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Overconfidence: the Influence of Positive and Negative Affect

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Abstract:

The consequences of overconfidence affect many spheres of economic life. As yet, few factors are known that determine the extent of possible overconfidence. There are also few studies concerning the influence of positive and negative emotions on self-assessment. It has not yet been examined whether emotions can affect learning effects regarding self-assessment, wherefore the present study addresses this research question.

In a real-effort-task experiment the participants are presented with tasks over the course of 5 rounds. After each round, they are asked to assess their own performance. They are then given feedback on their actual performance, thereby allowing for learning effects. Their mood is induced by positive (treatment "positive"), negative (treatment "negative") and neutral (treatment "neutral") movie clips. There are no significant differences in the three treatments regarding absolute and relative overconfidence. However, the participants' moods differed with regard to the occurrence of learning effects. Obvious learning effects can be established in a neutral mood when examining absolute overconfidence. These learning effects cannot be detected in positive and negative moods.

Keywords: overconfidence; positive affect; negative affect; mood; emotions; laboratory experiment; self-assessment; feedback; learning effect

JEL Classification: D81; D83; D84

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1
Introduction

In psychological research, the overconfidence bias is a widely-known phenomenon of individual behavior. In economic research, this phenomenon is regarded as a reason for inefficient markets (Proeger and Meub 2013). Different groups of people such as investors, managers, bankers and other economic actors have been proven to show overconfidence (Barber and Odean 2001; Menkhoff *et al.* 2013; Ifcher and Zarghamee 2014). Considering the numerous psychological and economic studies that have been concerned with the phenomenon of overconfidence,[1] the following literature review is limited to those studies that directly address the present research question:

The study by Allwood and Bjorhag (1991) did not reveal any findings that indicate the influence of negative affect on the extent of overconfidence. A positive mood could not be induced successfully which is why the influence of positive affect could not be examined.

Allwood *et al.* (2002) compared the effect of positive and negative emotions on the extent of overconfidence without taking into account a neutral treatment (control group). Their study showed that the participants are liable to overconfidence when being in a positive or in a negative mood. A significant difference regarding overconfidence between the two treatments could not be detected.

Kuvaas and Kaufmann (2004) published a similar study. They also compared the influence of positive and negative emotions on overconfidence—and did not consider a neutral treatment (control treatment) either. They concluded that there are no differences between the overconfidence shown in both treatments.

De Paola *et al.* (2014) assessed the effect of superstition and positive and negative emotions on overconfidence. Their examination was conducted as a field experiment with approx. 700 Italian students who were randomly allocated numbered seats before a written exam. Moods were induced by lucky numbers, unlucky numbers and neutral numbers. De Paola *et al.* ascertain that the students generally overestimate themselves systematically and that their overconfidence increases due to the lucky numbers. Unlucky numbers, by contrast, have a cushioning effect on the extent of overconfidence.

The study by Ifcher and Zarghamee (2014) is of great importance for the present study and is therefore presented in detail in the following: in two experiments, Ifcher and Zarghamee examined if positive, negative or neutral (control treatment) moods affect self-assessment.

[1] For an overview see Moore and Healy (2008), Adel and Mariem (2013), Ifcher and Zarghamee (2014).

In the first experiment, they examined the effects of positive and neutral moods on the extent of overconfidence. The moods were successfully induced with the help of movie clips. Those participants with a positive mood show more absolute overconfidence as well as more relative overconfidence than those participants with a neutral mood.[2] Overestimation is a common phenomenon relating to this behavior. 72% of the participants showed absolute overconfidence, while 62% showed relative overconfidence. On average, the participants overestimated their performance by 18.29%. The difference between positive and neutral moods, however, proved to be insignificant regarding absolute overconfidence.

In the second experiment, Ifcher and Zarghamee examined the effect of negative and neutral moods on the extent of overconfidence. The moods were successfully induced using movie clips. Those participants with a negative mood showed both more absolute overconfidence and more relative overconfidence than those participants with a neutral mood. These differences, however, are statistically not relevant. The participants overestimated their performance by averagely 9.2%.

Both positive and negative mood induction increases overconfidence in comparison to participants with a neutral mood. Comparing the treatments "positive" and "negative", the overconfidence in the "negative" treatment is lower than in the "positive" treatment. First, the results of these previous studies will be reviewed. Therefore, the first hypothesis therefore reads as follows:

Hypothesis 1:

H1a: Positive or negative emotions influence overconfidence to a larger extent than a neutral mood does.

