asked to find uncommon uses for a brick and a paperclip. Two objects were used because one object is not enough as suggested by Silvia et al. (2008). The brick was chosen because it seems to be a common object in the UUT (Nusbaum & Silvia, 2011; Silvia, Martin, & Nusbaum, 2009), whereas the paperclip was somehow related to the working environment. The time was limited to three minutes per task as done in most of the other studies (Beaty & Silvia, 2012; Nusbaum & Silvia, 2011; Silvia et al., 2009). The task explanation was used from a study conducted by Gilhooly et al. (2007). The UUT was translated to German in the same way as the BMIS.

Procedure

Universities and companies in Germany were recruited via e-mail with the request to participate in the study. An information sheet was attached with an overview about the study's purpose, the procedure and the duration. As mentioned above Adecco, Hochschule

Niederrhein and IUBH were willing to participate. In total, there were 14 lectures or events to visit from the 27th of March, 2018 to the 12th of April, 2018. As mentioned above the people attending the 14 different events were not randomized, but assigned to a group (happy, sad or control) to make sure that the sample size was more or less equal for each group. The procedure was the same for the happy and sad group. In a short introduction the investigator mentioned that every question was welcome, but that the research purpose could only be explained after the study. In addition, the investigator outlined that the participation was voluntary and that participants had the right to discontinue participation at any time. Furthermore, the investigator drew attention to the careful reading and listening of further instructions. The study was scheduled for completion in 15 minutes. After the introduction which was the same for the happy/sad group and the control group, the happy/sad group watched a power-point presentation with further instructions on how to fill out the survey. The investigator tried to be reticent to avoid influencing the participants in any way and only answered questions or explained tasks when necessary. First of all, the participants were asked to fill out the first page of the survey, including personal information and the mood survey. All information was handled anonymously and confidential. In the second step, the participants were instructed to put a straw either between their teeth (happy group) or between their lips (sad group) and to carefully watch and listen to the presentation which showed pictures of facial expressions with either happy or sad music. Furthermore, they were asked to fill out the second page of the survey and to read the task for the UUT. When none of the students or employees asked any more questions, the participants were asked to fill out the divergent thinking tasks on page 3. The time for answering each question was limited to 3 minutes and a timer was shown in the power-point-presentation. When the time was up, an acoustic signal occurred. The procedure for the control group was similar, however, they did not see the part of the power-point presentation with the pictures of facial expressions and the music.

After finishing the data collection, the data were transferred to an excel sheet. The mood scale was evaluated as suggested by the authors with reverse scores for negatively associated feelings (Mayer & Gaschke, 1988). Thus the study mostly focuses on the induction of happy/sad mood, the scale was evaluated to measure pleasant-unpleasant mood before and after the intervention (Mayer & Gaschke, 1988). The UUT was evaluated as suggested by other authors (Diehl & Stroebe, 1987) by counting the answers. Duplicate answers and answers that were considered nonsense by the investigator, did not count. Participants with an illegible handwriting were reviewed again to make sure that the counting was made reliable.

Results

The data used for the statistical analysis were screened for spelling mistakes and coding errors beforehand. Participants with incomplete data of the variables “Mood Before”, “Mood After” and “Sex” were excluded because the completion of these variables was important for the data analysis. However, some participants were not willing to fill out their “Age” or their “Department/Course”. Hence this information was not necessary for a proper statistical analysis, all those participants were included. Participants, who had problems to understand the divergent thinking tasks in the intended way, were excluded because they would distort the result. Finally, 346 participants were included in the analysis.

For the statistical analysis the program R was used. To identify univariate outliers, boxplots with all variables were created. Closer inspection highlights that the outliers had values close to the maximum or minimum and represent the considerable differences in the population (mild outliers), thus there is no need to exclude them for further analysis. Boxplots were created to get an overview of the distribution characteristics of the collected data. As depicted in Figure 1, the median for the mood score (before) in the control group was 46 with an interquartile range of 9.75. The median for the mood score (before) in the happy group was 47 and in the sad group 48. The interquartile range was 9 for both groups (see Figure 1). The most unpleasant mood of a participant (score of 24) was part of the control group, whereas the most pleasant mood of a participant belonged to the happy group (score of 63). As seen in Figure 1 the median for the mood score (after) in the happy group was 48 with an interquartile range of 10. The sad group had a median of 46 and an interquartile range of 10.25. The control group was only tested once, therefore the mood score before and after was considered as equal. The lowest and highest mood values were before and after the induction the same.

When taking a closer look at the creativity score which sums the counts for the brick and paperclip tasks, the boxplot showed that there are differences between the groups (see Figure 2). The minimum of answers in the control group was one and the maximum was 17, whereas the mean had a value of 8.33. The interquartile range was 5. In comparison, the minimum of answers for the sad and happy group was 0, whereas the maximum of answers in the happy group was 18 and in the sad group 17. The mean for the happy group was 8.07 and for the sad group 6.00. The interquartile range was in the happy group 5 and in the sad group 4.25.

