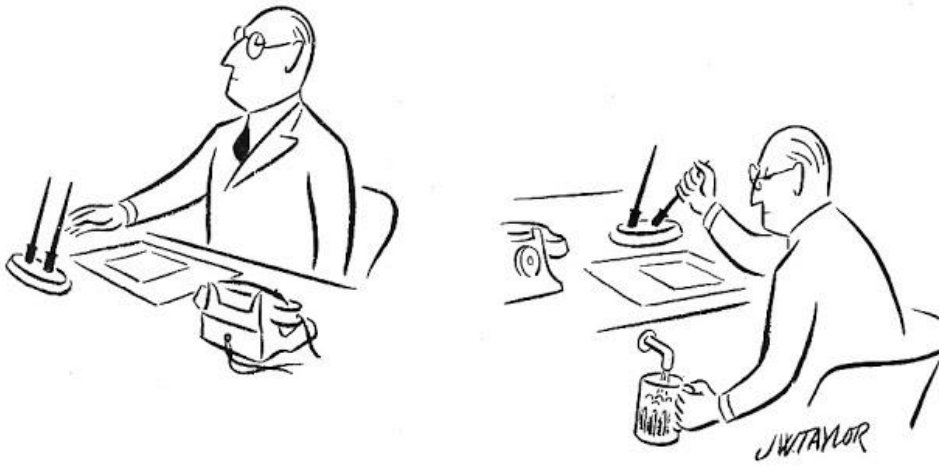
UNIVERSITY OF GOTHENBURG

DEPARTMENT OF APPLIED IT

DOES HUMOR WORK?

The influence of humor on cognitive executive function



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Abstract

Contrasting predictions have been made about the impact of positive affect and humor on cognitive processing. It has been argued that positive mood is likely to improve some cognitive processes, but there is also evidence that claims the opposite. To investigate the influence of humor on cognitive performance and executive functioning in particular, we designed an experiment with two independent groups. There were 26 participants in each group assigned to either of two conditions: exposure to humorous stimuli or mundane (control). In the humorous condition, subjects viewed a five-minute-long stand up comedy clip and they did the Stroop task thereafter. In the mundane condition they only did the stroop task. The dependent variable we measured was the time it took for each participant to complete the task. Overall, the humor group performed better than the control group. The results support the hypothesis that exposure to humorous stimuli would facilitate cognitive performance and executive functioning in particular. This suggests that humor is beneficial to cognitive executive functioning and may have some sort of priming effect on it.

Keywords

Humor, executive functioning, cognitive performance, Stroop color-word task, incongruity resolution, attentional resources

Titel

Fungerar humor? Humors inflytande på kognitiv exekutiv funktion

Sammanfattning

Kontrasterande förutsägelser har gjorts om positiv affekt och humors påverkan på kognitiv bearbetning. Det har hävdats att positivt humör sannolikt kommer att förbättra vissa kognitiva processer, men det finns också bevis som påstår det motsatta. För att undersöka humor och dess inflytande på kognitiv prestation och exekutiv funktion i synnerhet, utformade vi ett experiment med två oberoende grupper. Det var 26 deltagare i varje grupp som blev tilldelad någon av följande två tillstånd: exponering för humoristiska stimuli eller kontrollgrupp. I det humoristiska tillståndet såg deltagarna på ett fem minuters stand up klipp och därefter gjorde de Strooptestet. Kontrollgruppen gjorde bara Strooptestet. Den beroende variabeln som vi mätte var den tid det tog för varje deltagare att slutföra uppgiften. Sammantaget presterade humorgruppen bättre än kontrollgruppen. Resultatet stödjer hypotesen att exponering för humoristiska stimuli skulle underlätta kognitiv prestation och exekutiv funktion i synnerhet. Detta tyder på att humor är fördelaktigt för kognitiv exekutiv funktion och kan ha någon form av priming effekt.

Foreword

The current study is written at the University of Gothenburg at the Department of Applied information technology, during the spring term of 2018. Cecilia and Mariyana have taken equal responsibility and written most of the paper together. Work has been balanced, with Cecilia contributing more to the theories section and Mariyana more to the statistical analysis. It is unclear who saw a larger number of funny videos during the experiment design stage.

The authors would like to express their gratitude to all those who have participated in the experiment. A special thanks to our supervisor Alexander Almér for his indispensable guidance and support.

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1. Introduction

Humor is a complex phenomenon that can be studied from many different perspectives such as social, neurological, evolutionary and cognitive. In this study the focus will be on the cognitive perspective where the goal is to investigate the possibility that humor can have a positive effect on cognitive executive functioning in the form of inhibition of unwanted responses, strategy generation and attentional switching. Humor, as a positive affect, is a type of amusement demanding of cognitive resources, because it harnesses multiple cognitive capacities, including parallel processing of incongruent stimuli. Executive functioning, also called cognitive control, requires the same or similar capacities, because it is a mechanism for processing competing responses. A task commonly used to test these is the Stroop-color-word task and therefore we have chosen it as the assessment tool in the current research.