H1b: Overconfidence is stronger when feeling positive emotions rather than negative emotions.

The above-mentioned studies have not examined the development of overconfidence over time but only conducted the experiments in one session. As opposed to this, the present study will focus on the long-term influence of positive and negative affect on overconfidence.

Conducting the experiment in more than one session enables the researcher to examine if the participants have any learning effects when assessing their own performance. Since the experiment consists of 5 rounds and since the

[2] Research literature distinguishes between two kinds of overconfidence: "absolute overconfidence" (AOC), a form of self-evaluation in absolute numbers, and "relative overconfidence" (ROC), when the participants assess their own success in comparison to other participants (see also Ifcher and Zarghamee (2014), De Paola *et al.* (2014)). The following tables and figures will contain the abbreviations AOC and ROC.

participants receive feedback on their performances after each round, they can reflect on their self-assessment for the next round and thereby learn to easier assess their own capabilities. This makes it possible to analyze the influence of emotions on learning effects. We therefore consider the possibility that moods can influence possible learning effects that result from repeated self-assessment with individual feedback.

There are now some studies that investigate overconfidence within the framework of games with multiple periods containing feedback:

Clark and Friesen (2009) carried out a real-effort-task experiment in two rounds. After the first round, the participants estimated the number of the tasks that they completed correctly and were then given feedback on the actual number of correct answers. For the second round, the participants reconsidered their self-assessment and indeed performed better in the second round than in the first round. Hence, they experienced some learning effects.

Grossmann and Owens (2012) conclude that small learning effects could be achieved through self-assessment. However, they did not have any statistically relevant success.

Proeger and Meub (2014) performed a real-effort-task experiment. The participants had to solve 10 simple calculations with three fixed variables and one random variable. The participants were then asked to assess their own performance. They were asked to estimate how many problems they solved correctly. Each participant received some feedback. It can be concluded that the participants achieved a learning effect through self-assessment. In each round (3 rounds in total), the participants' self-assessment improved.

The previous studies did not examine the influence of emotions on learning effects. It remains to be examined whether learning effects are influenced by emotions. Therefore, it must be researched whether repeated self-assessment with individual feedback can lead to individuals breaking away from overconfidence even when they are in a positive or in a negative mood. Consequently, hypothesis 2 reads as follows:

Hypothesis 2:

H2a: Learning effects are triggered by feedback on repeated self-assessment in a neutral mood.

H2b: Learning effects that are attained by repeated self-assessment with individual feedback are not affected by positive or negative moods.

The present paper is structured in 4 paragraphs. The following paragraph describes the experimental design. In the subsequent paragraph, the results are presented. The last paragraph summarizes the most striking results of the study.

2
Experimental Design

The experimental design follows the design by Ifcher und Zarghamee (2014) who took the following approach:

First, the participants take part in a quiz that consists of 30 questions (20 general knowledge questions (Moore and Small, 2007) and 10 mathematical tasks (Niederle und Vesterlund, 2007)), which they have 15 minutes to answer. They will receive $ 0.50 for each correct answer. Secondly, the mood is induced. For mood induction, the participants are shown movie clips that are supposed to trigger positive or negative emotions. Meanwhile, the control group looks at a screen saver or watches neutral movie clips. In the next step, the participants assess their performance in the quiz. They estimate the number of the tasks that they completed correctly (absolute overconfidence) and assess the quality of their performance in comparison to their fellow gamblers (relative overconfidence). They receive $ 5.00 for each correct estimation. The fourth step includes the manipulation check of the participants' mood induction, using PANAS[3]. In the fifth step, they answer questions regarding demographic and personal characteristics. The average profit is $ 15.00.

The experimental design of the present study is structured as follows: after the participants have read the detailed instructions, they must answer four control questions[4] correctly. Before the start of the experiment, their mood is then scaled using the following question:

> How are you feeling now? Please mark the adequate number!
>
> 1—2—3—4—5—6—7—8—9—10
>
> very bad very good

Each round starts with a real-effort task. There are 25 general knowledge questions and 25 mathematical tasks. The general knowledge questions were taken from Moore and Small (2007) and supplemented with five similar questions. The mathematical tasks by Niederle and Vesterlund (2007) were also used and supplemented with 15 similar tasks. Hence, the experiment consists of 50 tasks and is structured into 5 rounds. Each round contains 5 general knowledge tasks and 5 mathematical tasks. The participants are allowed 45 seconds to complete the real-effort task. They receive a material incentive to motivate them to answer the questions correctly. 2 points are awarded for

[3] PANAS stands for Positive and Negative Affect Schedule.