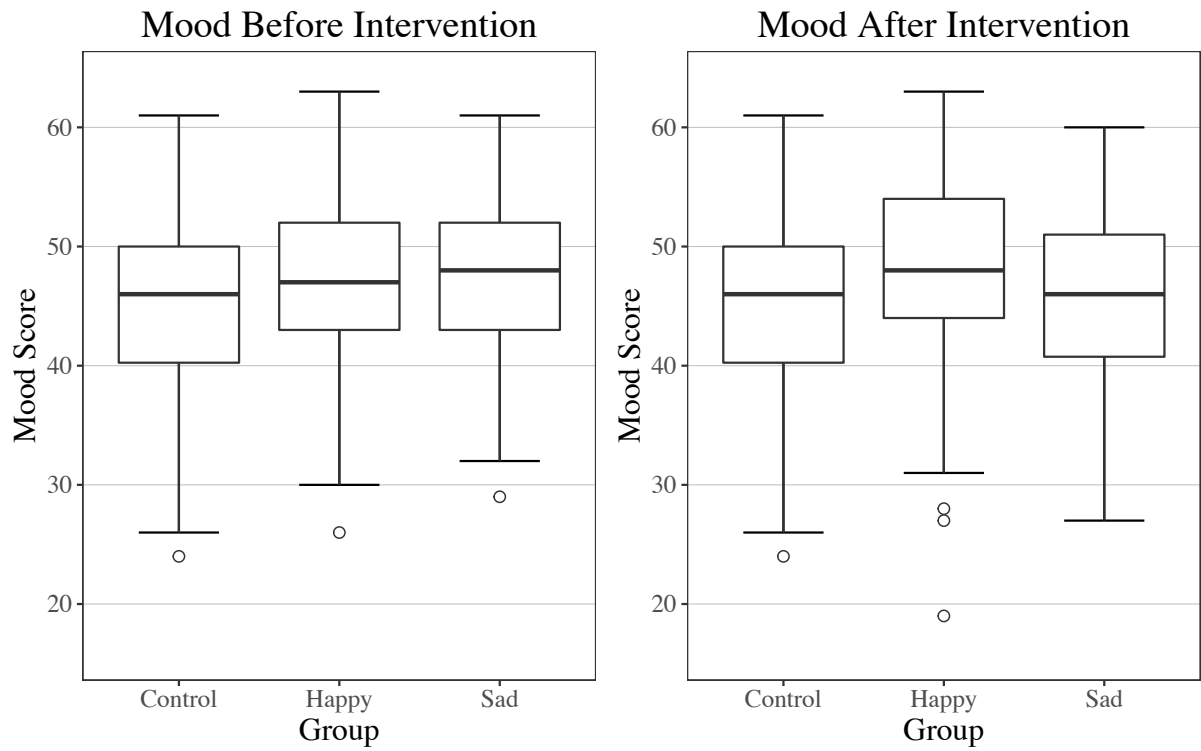


Figure 1. Distribution characteristics of the mood score before and after the intervention for all groups.

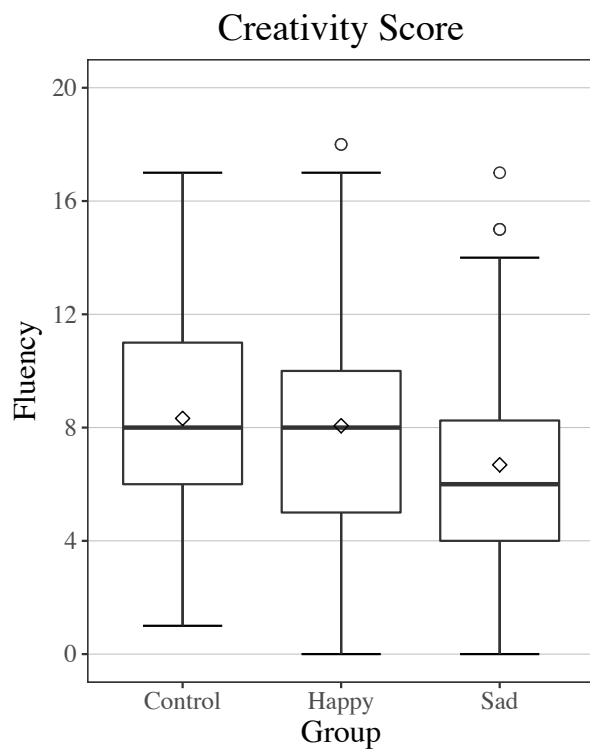


Figure 2. Distribution characteristics of the creativity score (fluency) for all groups.

For the statistical analysis a significant level of $\alpha = .05$ was used. To identify if the mood before differs significantly ($p \leq .05$) from the mood after, the one sample Wilcoxon-Test was calculated to examine the median differences between two groups. The W statistical value which is a list in R with V corresponds to the sum of ranks with a positive sign score. The choice for the test was based on the fact that the dependent variable (mood) was ordinal and that the groups were paired. The results showed a significant difference between the mood before and the mood after in the happy group ($V = 2194, p = .03$). The differences between the mood before and the mood after in the sad group was significant as well ($V = 3635.5, p = .003$). A visual representation of the mood differences for each participant in the happy and sad group can be seen in Figure 6 and Figure 7.

Further it is necessary to analyze whether the creativity scores significantly differ between the groups (happy, sad, and control). Thus the dependent variable (the creativity score) is metric, there is a need to determine if the normality assumption is fulfilled. The results of the Shapiro-Wilk test for the happy, sad and the control group indicate that the assumption for normality was violated ($p < .05$), thus parametric measurements cannot be used. Instead the Mann-Whitney-U-Test was used to analyze if the distribution of the dependent variable is identical for each group. The results showed that there was a significant difference between the creativity scores of the happy and the sad group ($W = 8218.5, p = .003$) and the sad and control group ($W = 4402, p < .001$). However, there was no significant difference between the happy and the control group ($W = 6771.5, p = .58$). The same procedure was performed to detect if the creativity scores differed significantly between the brick task and the paperclip task. The results underline that there was no significant difference between the brick task and the paperclip task ($p > .05$) neither in the happy, the sad nor the control group ($p > .05$). Spearman rank correlations were constructed to analyze if there was a relationship between the creativity score and the mood score (after). The results indicate that there was a correlation with a value of $r_s = .10$. More specific, the correlation between the mood score (after) and creativity for the happy group was $r_s = -.01$, for the sad group $r_s = .11$ and the control group $r_s = .21$. The correlations between the creativity score and the single items of the mood score (e.g. lively, happy, jittery) had values varying between $r_s = .09$ (happy) and $r_s = -.19$ (grouchy) and can be seen in Table 1. Based on the collected data a linear regression model ($R^2 = .01, F(1, 344) = 3.8, p = .05$) was conducted that shows the relationship between the mood score (after) and creativity, indicating that higher mood leads to higher fluency (see Figure 3).