Previous research has shown conflicting results on the impact of positive affect and humor on cognitive processing. In a recent study by Phillips, Bull, Adams and Fraser (2002) they argued that happy mood impairs executive function as it results in slower cognitive performance (on stroop task/attentional switching). Other authors such as Oaksford, Morris, Grainger and Williams (1996) also claim that positive moods impair performance on executive function tests. Contrary to their results, Zinchenko, Obermeier, Kanske, Schröger and Kotz (2017) have demonstrated that positive emotion does not impede cognitive processing and in an earlier study by Isen, Daubman and Nowicki (1987), positive affect and humour in particular, has been found to improve creative problem solving. Additionally, it is argued by the author that since creative thought is demanding of cognitive resources and a boost in creativity stems from a boost in cognitive capacity.

1.1 Objective

The current experiment is intended to test whether exposure to humorous stimuli would facilitate cognitive performance and executive functioning in particular.

1.2 Research question

The mixed evidence from previous studies makes it unclear what effect humor (as a type of positive affect) would have and that is why it is relevant to study humor and its influence. Therefore we ask the following question: Does humor promote cognitive executive function?

1.3 Hypothesis

Based on earlier research and theories we hypothesise that exposure to humorous stimuli would promote cognitive executive functioning and in particular performance on the Stroop-color-word task.

1.4 Limitations of the study

It has been shown that positive affect and humor boost creative thinking (Isen, et al. 1987), which leads to the speculation that it also promotes cognitive capacity. In a study by Oaksford et al. (1996), it has been found that positive mood states impair some aspects of cognition, which results in poor performance on tasks involving memory, deductive reasoning and planning. We have chosen to focus on the influence of humor on executive functioning, since we have not found unanimous research on that particular relation. Limited time and experimental resources have also played a role for this choice.

2. Theory

In order to be able to elaborate and explore the relation between humor and cognitive executive function we provide a background of relevant theories and define important concepts. Humor is a very complex phenomenon and there are a few theories defining it from different perspectives. It is difficult to say which one is most relevant for this study and each one seems to provide partial explanation for our results. For this reason we have given a short overview of the most influential theories. The section begins by defining humor and laughter and describing relevant theories. Thereafter, executive functioning and stroop test are described.

2.1 Humor

Humor can be defined in many different ways and from many different perspectives which makes it difficult to find a sufficiently comprehensive definition. Although the definitions of humor vary, there is widespread agreement among scholars that humor involves the communication of multiple, incongruous meanings that are amusing in some manner (Banas, Dunbar, Rodriguez, & Liu, 2011; Martin, 2007).

An attempt to define humour from a cognitive perspective is suggested by the "Incongruity Resolution theory" (Suls, 1972), which describes humor processing as a two-stage model. In the first stage - detection of incongruity - a feeling of surprise is generated by an unexpected event or situation. In the second stage - resolution of the incongruity - one needs to overcome the feeling of surprise in order to be able to rearrange the information and anew formulate an internal coherent interpretation. As described by Bartolo, Benuzzi, Nocetti, Baraldi, and Nichelli (2006), the perceiver of the humor "embarks on a sort of problem-solving exercise" (p. 1789).

2.2 Laughter

Laughter is a universal human behavior found in all cultures and virtually all individuals all over the world (Gervais and Wilson, 2005). When it comes to humor, laughter is the most obvious behavioral expression. It has also been shown that laughter contains distinctive behavioral patterns that also have psychophysiological correlations. According to Ruch and Ekman (2001), laughter can be defined as an expressive communication signal and according to Weisfeld (1993) laughter that is caused by humor is associated with a pleasant emotional state connected with cheerfulness and exhilaration. From an evolutionary standpoint, laughter is also considered a mechanism for communicating that a threat is benign.

2.3 Theories of humor

As we go back into history, we can see that in the days of Aristotle, philosophers and other scholars have tried to understand the origin, functions and meaning of humor (Veatch, 1998). Many theories have been proposed to explain why we laugh and what makes us laugh, but there are three basic theories of humor that are often found in literature, which are superiority theory, incongruity theory and relief theory (Meyer, 2000). These theories are presented below.

2.3.1 Superiority theory

Superiority theory is historically one of the first attempts to explain humor and laughter and is found in both Plato, Aristotle and Hobbes works. The theory proposes that we laugh about the misfortunes of others because it reflects our own superiority (Cundall, 2007). Using humor to make fun of others is an example of superiority theory (Banas et al., 2011). This theory believes that humor primarily has an emotional function and that it helps the humorist to build confidence and self-esteem. (Buijzen & Valkenburg, 2004). Hobbes, a well-known advocate of the theory, meant that we humans constantly compete with each other and look for flaws in others, and laughing is an expression of a sudden insight that we are better than others, an expression of 'sudden glory' (McCreaddie & Wiggins, 2008).

2.3.2 Incongruity theory

Incongruity theory is considered to be the most accepted and influential theory of humor and laughter and Immanuel Kant was one of its most famous advocates. The theory states that people laugh at what surprises them, is unexpected or odd in a non-threatening way. In other words, it is the perception of something incongruous, something that violates our mental patterns and expectations, and in this way causes the humorous response. Surprise is a key element in the incongruity theory. When we hear a joke, it is the element of surprise (unexpected punchline) that triggers laughter (Meyer, 2000). This theory emphasizes cognition and it acknowledges that cognitive resources are necessary to note, understand and categorize incongruous changes and this way allow the perceiver to experience humor (Meyer, 2000).