[4] The control questions are used to check if the participants understood the instructions of the experiment.

each correct answer. They can receive 100 points in total if all questions are answered correctly. This is equivalent to a payout of € 15.00.

Moods are then induced using short movie clips. Emotional movie clips are one of the most effective methods to trigger emotions.[5] Movie clips are often used in economic experiments to evoke certain moods (see e.g. Allwood *et al.*, 2002; Kirchsteiger *et al.*, 2006; Rottenberg *et al.*, 2007; Ifcher and Zarghamee, 2014; Oswald *et al.*, 2015).

The movie clips have been chosen from the study by Schaefer *et al.* (2010), which analyzes more than 70 movie clips for their effect on mood induction. The movie clips are categorized into positive, negative and neutral effects on a person's mood and ranked according to their effectivity.

The present experiment uses the following movie clips to induce a positive mood: (1) Benny & Joon (122 seconds): Benny (Johnny Depp) clowns around in a café. (2) Life is Beautiful (266 seconds): mother and son are reunited after World War II. (3) Dead Poets Society (163 seconds): the students mount their desks to express their solidarity with Mr. Keating (Robin Williams). (4) Forrest Gump (121 seconds): father (Tom Hanks) meets son. (5) Dinner for Schmucks (101 seconds): complex comic scene.

The following movie clips were used to induce a negative mood: (1) Saving Private Ryan (327 seconds): a combat scene in World War II. (2) The Piano (42 seconds): one of the main characters has a finger chopped off with an ax. (3) The Blair Witch Project (232 seconds): final scene when the main characters are obviously killed. (4) Schindler's List (76 seconds): corpses are burnt in a concentration camp. (5) City of Angels (257 seconds): Maggie (Meg Ryan) dies in Seth's (Nicolas Cage) arms.

The neutral movie clips were the following: (1) The Lover (43 seconds): Marguerite (Jane March) gets into a car. She is taken to a house in a busy street where she knocks on a door. A Chinese man opens the door and she enters the house. (2) Blue (40 seconds): a man clears the drawers of his desk. A woman passes through an alley and salutes another woman on the way. (3) Train Ride (58 seconds): a train crosses a green countryside.[6] (4) Blue (25 seconds): a woman holding a box goes up an escalator. (5) Blue (16 seconds): a person throws a piece oft in foil out of the window of a car.

Those movie clips inducing negative emotions are shown in the treatment "negative", while those clips triggering positive emotions are shown in the treatment "positive" and the neutral clips are presented in the treatment "neutral" (control group).

[5] There are different methods of mood induction, including real situations, memories and imaginations, noises and music, gifts, movie clips or the Velten technology. See Westermann *et al.* (1996).

[6] The movie clip "Train Ride" is similar to the clip chosen by Gendolla and Krüsken (2002).

In each round, a manipulation check was conducted after the participants watched the movie clip. The participants were asked the following question:[7]

> Which emotions did you experience while watching the movie clip? Please mark one number accordingly!
>
> 1—2—3—4—5—6—7—8—9—10
>
> very negative very positive

Afterwards, the participants' self-assessment is captured by the following questions:

- How many of the 10 tasks did you complete correctly?
- How many tasks did you complete correctly compared to the other participants, i.e. how many more or fewer tasks compared to the average number of tasks completed by the other participants?

To motivate the participants to assess their performance as accurately as possible, they receive 8 points for each overlap of the estimated and the actual performance. They can receive 80 points in total, which equates to a payout of € 12.00.

The investigation of the self-assessment follows the approach by Ifcher and Zarghamee (2014): absolute overconfidence is captured and relative confidence is considered.

The absolute overconfidence is the difference between the assumed number of correctly completed tasks and the actual number of correctly solved tasks. If, for example, a participant assumes that they completed 10 (4) tasks correctly but only 7 tasks were actually solved, their absolute overconfidence would be +3 (-3).

Relative overconfidence results from the difference between the assumed and the actual relative success in comparison to the other participants. For example, a participant assumes that they averagely solved 4 tasks more (4 tasks less) than the other participants. In fact, they only correctly solved 2 more tasks than the other participants. Hence, relative overconfidence is +2 (-6).