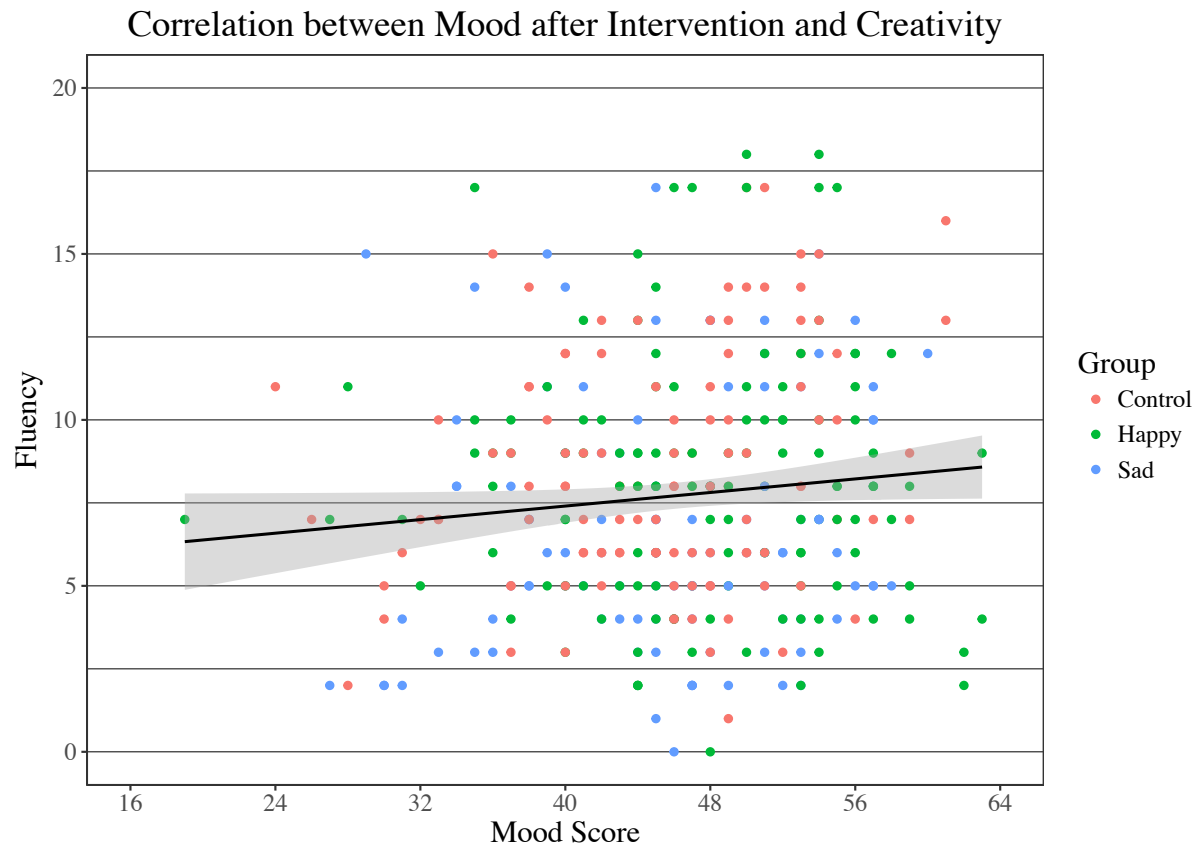


Figure 3. Correlation between actual mood score after intervention and creativity (fluency).

In addition, boxplots with gender effects can be seen Figure 4. The female control group had a mood value of 48. However, the females in the happy group had before the intervention a median of 47 and afterwards a median of 48. The interquartile range was 6 before the intervention and 8.5 afterwards. Females in the sad group had a median of 49 before and 45 after the intervention, with interquartile ranges from 7.5 (before) and 9 (after). The males in the control group had a mood score with a median of 48. The median for the male mood group (happy) was the same before and after the intervention ($Mdn = 48$). The interquartile range (happy) for the males was before 10 and after 12. In the sad group males had median mood scores of 48 (before) and of 47 (after). The interquartile range was 10 before intervention and 12 afterwards. However, the results of the Mann-Whitney-U-Test showed that the differences between females' and males' mood scores before and after the intervention (happy and sad group) are not significant ($p > .05$). The mean creativity score in the female group was 7.6 and the median was 7. In contrast the male group had a mean creativity score of 7.8 and a median of 10 (see Figure 5). The Mann-Whitney-U-Test showed that the creativity score did not differ significantly between the female and male group ($p > .05$).

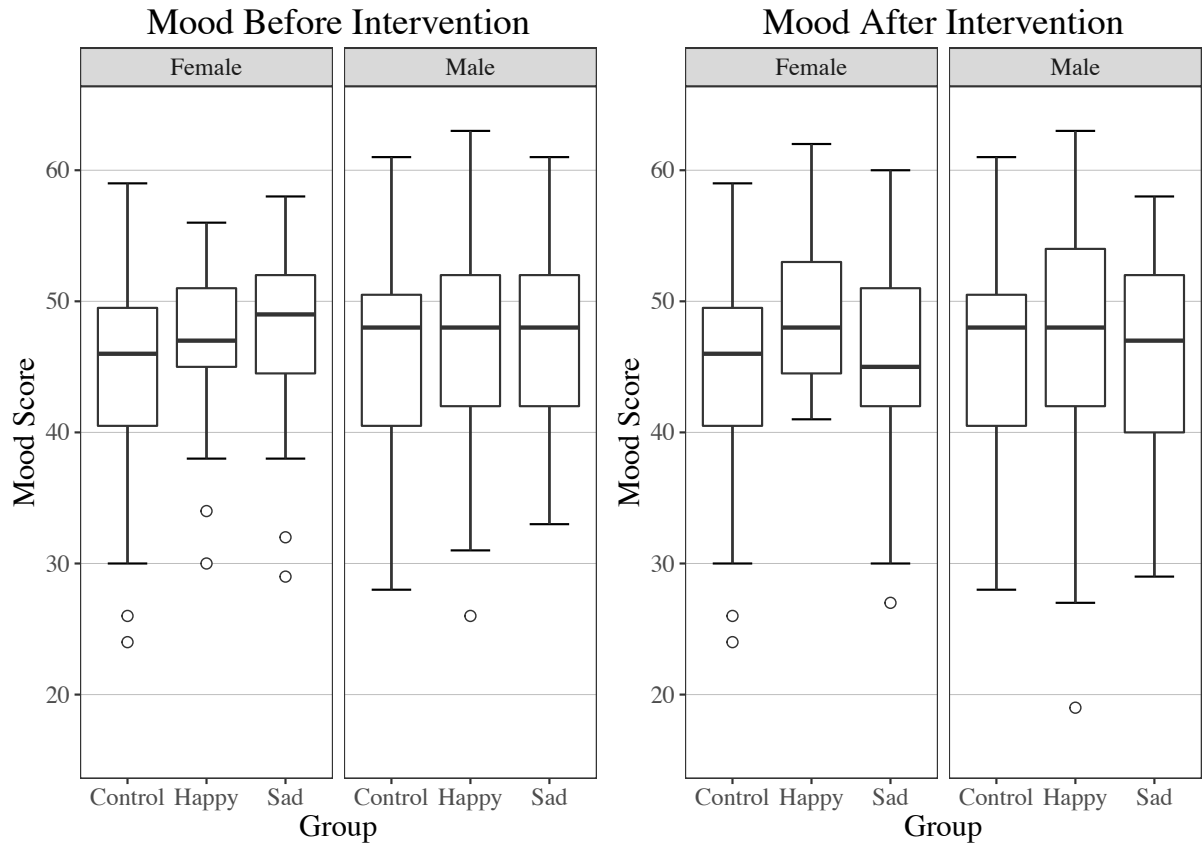


Figure 4. Mood score before and after intervention distinguished between sex.