2.3.3 Relief theory

The Relief theory posits that humor and laughter are a combination of a cognitive appraisal with optimal physiological arousal (Banas et al., 2011). The theory focuses on the physiological and proposes that people laugh because they need to reduce physiological tension from time to time. The theory assumes that laughter and mirth result from a release of nervous energy (Meyer, 2000). Spencer and Freud are known advocates of this theory (Cundall, 2007). In the light of evolution it is speculated that laughter communicates the absence of danger and brings relief. It is a false alarm signal to akin members (Ramachandran, 1998).

2.3.4 Broaden-and-build theory

Another theory that is relevant to mention is the Broaden-and-Build Theory presented by Fredrickson in 1998. The theory hypothesizes that "positive emotions broaden the scopes of

attention, cognition, and action, widening the array of percepts, thoughts, and actions presently in mind" (Fredrickson & Branigan, 2005, p. 315). This in turn has the effect of building the individual's physical, intellectual, and social resources. The purpose of the new model was to describe the shape and functions of positive emotions, such as joy, interest, satisfaction and love. Fredrickson (1998) proposes that joy specifically promotes the urge to play and be playful in the broadest sense of the world. This encompasses not only physical and social play, but also intellectual and artistic play, thus building resources and promoting social cohesion, cooperation and even altruism.

2.4 Executive functioning

The current experiment investigates the effect of humorous stimuli on executive functioning. Even though a robust definition of the term executive functioning is still under discussion, there is consensus that it consists of a number of cognitive abilities (functions), such as inhibition of unwanted responses, strategy generation and attentional switching (Phillips et al., 2002).

2.5 Stroop Test

A test that has been widely administered for assessing cognitive control, in particular inhibition of prepotent responses (Salthouse, 2005) is the Stroop test. In the classic Stroop task, the names of colors are printed in incompatible ink color. The mismatch between the color of the word and the meaning of the word interferes with the processing speed. What is more, it requires additional cognitive effort, because in order to suppress the currently irrelevant response, some type of inhibition is in demand. Naming the color correctly requires the subject to switch attention between the two different ways stimuli is presented and change her strategy to offer new ways of solving the task. The Stroop effect (also known as Stroop interference) shows that processing of incongruent stimuli results in longer response times and higher propensity to error (MacLeod, 2015).

3. Earlier research

Humor is a complex phenomenon that can be studied from many different perspectives such as social, neurological, evolutionary and cognitive. Previous research has shown conflicting results on the impact of positive affect and on humor cognitive processing, which will be presented in the following section.

Isen et al. (1987) conducted four experiments where it was found that positive affect, induced by seeing a few minutes of a comedy movie or by receiving a small bag of candy, improved performance on two tasks. In the first two studies they used the candle task which is a cognitive performance test created by Karl Duncker 1945. The task measuring the influence of functional fixedness on a participant's problem solving capabilities and in the task the subjects is presented with a box of tacks, a candle, and a book of matches. They are supposed to attach the candle to the wall in a way that it will burn without dripping wax onto the table below. The task in studies three and four were based on the Remote Associates test, which is a creativity test used to determine a human's creative potential. The subjects need to think of a word that is related to each of three other words presented. According to the results, the authors conclude that positive affect and humor in particular has been found to improve creative problem solving and also that a boost in creativity stems from a boost in cognitive capacity, since creative thought is demanding of cognitive capacity. Therefore, Isen et al. (1987) consider it unwise to think of positive effects such as reducing cognitive capacity or that it would lead to lazy and ineffective problem solving.

Ashby, Isen, and Turken (1999) argue that positive mood systematically influence performance on many cognitive task and that it leads to greater cognitive flexibility and facilitates creative problem solving. Ashby et al. (1999) proposed a neuropsychological theory of the influence of positive affect on cognition and they argued that positive mood results in increased dopamine levels in the brain, which then results in better cognitive performance on some tasks. Since moderate levels of positive impact can improve work memory and cognitive set, it is suggested that positive mood can improve performance on at least some executive function tests. They also point out that in humans, the presence of dopamine in the brain is correlated with cognitive flexibility. In a study by Davidson, Ekman, Saron, Snukis and Friesen (1990), it was found that happy mood states increase activity in the frontal lobe. In two EEG experiments Zinchenko et al. (2017) investigated the role of positive audiovisual target stimuli in cognitive and emotional conflict processing and they demonstrated that positive emotion does not impede cognitive processing.

In contrast, other authors like Oaksford et al. (1996), argue that positive mood particularly impairs performance on executive function tests. When they investigated the effects of positive impact, using the Tower of London task, a classic test of executive function, they found that positive mood impaired performance on the task. They argued that impairment of executive

control processes underlies the deleterious effects of positive mood on deontic reasoning. Neuropsychological evidence has also shown that increased demands on emotional control may reduce capacity for control of cognitive processes (Bush, Luu & Posner, 2000). This is the reason why some authors have predicted that happy mood states will improve cognitive control processes, whereas other authors have predicted impairment (Phillips, Bull, Adams and Fraser, 2002). A study by Phillips et al. (2002) examined the effect of positive mood states on the Stroop task, as well as the effects of positive mood on a range of different verbal fluency tasks. Both these task are frequently used to assess executive function. Based on the results of the experiment, the authors concluded that positive mood impaired performance on a switching condition of the Stroop test, but improved performance on a creative uses test of fluency.