After each of the five rounds, the participants are given feedback on the success of their self-assessment. Each participant is told how many tasks they completed correctly (absolute overconfidence) and how they performed in relation to the other participants (relative overconfidence). Over the course of the five rounds, the participants can thereby learn from their experience in the previous rounds and progressively assess their own performance in a more realistic way.

[7] Similar manipulation checks were conducted in the studies by Kirchsteiger *et al.* (2006), Rottenberg *et al.* (2007), Lahav and Meer (2012), Andrade *et al.* (2015).

Except for the presented movie clips, the experimental process is the same for the treatments "negative", "positive" and "neutral". Table 1 provides an overview on the research method.

Table 1: Overview on the Treatments of the Experiment

Treat-ment	Real-effort Task	Mood Induction	Manipulation Check	Self-assess-ment	Feed-back
Negative	Yes	Yes	Yes	Yes	Yes
Neutral	Yes	Yes	Yes	Yes	Yes
Positive	Yes	Yes	Yes	Yes	Yes

The treatments "positive" and "negative" lasted approx. 45 minutes, while the experiment lasted approx. 35 minutes for the control group. This can be attributed to the length of the movie clips, which are considerably shorter for the induction of a neutral mood than for the induction of a positive or negative mood.

The participants are remunerated for their performance. The total number of points awarded to each participant (180 points are possible to achieve in total) is converted into a sum of money in euros. Each point equals € 0.15. Each participant furthermore receives a show-up fee of € 2.50. The participants can earn € 29.50 in total. They earned € 12.81 on average. The minimum payout was € 19.60; the maximum payout was € 2.50.

The experiment was programmed in z-Tree (Fischbacher 2007). The instructions are given in the appendix of this paper.

The experiment was conducted between 30 March and 22 April 2015 with students of the Ostfalia University of Applied Sciences. 104 participants took part in the 22 sessions of the experiment. 45 participants study at the Faculty of Business (43.3%), 45 participants study at the Faculty of Automotive Engineering (43.3%) and 14 participants study at the Faculty of Public Health Services (13.5%). 28 women (26.9%) and 76 men (73.1%) participated in the experiment. The participants were assigned to the treatments as follows: 34 participants (32.7%) played the treatment "negative", 32 participants (30.8%) the treatment "positive" and 38 participants (36.5%) played the treatment "neutral". The average age of the participants was 23.7 years.

3
Results

3.1 Mood Induction

First, I will determine if the mood induction was successful. The average mood of the participants in treatment "negative" was 3.28 (SD 1.24). The average mood of the participants in treatment "neutral" was 5.52 (SD 0.95). The average mood of the participants in treatment "positive" was 7.03 (SD 1.50). Figure 1 gives an overview on the participants' moods in each treatment and round.