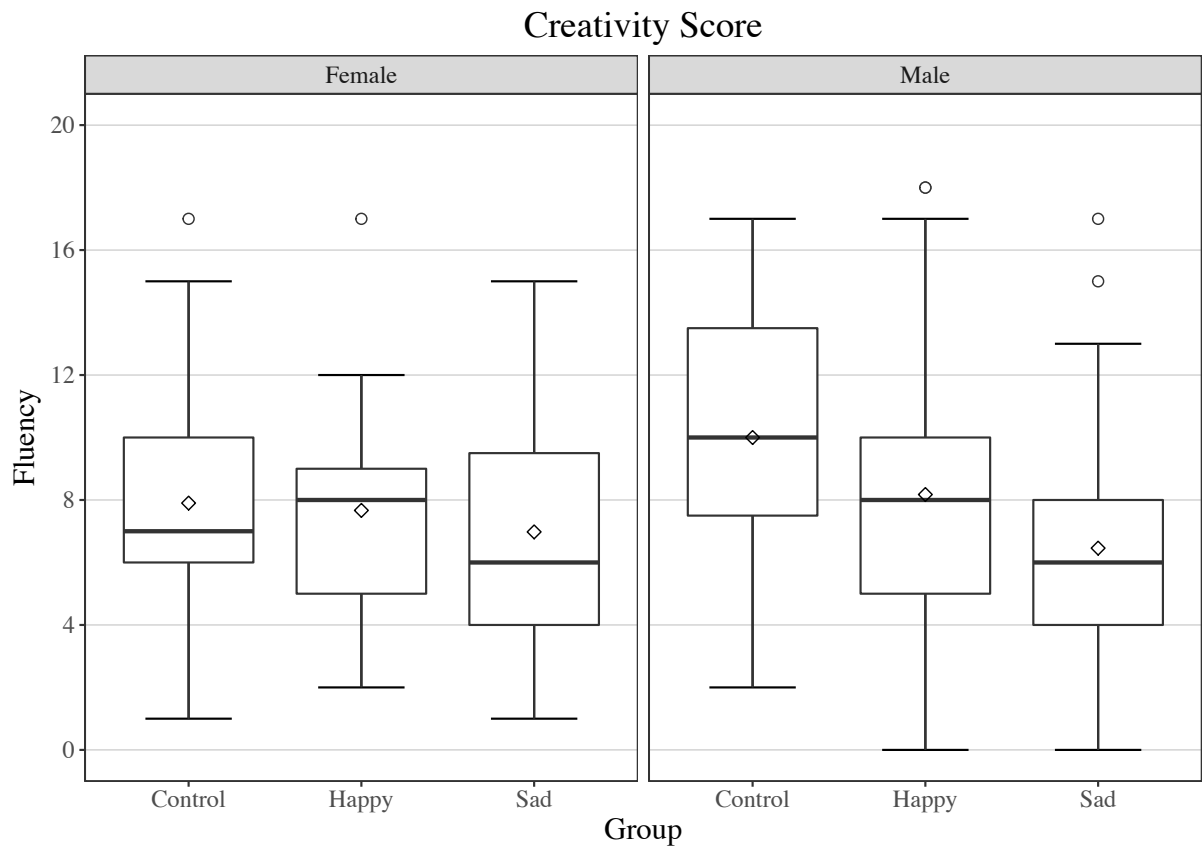


Figure 5. Creativity score distinguished between sex.

Discussion

The results show that the mood manipulation through facial expression (facial feedback and pictures) and corresponding music is successful. Before the intervention the sad group was in a better mood than the happy group and the control group. Based on the mood-congruency theory (see above) it was even more difficult to decrease their mood and make them feel sad. The range between minimum and maximum before the intervention does not differ much between the groups which underlines that there are hardly differences between them. The interquartile ranges of each group that represent 50% of the data, indicate that the participants within one group have similar mood scores. After the mood manipulation the happy group has slightly higher mood scores in comparison to the control and the sad group which underlines that there is an obvious difference between the groups. For the happy and the sad group the interquartile range values increase slightly, thus the mood of the participants changes and spreads more than before. When considering the median of the happy and the sad group before and after the intervention, it is obvious that the mood of the happy group increases and for the sad group decreases. Thus, there is evidence to confirm hypothesis 1 and hypothesis 2. Even if the results of the mood manipulation were significant, it was not the case for each participant. For a number of participants in the happy group the intervention with happy music and convergent facial expression led to a more unpleasant mood than before. The same results in the reversed way were valid for the sad group. One possible reason for this is that the mood-congruency theory (see above) was not considered in this study (Hunter et al., 2011). Instead of grouping participants by their actual mood, the assignment has been done in advance by the investigator to make sure that the sample size for each group is equal. Thus people who have been in a happy mood might be part of the sad group which hinders the recall of sad emotions. Furthermore, inter-individual differences in the personality could lead to diverse experiences of the situation. Some people might be more accessible for certain mood changes than others. Researchers found that neuroticism is associated with a higher emotional reactivity to negative mood changes, whereas extraversion leads to a higher emotional reactivity to positive mood changes (Larsen & Ketelaar, 1991). In addition, it was proposed that the same affective stimulus leads to different outcomes in individuals (Larsen & Ketelaar, 1991). Another study indicated that highly negative affected individuals are in general more likely to experience and access negative emotions, regardless of the situation (Watson et al., 1988). Consistently with personal attitudes, some people might have found the overall setting of the study not adequate to feel either strong positive or negative emotions. In some cases the investigator observed that participants found it funny to put the straw either

between the lips or the teeth, whereas others seemed to feel constrained. Moreover, the atmosphere of being together with several participants in a classroom or meeting room might have an impact on the accessibility of certain emotions. Even if the mood change was only slightly successful, it does not affect the purpose of the study because the preexisting mood (mood before) of the participants was measured as well.