The comprehension and appreciation of humor requires harnessing a number of cognitive functions, including language processing, memory and attention, emotional evaluation. In an fMRI study, Bartolo et al. (2006) found out that the feeling of amusement accompanied by resolving the incongruent part of the humorous stimuli invoked activation in the brain circuits responsible for attribution of attention. Executive functioning, on the other hand, is considered to be an interplay of multiple processes, where attentional switching, inhibition of unwanted responses and strategy reformulation are the main ones. All of these seem to play a significant role in humor appreciation as well attentional resources, the ability to switch between the incongruent meanings and inhibit one of them, as well as reformulation of the storyline, after resolving the incongruity. Therefore, it seems that the mechanisms underlying humor appreciation and executive functioning overlap each other.

A recent study by Uekermann, Channon and Daum (2006) investigated the link between cognitive and humor processing with respect to normal aging. Participants of ages 20 to 78 were assigned to three different groups: young, middle-aged and older. They were asked to complete four tasks. The first one involved humor processing and was followed by three cognitive performance assessment tasks. In the humour task, the subjects were presented with an open ending verbal joke, where they had to select the correct punchline. The other three tasks were meant to assess executive functioning by evaluating the participants' capabilities for inhibition, set shifting and working memory. The results showed that older people did not perform as well on the executive function tasks and were impaired with respect of the cognitive component of humour processing. The findings imply that humour comprehension is dependent on cognitive capacity. If this correlation goes both ways, then exposure to humorous stimuli can act as some sort of primer for cognitive processing and should influence it in a positive manner.

4. Method

4.1 Participants

A convenience sample of 26 females and 26 males evenly distributed over two groups participated in the study. Participants were of ages between 18 and 55. Roughly half of them were students available on campus and the rest were experimenters' colleagues, who agreed to participate. The participants were offered coffee and chocolate as thanks for their participation.

4.2 Materials

The movie clip we showed was a part of a stand up comedy show by the Swedish comedian Johan Glans. The movie was played from youTube.com. Permission is assumed granted per "Standard Youtube License" of the video in question. A laptop computer and headphones were used to view the video clip. A smartphone app, presented to the participants as a game, was used for administering the stroop task: "Stroop Effect Challenge", see figure 1 and figure 2. It recorded the time it took for each participant to complete the task of correctly identifying the color of 30 words (names of colors) coming up on the screen. The words featured in the app were always incongruent with the color they had. The number of incorrectly identified colors was not counted, but each incorrect user input added to the completion time. Subjects had to choose the right color in order to be shown the next word. All stroop tasks were administered using the same smartphone. The smartphone was used in airplane mode to avoid any possible disturbance from calls or messages. At the end of the experiment a short questionnaire was filled out in order to keep track of the participants age, sex and occupation.

Figure 1. The stroop task: Stroop Effect Challenge

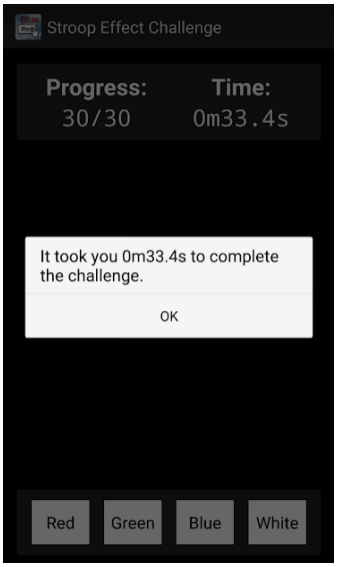

Figure 2. When the task was completed

4.3 Design

Two independent and equal in size groups were formed. Since participants' sex, occupation and age could be potentially relevant variables, these characteristics were matched across the conditions, in order to procure comparable groups. Subjects were then alternately assigned to either of the two conditions: exposure to humorous stimuli or mundane (control). The first one involved manipulation of affect (humorous state) by the means of a short video clip. In the humorous condition, subjects viewed a five-minute-long stand up comedy clip. Given that the participants were all swedes we intentionally played a clip were the artist performed in Swedish. The reason for this choice was to eliminate a possible language barrier, as well as possible cultural barrier, and to increase the immediateness of the humorous effect. The mundane condition was used as control group. There was no attempt to induce affect. Only the task was included. The purpose was to take advantage of the "mundane" feeling of the situation at the time being. To avoid possible practice effects, each participant took the Stroop test only once. The result we measured was the time that each participant took to complete the task. Any results from previous tests were cleared from the screen in order to eliminate goals or expectations influencing performance on the test.

4.4 Manipulation check

The participants in the condition with exposure to humorous stimuli had to answer an additional question, regarding their opinion on the video. At the end of the experiment, they had to rate the video's funniness on a scale from 1 to 6, where 1 was "Not funny at all" and 6 was "Very funny". The scale was deliberately chosen as to give the participants a feeling of reasonably flexible and intuitive rating, while in the same time allowed us to isolate those participants who did not think the video was funny. Only subjects' results, which rated the video's funnines as 4, 5 and 6 were considered.