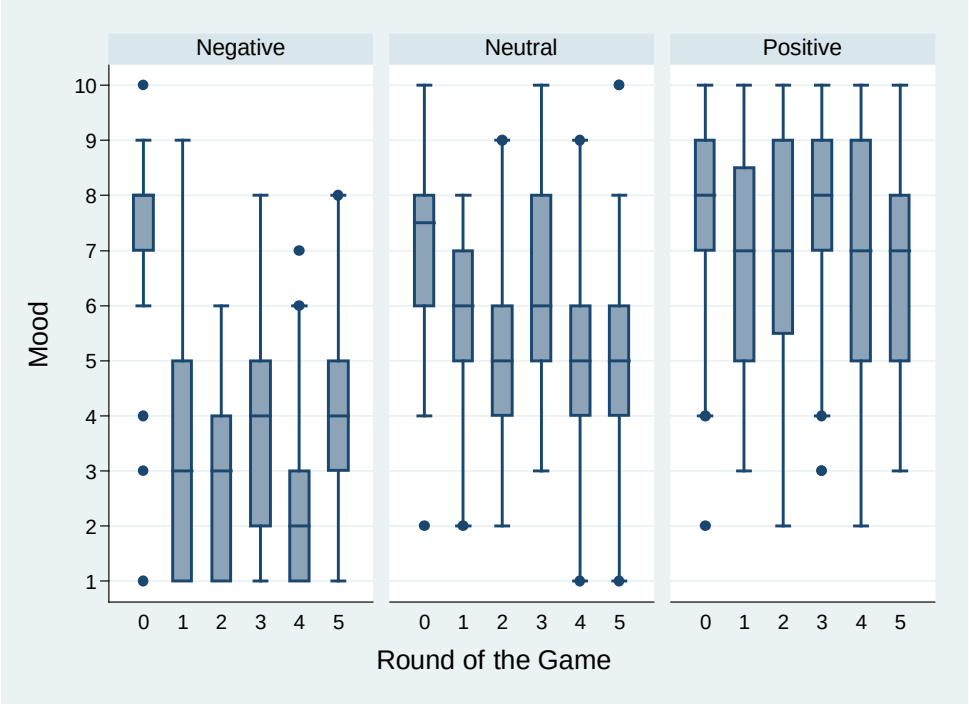

Figure 1: Participants' Moods before the Experiment and in the Five Rounds of the Game

Figure 1 shows that the mood induction in the individual treatments was successful. Before the start of the treatments, the participants were in a positive mood (see the boxplots of round 0). After mood induction, the moods of the participants in the three treatments disperse (rounds 1-5). Figure 2 summarizes the different moods of the participants in the three treatments of the five rounds. This highlights the success of the mood induction. The participants' moods before the start and in each round of the experiment as well as the standard deviations are shown in table 2.

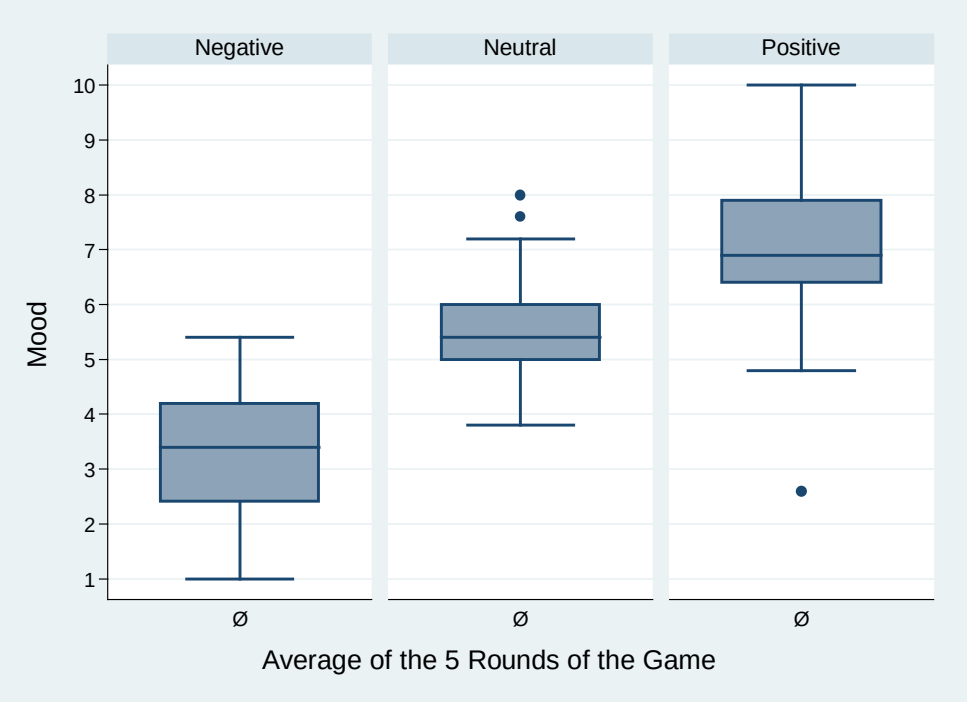

Figure 2: Participants' Average Moods in the Five Rounds of the Game (Excluding the Mood before the Experiment)

Table 2: Participants' Average Moods per Round

Treat-ment	#	Average Mood per Round (Standard Deviation)						
		Before the Experiment	1	2	3	4	5	Ø[a]
Nega-tive	34	7.21 (1.75)	3.32 (2.10)	2.65 (1.47)	3.85 (1.88)	2.53 (1.67)	4.06 (1.54)	**3.28*** (1.24)**
Neutral	38	7.16 (1.84)	5.68 (1.44)	5.26 (1.54)	6.26 (1.98)	5.37 (1.63)	5.00 (2.10)	**5.52*** (0.95)**
Positive	32	7.69 (1.82)	6.88 (2.10)	7.09 (1.96)	7.53 (1.93)	7.13 (2.24)	6.53 (2.27)	**7.03*** (1.50)**

Please note: the significant values are printed in bold (*** p<0.01; ** p<0.05, * p<0.1).