Since there are no significant differences between the brick and the paperclip tasks, the overall creativity score seems to be an accurate estimate. It is obvious that the happy group and the control group have similar creativity scores that differ from the sad group. The sad group has in comparison to the others a smaller interquartile range which shows that there is a high level of agreement between the participants regarding their lower creativity score. The results of the statistical test underline that mood and creativity are somehow related to each other. Participants in a sad condition show lower creativity scores in comparison to the control or the happy group. However, there are no significant differences between the happy and the control group which highlights that the positive mood manipulation had no effect on the overall creativity score. This underlines that the environment might also influence creativity, indicating that a positive manipulation is not sufficient to change the mood of the participants, whereas a negative mood manipulation is sufficient. In contrast to the results of this study, another study by Ritter and Ferguson (2017) who induced the mood of the participants only with music, found a significant difference of the creativity score between the group listening to happy music ($M = 93.87$, $SD = 32.02$) and the control group without music ($M = 76.10$, $SD = 32.62$). Hence other reviewed studies did not have any control group, the direction between the creativity score and the control group remains unclear. Other studies within the area of organizational creativity found a link between creativity and motivation, indicating that intrinsic motivation enhances creativity (Auger & Woodman, 2016; Shalley, Zhou, & Oldham, 2004). It underlines that the overall creativity score in the present study might be influenced by the intrinsic motivation of the participants. Under consideration that the participants for the happy group and the control group were recruited mainly from one or two lectures and one company event, it is comprehensible that the results in these samples are more influenced by the intrinsic motivation of the participants within one lecture which might explain why the happy and the control group have similar creativity scores. On the other hand, the participation was voluntary. Summing up the reported results indicate that a relationship between mood and creativity can be assumed. This assumption is justified to the fact that the mood induction was successful and that the creativity score between the happy and sad group shows a

significant difference. The linear regression model gives evidence for a positive relationship between mood and creativity and indicates that higher mood scores are significantly related to higher fluency levels (divergent thinking task), independently from the mood manipulation. The linear model was chosen to identify the direction of the relationship between mood and creativity and had not the purpose to predict certain values. Thus there is evidence to support hypothesis 3 and hypothesis 4.

The results are confirmed by other studies, which have shown that positive mood fosters creative problem solving (Chermahini & Hommel, 2012; J. I. Davis et al., 2009; De Dreu et al., 2008; Ritter & Ferguson, 2017; Yamada & Nagai, 2015). The link between creativity and mood can be explained with the *dual pathway model* by De Dreu et al. (2008). Based on the dual pathway model, mood states influence the individuals cognitive flexibility and persistence (De Dreu et al., 2008). Cognitive flexibility and persistence are important abilities that lead to novel and creative ideas (De Dreu et al., 2008). Thus when enhancing either the cognitive flexibility or the cognitive perseverance, creative fluency can be fostered (De Dreu et al., 2008). Furthermore, the model suggests considering the positive or negative valence (hedonic tone) and the activation or deactivation of each manipulated mood state. According to the broaden-and-build theory (Fredrickson, 2001) positive affective states encourage novelty because individuals feel safe and motivated to explore new pathways. Negative affective states underline that the current situation is dangerous, so that several actions are activated to reduce the threat or the problem (Ambady & Gray, 2002; De Dreu et al., 2008; Lench, 2018). Thus it can be assumed that a cognitive persistence and a more analytic and systematic approach is required (De Dreu et al., 2008). In comparison to deactivating moods, activating moods are more likely to boost creativity because they increase attention, information processing, working memory capacity and promote the production of dopamine and noradrenalin (De Dreu et al., 2008). It follows that activation moods which have a positive tone (happy, elated) or a negative tone (angry, fearful) can foster cognitive flexibility or cognitive persistence and consequently creativity (De Dreu et al., 2008). Based on this approach the results of the current study can be explained, indicating that happiness (positive tone and activation) increases creativity through an enhanced cognitive flexibility, whereas sadness (negative tone and deactivation) inhibits creativity through a reduced cognitive persistence. Even if the results of the significant tests are promising, it should be considered that the relationship between mood and creativity in this study is very weak ($r_s = .10$). In contrast to these results, another study found strong evidence that happy music facilitated divergent thinking (Ritter & Ferguson, 2017).

However, the study did not report any effects of sad, calm or anxious music (Ritter & Ferguson, 2017). It was also noticeable that certain mood facets as sad, gloomy, jittery and grouchy had a higher correlation with the overall creativity score than all the other facets. That underlines that in particular negative emotions have an influence on creativity.

As proposed, no gender effects are visible, indicating that hypothesis 5 can be confirmed. Even if the female groups and the male groups slightly differ from each other regarding the mood score before and after, as well as the creativity value, these differences are not significant. Thus there is evidence that creativity as proposed is independent from the gender. These results can be confirmed by another study which also found that gender had no effects (De Dreu et al., 2008).

Limitations

The present study was limited through its design which was not able to control any variables in the environment, decreasing the internal validity. The overall setting of the study and the unknown situation of being a participant in an experimental study, might have influenced the overall result of each mood score. Other researchers found that peoples' current affective states are linked to the location and that for example social places e.g. restaurants, bars are more often associated with positive emotions than being at home or at work (Sandstrom, Lathia, Mascolo, & Rentfrow, 2017). Based on the reviewed research the investigator carefully selected the mood induction methods and assumed that a combination would have a greater impact on the mood score. But no pre-tests were done to identify whether the combined mood induction is successful or not. Furthermore, it remains unclear if just one method would be enough to obtain the observed effects. Another aspect that could have an influence on the overall results is the fact that the pictures of facial expressions for the happy group were provided in color, whereas the materials for the sad group were black and white. However, there is evidence that bright colors as yellow, green and blue are associated with happy songs and gray with sad songs (Barbieri, Vidal, & Zellner, 2007) which would match to the aspired mood manipulation. It would also have been beneficial to have tested in advance which items for the divergent thinking task are best suitable for the sample. Even if the used items (brick and paperclip) were defined and visually shown, participants might rarely use the brick or the paperclip and thus have problems to find innovative uses for them that differ from the common use. Especially the function of a brick might be unclear, as it is rarely used by

students and employees, so it would have been better to use another object such as a pencil, a car or a shoe as seen by Gilhooly et al. (2007) even if most of the reviewed studies use the brick (e.g. Gilhooly et al., 2007; Nusbaum & Silvia, 2011).

As mentioned above in the mood-congruency theory, it would be more promising to group participants by their current mood. To reduce the likelihood of a pre-existing positive or negative mood, it would be constructive to have an additional neutral mood manipulation group. As seen in several studies, having a baseline would alleviate the comparison between the groups because the differences between the neutral group and the sad or happy group might be greater in comparison to the control group (Barger & Pitt Derryberry, 2013; Forgeard, 2011; Fredrickson, 2001; Yamada & Nagai, 2015). However, the implementation of a neutral group is challenging, since it is unclear how to define neutral music. Instead a meaningless text could be read out. Even if the fluency score seems to be a reliable estimate, more information can be gained when additionally measuring originality and flexibility. Furthermore, the present study does not examine if the UUT and BMIS might influence each other which of course would have consequences for the reliability and validity of the used method. Another limitation is that the participants came from different countries. Therefore some participants had to answer not in their native language. Thus they might have needed more time to translate and had more difficulties to find the right answer in English or German. In addition, it could be possible that creativity is somehow related to the culture. Past research showed that participants from the United States perform better in creativity tasks in comparison to Chinese (Wong & Niu, 2013). A recent study by Storme et al. (2017) compared the results of monocultural and multicultural samples of Chinese and French children and highlighted that the cultural background has an impact on the creative performance of the participants.