4.5 Pilot study

A pilot study was performed with one participant in order to make sure that the instructions, task and questionnaire were clearly formulated and easy to understand. The pilot study also helped estimate if the length of the Stroop task was acceptable, so as to not overpower the humorous effect. Because of the transient nature of the affective state, and to minimise a potential feeling of frustration in the participants, the assessment task had to be of an appropriate time length.

4.6 Procedure

4.6.1 Humour group (Exposure to humorous stimuli group)

Subjects were seated in a calm room or secluded area in front of a laptop computer with headphones. They were instructed to watch the four minutes and 30 seconds long video clip that we chose and were informed that they did not need to memorise anything from the movie clip,

but only watch it for amusement. The experimenters left the room/area as to allow for undisturbed exposure to the affective humorous stimuli. When the clip was over, the experimenter came back in the room, handed the participants a phone and briefed them on how to play the game used to administer the Stroop task. The experimenter left the room/area again and came back when the participant had completed the task. Finally a short questionnaire, including rating the funniness of the video clip was completed.

4.6.2 Control (Mundane) group

Participants in the control group were also seated in a calm room or secluded area, but they only played the same game.They were briefed in the same way on how to play as the participants in the humour condition. As in the other group, the experimenter left the room/area again and came back when the participant had completed the task. Finally the short questionnaire was completed, but for this group it did not contain the funniness question.

4.7 Operationalizing

4.7.1 Humorous affect

Even though we cannot give a definition for the state of mind that humor induces, we had to make sure that the subjects in the humorous condition were amused. For this reason we used a scale to rate the funniness of the video. The scale was from 1 to 6 where 1 was “Not funny at all” and 6 was “Very funny”. Only the participants that rated the funniness 4 or higher were attributed to the humorous group.

4.7.2 Completion Time

To measure the performance on the Stroop task in the groups we recorded the length of time it took to complete the task.

4.8 Ethical considerations

All participants were informed about the character of the tasks and gave their consent prior to the experiment and knew that they could withdraw at any time. Our purpose was to induce positive affect if any at all, and this is why irony and sarcasm were deliberately avoided when choosing a funny video for this study, even though both are often present in humor. All information was gathered anonymously and the subjects were discouraged from sharing their test results with each other. Everyone was informed about the purpose of the research after the experiment and they were also informed that all information will only be used for research purposes.

5. Results

To examine the effect of exposure to humorous stimuli on cognitive executive function we measured the time it took each participant to complete the Stroop task. There were 26 in the humor condition and 26 participants in the mundane condition. An independent-samples t-test was run to determine if there were differences in the performance on the task between subjects in the humorous condition and the control group. Task completion times for each level were normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$), and there was homogeneity of variances, as assessed by Levene's test for equality of variances ($p = 0{,}185$). The task completion times were shorter in the humorous group (M= 38,73, SE= 6,84) than for the control group (M= 43,98, SE= 8,14), a statistically significant mean difference of 5,26 (95% CI, 1,07 to 9,44), $t(50) = 2{,}51$, $p = 0{,}015$, $d = 0{,}70$.