[a]To calculate the average values, the values of the five rounds of the game were taken into account; the values before the start of the experiment were not considered.

Comparing the treatments (table 2), the treatment "negative" shows significantly lower values than the treatment "positive" (z= -6,561, p= 0,0000; Mann-Whitney U Test). The treatment "negative" also shows considerably lower values when compared to the treatment "neutral" (z= -6,382, p= 0,0000; Mann-Whitney U Test). Furthermore, the treatment "positive" shows

significantly higher values than the treatment "neutral" (z= 4,570, p= 0,0000; Mann-Whitney U Test). Mood induction was therefore successful.

3.2 Absolute Overconfidence

This subchapter presents the results of absolute overconfidence. Figure 3 portrays the results of the three treatments and the five rounds of the game. It can clearly be observed that the treatments "negative", "neutral" and "positive" do not differ greatly regarding absolute overconfidence. The median is on the level of 0 for a total of seven times (treatment "negative": rounds 4 and 5; treatment "neutral": rounds 3 and 4; treatment "positive": rounds 2, 3 and 4).

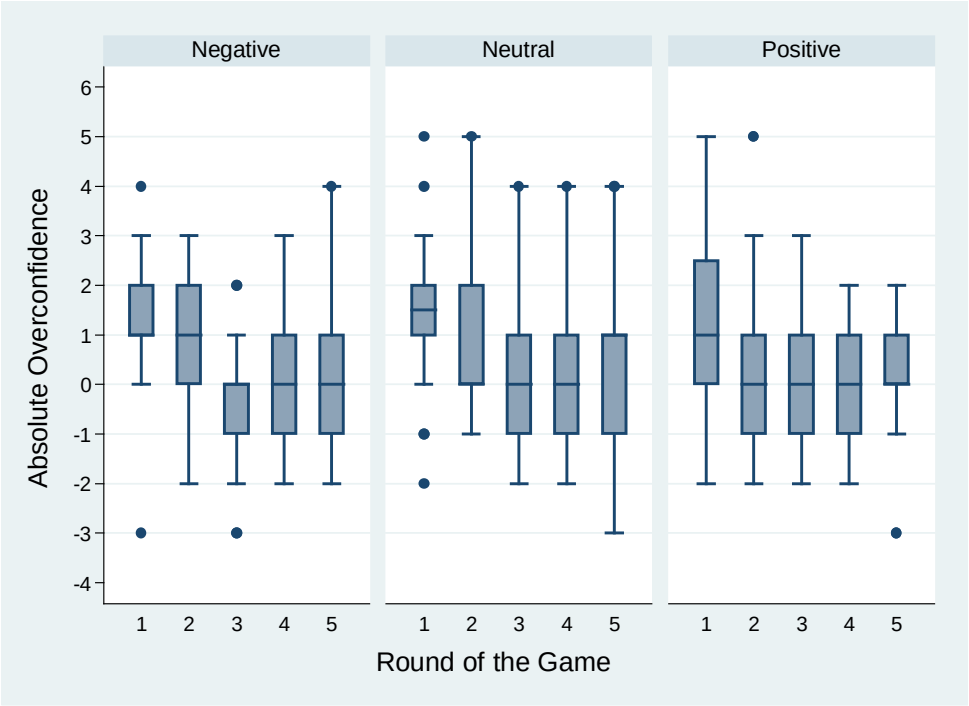

Figure 3: Participants' Absolute Overconfidence in the Three Treatments and in the Five Rounds of the Game

Figure 4 shows the average absolute overconfidence in the five rounds. It can clearly be seen how close the absolute overconfidence in the three treatments lie together. The lower whiskers are all between 0 and -1. The upper whiskers are all between 1 and 2. The median for all three treatments is between 0 and 1. In the treatments "neutral" and "positive" 25% of the values are lower than 0 and 75% of the values are higher than 0. In the treatment "negative" 80% of the values are higher than 0 and 20% of the values are lower than 0. Thus, all three treatments show a clear tendency towards overconfidence.