Given that the music was chosen by the investigator, it is unclear if each participant associated the happy/sad song with the congruent emotions. It would be more beneficial to let the participants choose their own happy or sad song to make sure that the song puts the participants in the intended mood. However, the results of the current study underline that the mood manipulation was successful, even if the music was chosen by the investigator. Another limitation of the study could be that no randomized design was used, as the aim was to maintain the natural environment of the participants. Indicating that the current study has differences between the treatment groups that might have an impact on the mood and creativity score

which decreases the internal validity. In contrast, the sample size of each group is large, so that these effects might just have a little influence on the overall results of the study. Another approach to avoid individual differences could be to use a repeated measure design, however, this design would be very time consuming even if it would require fewer participants. Furthermore, it is expected that it would contain order and learning effects that might falsify the results of the UUT. At last it should be mentioned that the general choice of a 95% confidence interval which is common practice, limits the results of the study as a 99% confidence interval would reduce the probability of a type one error.

Despite the limitations, this study is one of the few investigations that included employees and students in the design which enables to generalize the results to different environments such as universities and work places. In addition, the sample size of the study is with 346 participants very large in comparison to other studies that also investigated the relationship between mood and creativity (e.g. Forgeard, 2011; Ritter & Ferguson, 2017; Yamada & Nagai, 2015). The sample size and the setting which was the daily environment of the individual highlights that the present study has a high external validity.

Future Studies and Implications

Future studies could use the collected data for a more in-depth analysis of the evaluation of the divergent thinking task. An approach by Silvia et al. (2008) suggests a new scoring method, in which the participants circle two responses that they think are the most creative of the ones they made. Raters evaluate these responses on a 5-point scale from 1= “not at all creative” to 5= “highly creative” based on the criteria “uncommon”, “remote” and “clever”. This scoring method seems to be a promising, but time-consuming evaluation that could be further studied. In general, there are many ways to induce the mood of the participants, however, several studies suggest to use small video clips because they have a stronger impact on mood than other methods (Hewig et al., 2005; Likowski et al., 2011). A study by Eldar et al. (2007) found that emotional stimuli which are related to a realistic scene as shown in film clips, activated the amygdala in a stronger way than an emotional stimuli which does not belong to any content related and meaningful situation (Eldar et al., 2007). Thus it might be beneficial to combine video clips with facial feedback, although the combination is not well explored. New studies could also use additional physical parameters like the heart rate, the skin temperature or the pupil diameters to measure the mood (Desmet, 2015). In addition, it might be useful to

measure the attention of participants as it seems to play an important role when considering the relationship between mood and creativity (see dual pathway model). Another new approach could be to change the environment with virtual reality with the goal to induce certain pleasant or unpleasant emotions. In general, a controlled setting is needed to minimize the probability of confounding variables. One-to-one sessions in a laboratory are very time-consuming and would reduce the ecological validity, but the results might show stronger evidence for the relationship of mood and creativity than a field study. Besides it would be beneficial to conduct a longitudinal study to identify whether the relationship between mood and divergent thinking is stable over time. Otherwise it would be difficult to make the general conclusion that a pleasant mood fosters creativity. Since there are only a few longitudinal studies available in the research field of creativity and affect, it is particularly interesting to consider the results of a study by Amabile et al. (2005). The results of the study confirmed that there is a positive relationship between affect and organizational creativity over a longer duration time of 9 to 38 weeks. A review study by Davis M.A. (2009) indicated that the relationship between affect and creativity is curvilinear. Meaning that both an intensely negative and positive mood have an impact on creativity. In contrast to this approach, Amabile et al. (2005) showed evidence for a direction of a linear relationship between mood and creativity which fits to the results of the current study. Since the participants in the current study only had very similar mood scores, extreme mood conditions are not represented. Therefore it could be necessary in future studies to include participants such as people with depression which experience emotions more strongly.

The current study shows evidence that negative facets of mood have a stronger impact on creativity than positive facets. As a practical implication, the study underlines that a negative atmosphere in an organization or university should be prevented. Conform with these results, another study indicated that especially the atmosphere in an organization has a strong impact on the development of new ideas (Yeh-Yun Lin & Liu, 2012). Because employees have a higher work motivation and thus perform better on a task that requires creativity (Yeh-Yun Lin & Liu, 2012). Organizations and universities that have the goal to promote creativity should try to foster a supportive atmosphere, in which employees have the possibility to take part in decision making, learning to trust each other and get the support they need (Ohly, 2018). Even if there is some evidence that negative facets have a stronger impact on creativity future studies should analyze specific mood facets and their relationship with creativity more in-depths. Future studies could use a similar experimental design as the present study, but

should involve only employees as creativity seems to be an important component for organizational growth and development which needs to be further studied (Mynbayeva et al., 2016). For this purpose the creativity or divergent thinking task needs to be adjusted. Instead of using the UUT, participants should be encouraged to create new products or manually build something with the provided materials. Furthermore, the mood induction should be adapted to an organizational setting, indicating that video sequences or music could be more appropriate than facial feedback. The results of the study could give practical implications and might show that it is beneficial to implement “creativity breaks”, in which the employees foster their mood by listening to music or by watching funny video sequences.

Conclusion

The results of the study underline that the mood was successfully manipulated and that overall the participants in the happy group increased their mood, whereas participants in the sad group decreased their mood. The study implies that emotions can be evoked by the simultaneous presentation of pictures of facial expressions with the activation of facial muscles and a corresponding music stimulus. Thus the mood induction with vocal music and facial feedback are unexplored fields, this study provides the first evidence for the combination of the three methods. In addition, it encourages researchers to develop new methods and to consider facial feedback and vocal music as potential factors to induce the mood of participants, especially because the methods are easily applicable, inexpensive and efficient. Furthermore, the study shows that creative performance is mood sensitive which highlights that there is a positive relationship between mood and divergent thinking.