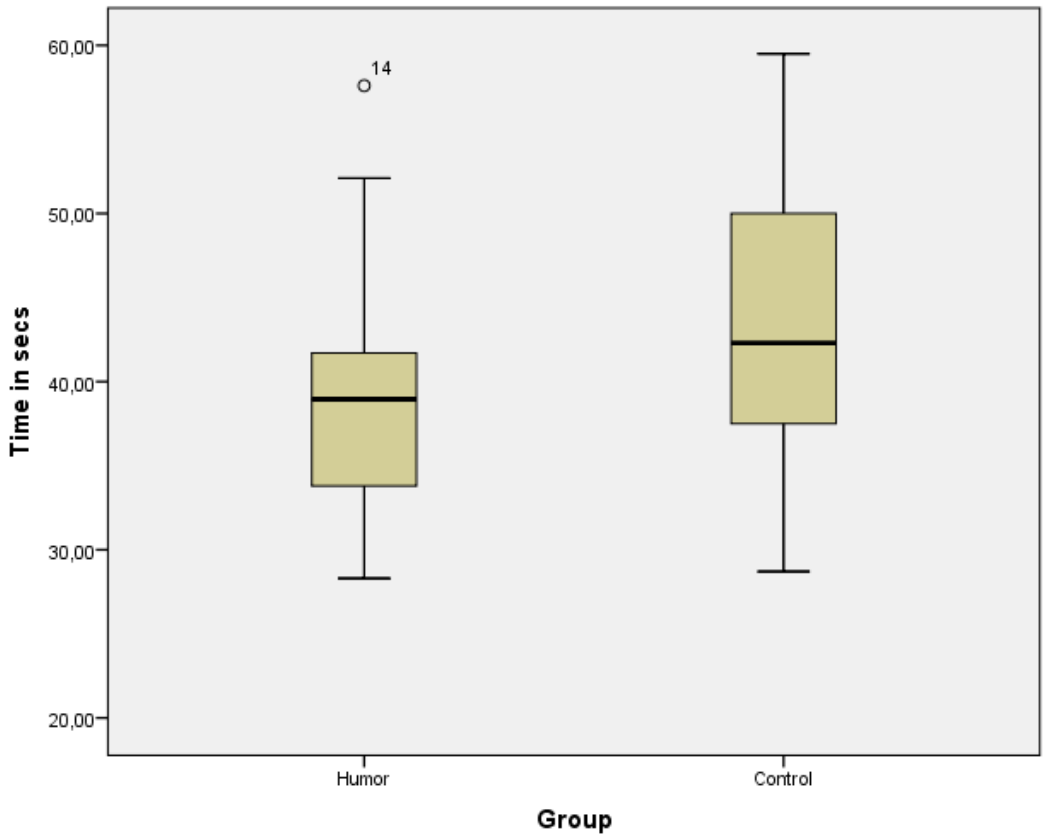

Figure 3. The box plot of the results (completion time in sec.) in both humor and control groups. There was one outlier in the Humor group (participant number 14). Differences in performance on the task were larger in the control group.

The box plot showed one outlier in the humour condition. It represented longest time in the humor condition and was included in the data, even though affected the effect size of humor negatively. Cohen's d (0, 70) suggests that exposure to humorous stimuli has a medium size effect on cognitive control, as assessed by performance on the Stroop task.

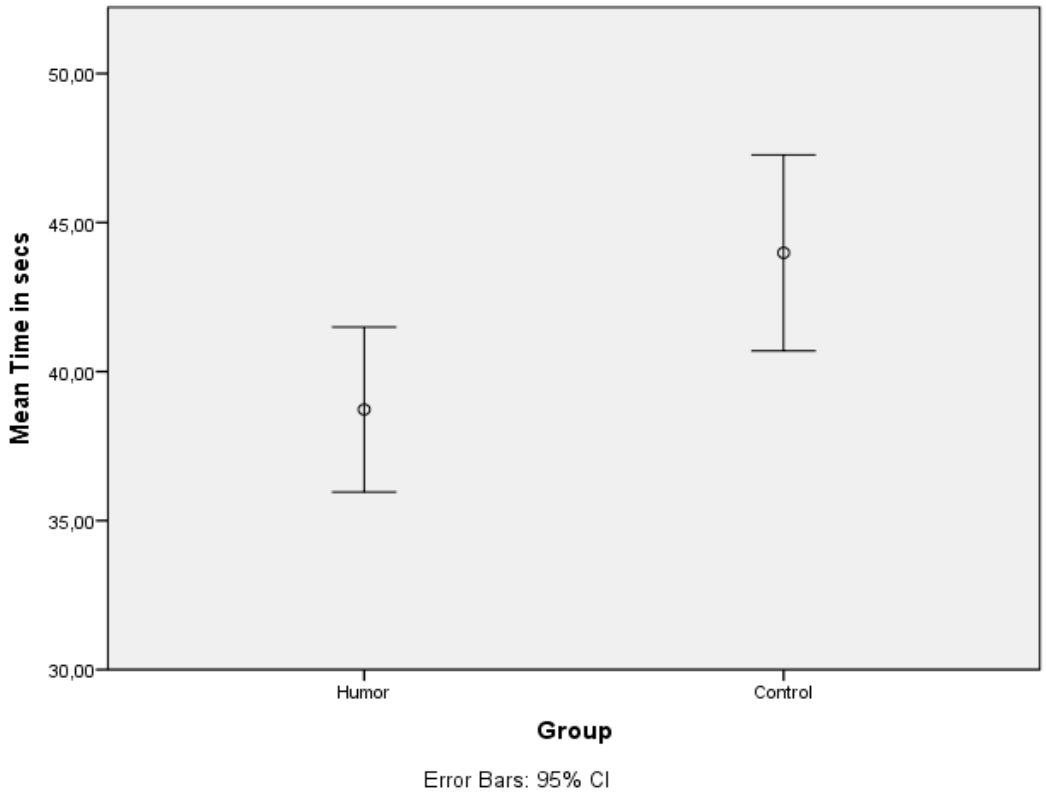

Figure 4. The 95% Confidence intervals overlap slightly.

The 95% CIs were: [*35,96 , 41,49]* for the humour group and *[40,70 , 47,27]* for the control group. Comparison of the confidence intervals revealed that the humor condition differed from the control condition. In conclusion the task completion times in the humour groups were (significantly) shorter that those of the control group.

6. Discussion

The present study aimed to assess the influence of humor on cognitive executive function. We hypothesised that exposure to humorous stimuli would promote executive functioning as assessed by performance on the Stroop-color-word task. The results support the hypothesis and show that the participants who had been exposed to humorous stimuli performed better on the Stroop-color-word task than those who only did the task.

Previous research has shown conflicting evidence about the influence of humor on cognitive processing. Our findings differ from those of Phillips et al. (2002), that positive mood impaired performance on a switching condition of the Stroop test, but are consistent with the argument that there is a positive correlation between cognitive and humor processing (Uekermann et al., 2006). These results also corroborate the idea of Isen et al. (1987) that if humor boosts creative thinking, then the same must be true for cognitive capacity, because creative thought is demanding of it.