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Table

Table 1
Correlation (r_s) between Facets of Mood and Creativity Score

Facets of Mood	Creativity Score
Lively	.03
Happy	.09
Sad	-.16
Tired	.01
Caring	-.04
Content	.03
Gloomy	-.17
Jittery	-.16
Drowsy	-.03
Grouchy	-.19
Peppy	.01
Nervous	-.08
Calm	-.05
Loving	-.05
Fed Up	-.09
Active	.05

Figures

Mood Difference with Happy Intervention

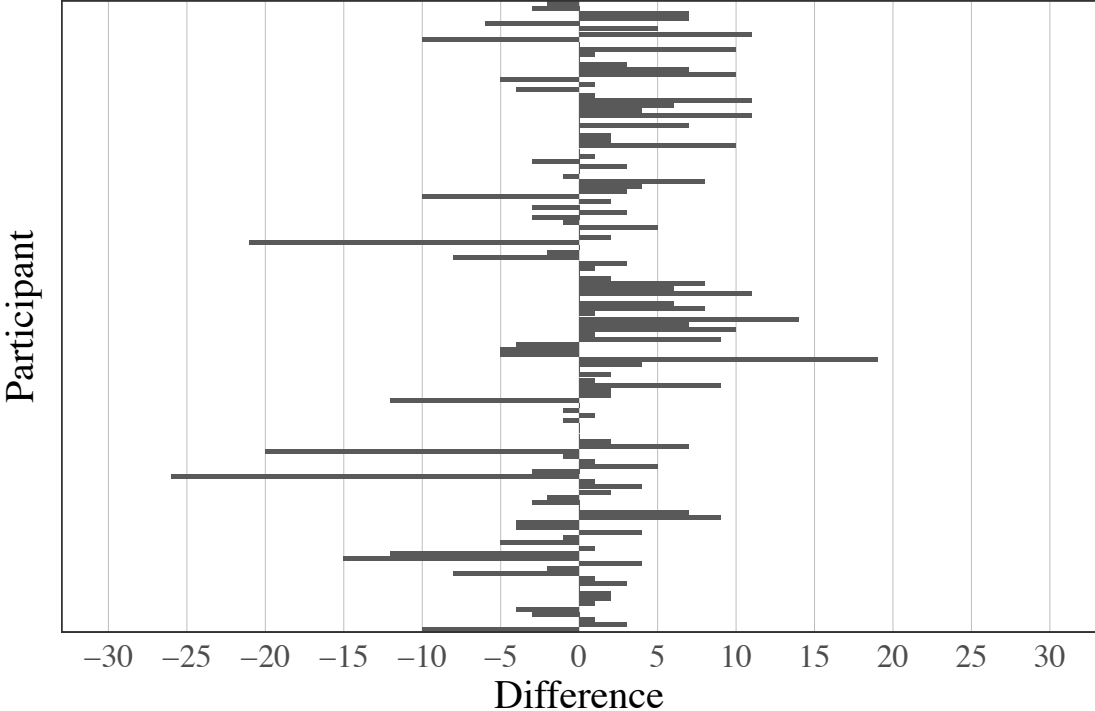


Figure 6. Differences of mood before and after happy intervention for each participant.

Mood Difference with Sad Intervention

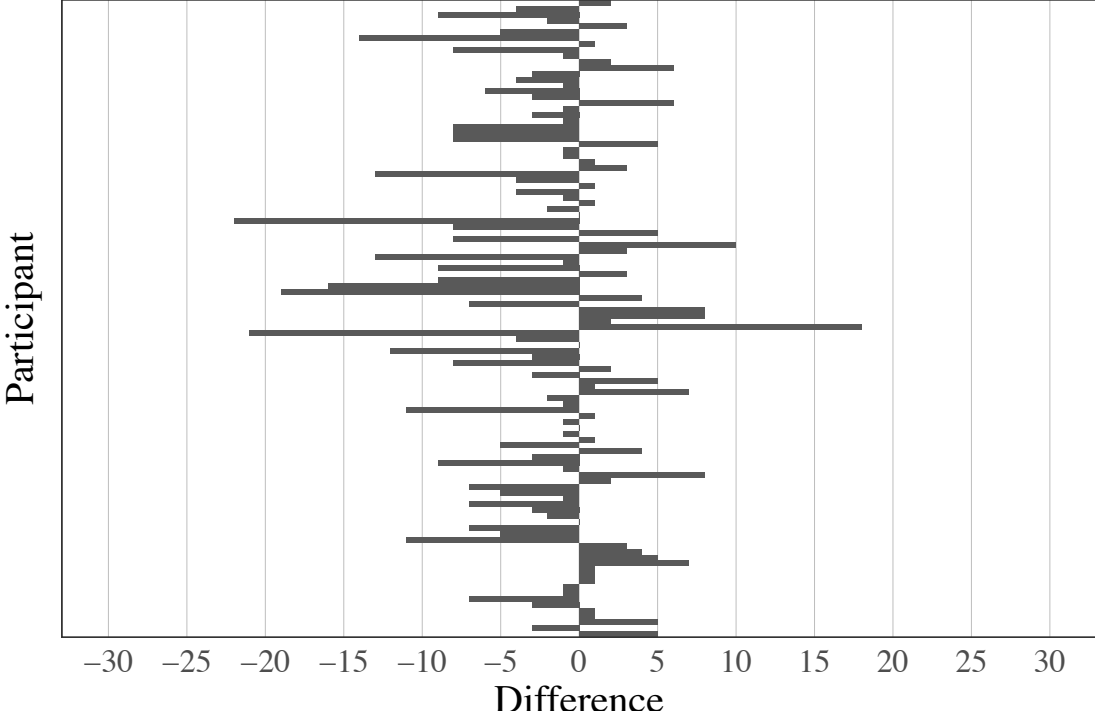


Figure 7. Differences of mood before and after sad intervention for each participant.

Appendix

Facial Feedback

Facial Feedback exercise for the Sad Group



Facial Feedback exercise for the Happy Group



Survey in English and German with Mood Scale and Divergent Thinking Task

Deutsche Version H

1



Liebe Teilnehmerin, lieber Teilnehmer,
herzlichen Dank für Ihr Interesse an meiner Masterarbeit an der Lund University in Schweden. Die Studie dauert insgesamt weniger als 15 Minuten. Es gibt keine richtigen oder falschen Antworten und Ihre Daten werden sehr vertrauensvoll behandelt und sind anonym.
Bei Fragen zu meiner Masterarbeit können Sie mir gerne eine E-Mail schicken:
al2732ha-s@student.lu.se.

Es ist sehr wichtig, dass Sie die Fragen in der richtigen Reihenfolge beantworten und nicht umblättern, bevor Sie darum gebeten werden. Deshalb ist es notwendig alles genau **zu lesen und dem Versuchsleiter zuzuhören**.

Bitte starten Sie damit, die Fragen auf dieser Seite zu beantworten. **Warten** Sie dann auf weitere Anweisungen des Versuchsleiters.

Geschlecht: ____

Alter: ____

Firma/ Universität: _____

Abteilung/ Studiengang: _____

Kreisen Sie die Antwort auf der darunter liegenden Skala ein, die angibt, wie gut jedes Adjektiv Ihre aktuelle Stimmung beschreibt. **Wie fühlen Sie sich gerade?**

1= Fühle definitiv nicht so!

2= Fühle nicht so!

3= Fühle ein bisschen so!

4= Fühle definitiv so!

Lebhaft	1	2	3	4	Schläfrig	1	2	3	4
Glücklich	1	2	3	4	Motzig	1	2	3	4
Traurig	1	2	3	4	Energiegeladen	1	2	3	4
Müde	1	2	3	4	Nervös	1	2	3	4
Mitfühlend	1	2	3	4	Ruhig	1	2	3	4
Zufrieden	1	2	3	4	Liebevoll	1	2	3	4
Bedrückt	1	2	3	4	Genervt	1	2	3	4
Ängstlich	1	2	3	4	Tatkräftig	1	2	3	4

Bitte warten Sie auf weitere Anweisungen bevor Sie auf die nächste Seite wechseln!

Deutsche Version H

2



Kreisen Sie die Antwort auf der darunter liegenden Skala ein, die angibt, wie gut jedes Adjektiv Ihre aktuelle Stimmung beschreibt. **Wie fühlen Sie sich gerade?**

1 = Fühle definitiv nicht so!

2 = Fühle nicht so!

3 = Fühle ein bisschen so!

4 = Fühle definitiv so!

Lebhaft	1	2	3	4	Schläfrig	1	2	3	4
Glücklich	1	2	3	4	Motzig	1	2	3	4
Traurig	1	2	3	4	Energiegeladen	1	2	3	4
Müde	1	2	3	4	Nervös	1	2	3	4
Mitfühlend	1	2	3	4	Ruhig	1	2	3	4
Zufrieden	1	2	3	4	Liebevoll	1	2	3	4
Bedrückt	1	2	3	4	Genervt	1	2	3	4
Ängstlich	1	2	3	4	Tatkräftig	1	2	3	4

Bitte lesen Sie den folgenden Text:

Sie werden aufgefordert, möglichst viele neue Verwendungen für einen gebräuchlichen Gegenstand zu finden, die sich von der normalen Verwendung unterscheiden. Zum Beispiel verwendet man eine Zeitung zum Lesen, aber Sie könnte auch zum Fliegen klatschen, zum Auskleiden von Schubladen, zur Herstellung eines Papierhutes usw. genutzt werden.

Sie haben drei Minuten Zeit pro Objekt. Der reguläre Verwendungszweck der Gegenstände ist angegeben. Aber bitte versuchen Sie, mögliche Verwendungszwecke anzugeben, die sich von der normalen Verwendungen unterscheiden und die sich auch voneinander unterscheiden.

Haben Sie noch weitere Fragen?

Ich werde Ihnen Bescheid geben, wenn Sie zur nächsten Frage wechseln müssen. Sie haben insgesamt **drei Minuten** Zeit für jeden Gegenstand!

Bitte warten Sie auf weitere Anweisungen, bevor Sie auf die nächste Seite wechseln!

Deutsche Version H

3



Auf welche Art und Weise können Sie einen Ziegelstein noch nutzen?

Ein Ziegelstein ist ein künstlich hergestellter Stein, welcher zum Mauerwerksbau genutzt wird.

Auf welche Art und Weise können Sie einen Büroklammer noch nutzen?

Eine Büroklammer wird verwendet, um mehrere Blätter wiederlösbar aneinander zu befestigen.

English Version H

1



Dear participant,
 thank you for your interest in my master thesis at Lund University in Sweden. This study takes less than 15 minutes in total. There are no right or wrong answers. Your data will be kept strictly confidential and anonymous.
 For further questions you are more than welcome to write me an e-mail at al2732ha-s@student.lu.se.

It is important, that you answer the questions in the right order and don't turn over to the next page. Therefore it is necessary to **read and listen carefully to the investigator**.

Please start with answering the first questions and **wait** for further instructions of the investigator.

Sex: _____

Age: _____

Company/ University: _____

Department/ Study Course: _____

Circle the response on the scale below that indicates how well each adjective describes your present mood. **How do you feel right now?**

1 = Definitely do not feel

2 = Do not feel

3 = Slightly feel

4 = Definitely feel

Lively	1	2	3	4	Drowsy*	1	2	3	4
Happy	1	2	3	4	Grouchy*	1	2	3	4
Sad	1	2	3	4	Peppy*	1	2	3	4
Tired	1	2	3	4	Nervous	1	2	3	4
Caring	1	2	3	4	Calm	1	2	3	4
Content*	1	2	3	4	Loving	1	2	3	4
Gloomy*	1	2	3	4	Fed up	1	2	3	4
Jittery*	1	2	3	4	Active	1	2	3	4

*Synonyms

Content= satisfy, in a state of peaceful happiness

Gloomy= pessimistic

Jittery= anxious

Drowsy= sleepy; state right before sleep

Grouchy= grumpy, complaining

Peppy= full of energy to be productive

Please wait for the instruction to turn to the next page!

English Version H

2



Circle the response on the scale below that indicates how well each adjective describes your present mood. **How do you feel right now?**

1 = Definitely do not feel

2 = Do not feel

3 = Slightly feel

4 = Definitely feel

Lively	1	2	3	4	Drowsy*	1	2	3	4
Happy	1	2	3	4	Grouchy*	1	2	3	4
Sad	1	2	3	4	Peppy*	1	2	3	4
Tired	1	2	3	4	Nervous	1	2	3	4
Caring	1	2	3	4	Calm	1	2	3	4
Content*	1	2	3	4	Loving	1	2	3	4
Gloomy*	1	2	3	4	Fed up	1	2	3	4
Jittery*	1	2	3	4	Active	1	2	3	4

*Synonyms

Content= satisfy, in a state of peaceful happiness

Gloomy= pessimistic

Jittery= anxious

Drowsy= sleepy; state right before sleep

Grouchy= grumpy, complaining

Peppy= full of energy to be productive

Please read the following text:

You will be asked to produce as many different uses as you can think of, which are different from the normal use, for a number of common objects. For example, the common use for a newspaper is for reading, but it could also be used for swatting flies, to line drawers, to make a paper hat and so on. You will have three minutes on each object. Its common use will be stated but you are to try to produce possible uses which are different from the normal one and different in kind from each other. Any questions?

I will tell you when to stop on each item. You will have three minutes for each item.

Please wait for the instruction to turn to the next page!

English Version H

3



In which different ways can you use a brick?

A brick is a synthetic block typically made of fired or sun-dried clay, used in wall building.

In which different ways can you use a paper clip?

A paper clip is used to hold sheets of paper together, which can be separated easily.