We speculate that better performance in the humor condition might be due to the fact that both humor appreciation and the Stroop task resolve incongruous stimuli. One explanation for our findings is that the mechanisms underlying both activities overlap to some extent. This suggests that humor acts as some sort of primer for executive functioning. Another explanation is offered by the emotional dimension of humor. Even though the present study focuses on the cognitive component of humor processing, we have to mention the possibility that positive affect does promote cognitive performance, as proposed by several authors (Ashby et al., 1999; Isen et al., 1987; Zinchenko et al., 2017). What is more, the relief experienced parallely with the amusement promotes exploratory behaviour and maybe also clears tension, thus frees up resources. One more aspect of humor that may have a positive influence on cognition can be accounted for by the superiority theory. Low self-esteem in negatively correlated to executive function and attention (Capelatto, 2014). Humor raises the self-confidence of the receiver by making her feel superior than the characters of the funny story and this could be one of the reasons for better performance. Another explanation for the result may be that positive emotions broaden the scopes of attention, cognition, and action, which in turn has the effect of building the individual's physical, intellectual, and social capacities.

Because humor is complex and can be perceived very differently, people's individual preferences and experiences can influence how they feel about it. In other words, the intensity and quality of humor comprehension is subjective and so is its effect. Cultural differences need also be considered when it comes to humor evaluation. The biggest limitation of our study is that all subjects belong to the same linguistic and cultural group. The reason for this is that in order to achieve a consistent affect we needed to use the same comedy clip.

It was difficult to find an appropriate movie clip, that would be of an acceptable length and generally funny for all participants. After looking through many different types of clips and different approaches in humor, we chose to avoid irony and sarcasm because it can be interpreted in many different ways and give rise to feelings that could have negatively affected the purpose of this study. Instead, we chose a humor clip based on recognition because we thought it was the most appropriate form of humor and that most people would think it was fun. Of course, it's not possible to find a humor clip that all people think is fun, but our goal was to choose a clip that the majority would like and be able to laugh at.

It remains to be explored if these results are replicable in cultures with different attitude to humor. It would also be interesting to investigate if humour as a mechanism for coping with failure can influence cognitive capacity. Another suggestion for future research is to find out how the quantity and quality of humorous stimuli affect cognitive performance, and if there are any differences for women and men.

7. Conclusion

The question researched in this paper is if exposure to humorous stimuli would promote cognitive executive functioning. Our results confirm this idea, as assessed by performance on the Stroop color-word task. To our knowledge this connection has not been previously explored. Humor perception is dependent on making sense out of mismatched stimuli, which is demanding of cognitive resources. It embodies the complexities of problem solving and lateral thinking and therefore might give the benefit of an unintentional cognitive exercise. The amusing practical implication is that there might very well be a fun way to improve the effectiveness of work and study.

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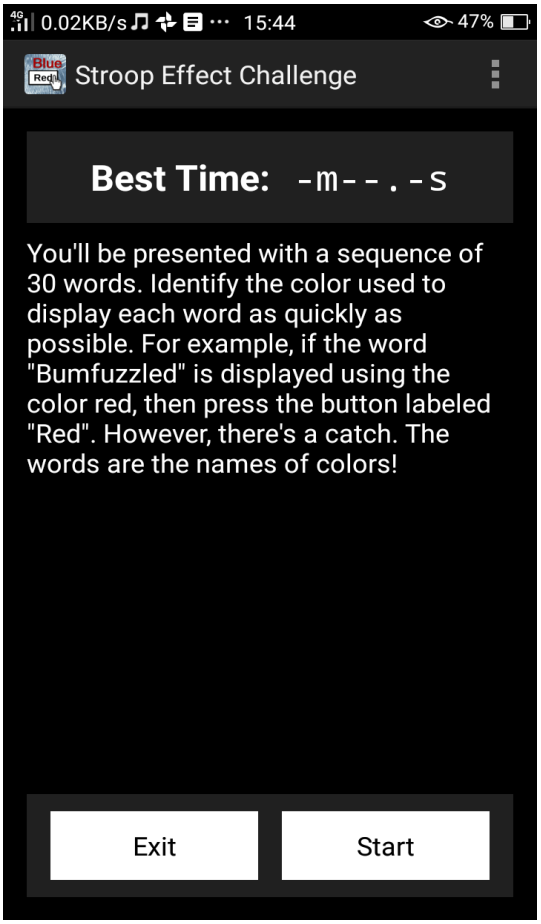
The picture on the first page: http://mikelynchcartoons.blogspot.se/2016/06/punch-cartoonist-jw-taylor.html

9. Appendices

Appendix 1. Instructions screen for the Stroop task



Appendix 2. The humor clip

RAW comedy- Sveriges bästa komiker (2014, 1 januari). Baksmällan - Johan Glans. [Video file]. Retrieved from https://www.youtube.com/watch?v=hpmD2h_AF1k&t=1s

Appendix 3. Questionnaire that the participants filled out at the end

Ringa in det alternativ som bäst stämmer in på dig

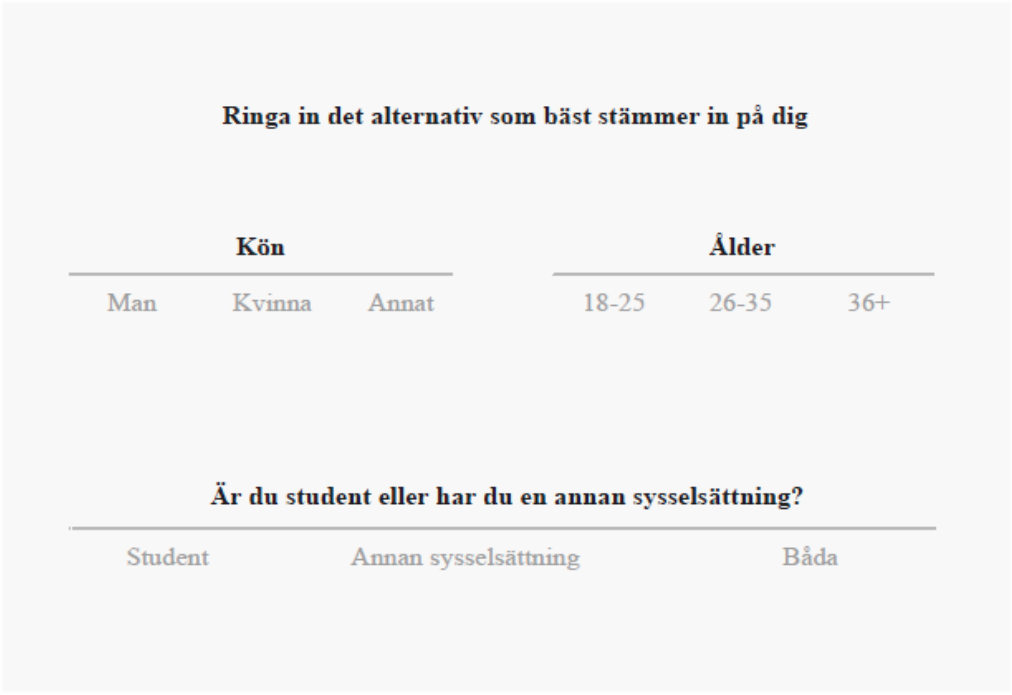
Kön			Ålder		
Man	Kvinna	Annat	18-25	26-35	36+

Är du student eller har du en annan sysselsättning?

Student	Annan sysselsättning	Båda

Tyckte du att klippet var roligt?

Inte alls 1 2 3 4 5 6 Väldigt roligt



Ringa in det alternativ som bäst stämmer in på dig

Kön			Ålder		
Man	Kvinna	Annat	18-25	26-35	36+

Är du student eller har du en annan sysselsättning?

Student	Annan sysselsättning	Båda

Appendix 4. Results on the Stroop task achieved by the humor group and the control group

Humor Group		Control Group	
Gender	Completion time	Gender	Completion time
Man	39,5	Woman	55,3
Man	40,1	Woman	39,8
Man	37,0	Woman	41,3
Kvinna	32,8	Woman	40,6
Kvinna	33,8	Woman	55,6
Kvinna	28,3	Woman	48,1
Kvinna	40,5	Woman	43,3
Man	52,1	Woman	55,0
Kvinna	46,6	Man	46,9
Man	35,9	Man	37,5
Man	42,8	Man	40,0
Kvinna	32,4	Woman	48,1
Kvinna	41,1	Woman	36,4
Kvinna	57,6	Man	59,5
Kvinna	41,7	Woman	35,1
Kvinna	41,5	Man	33,0
Kvinna	41,9	Man	45,7
Kvinna	31,0	Man	51,0
Man	45,6	Man	40,1
Man	41,4	Man	32,7
Kvinna	33,9	Man	54,1
Man	38,4	Man	37,0
Man	30,1	Woman	41,1
Man	30,9	Woman	28,7
Man	35,0	Man	47,7
Kvinna	35,0	Man	50,0

Appendix 5. Descriptives and T-test obtained with IBM SPSS Statistics

Descriptives

	grupp			Statistic	Std. Error
Time in secs	Humor	Mean		38,7269	1,34253
		95% Confidence Interval for Mean	Lower Bound	35,9619	
			Upper Bound	41,4919	
		5% Trimmed Mean		38,3051	
		Median		38,9500	
		Variance		46,862	
		Std. Deviation		6,84559	
		Minimum		28,30	
		Maximum		57,60	
		Range		29,30	
		Interquartile Range		8,20	
		Skewness		,888	,456
		Kurtosis		1,112	,887
	Control	Mean		43,9846	1,59649
		95% Confidence Interval for Mean	Lower Bound	40,6966	
			Upper Bound	47,2727	
		5% Trimmed Mean		43,9705	
		Median		42,3000	
		Variance		66,269	
		Std. Deviation		8,14055	
		Minimum		28,70	
		Maximum		59,50	
		Range		30,80	
		Interquartile Range		12,88	
		Skewness		,124	,456
		Kurtosis		-,821	,887

T-Test

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Time in secs	Control	26	43,9846	8,14055	1,59649
	Humor	26	38,7269	6,84559	1,34253

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Time in secs	Equal variances assumed	1,803	,185	2,521	50	,015	5,25769	2,08595	1,06794	9,44744
	Equal variances not assumed			2,521	48,571	,015	5,25769	2,08595	1,06489	9,45050