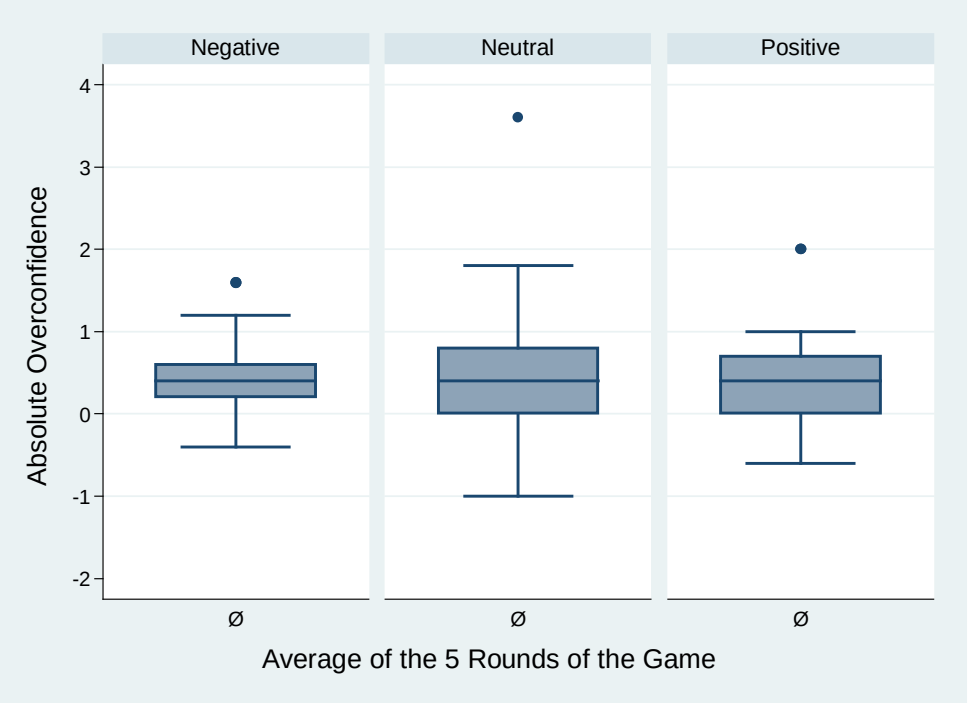

Figure 4: Participants' Absolute Overconfidence per Treatment

Table 3 shows the participants' self-assessment regarding absolute overconfidence in each treatment. It can be observed that overestimation is predominant. In the treatment "negative", 46.5% of participants overestimate themselves, in the treatment "positive" 43.1% of participants overestimate themselves and in the treatment "neutral" 51.1% of participants overestimate themselves. Underestimation occurs in the treatment "negative" with 25.9% of participants, with 26.3% in the treatment "positive" and with 26.8% in the treatment "neutral". Accurate self-assessment was detected with 27.6% of participants in treatment "negative", with 30.6% in the treatment "positive" and with 22.1% in the treatment "neutral".

Table 3: Participants' Self-assessment (Absolute Overconfidence) per Treatment

Treatment	#	Absolute Overconfidence in %		
		Underrating	Adequate Self-assessment	Overcon-fidence
Negative	34	25.9	27.6	46.5
Neutral	38	26.8	22.1	51.1
Positive	32	26.3	30.6	43.1

Table 4 shows a summary of all numbers on overconfidence. Surprisingly, the average absolute values for overconfidence are highest in the treatment "neutral" with 0.55 (SD 0.79). This number is followed by 0.41 (SD 0.46) in the treatment "negative" and by 0.40 (SD 0.61) in the treatment "positive".

Table 4: Participants' Absolute Overconfidence per Round

Treatment	#	Average AOC Values per Round (Standard Deviation)					
		1	2	3	4	5	Ø
Negative	34	1.29 (1.27)	0.71 (1.34)	-0.47 (1.31)	0.38 (1.37)	0.15 (1.31)	**0.41 (0.46)**
Neutral	38	1.50 (1.43)	0.71 (1.51)	0.21 (1.44)	0.03 (1.24)	0.32 (1.65)	**0.55 (0.79)**
Positive	32	1.38 (1.79)	0.31 (1.75)	0.00 (1.32)	0.09 (1.00)	0.22 (1.26)	**0.40 (0.61)**

Please note: the significant values are printed in bold (*** p<0.01; ** p<0.05, * p<0.1).

In the treatment "negative", the participants assumed that they averagely solved 5.39 (SD 1.59) tasks correctly. They actually completed only 4.98 (SD 1.68) tasks correctly. The difference is 0.41. Hence, the participants overestimated their own performance by 8.23%. The same is true for the treatment "positive". On average, the participants assumed that they solved 5.36 (SD 1.56) tasks correctly. They actually completed only 4.96 (SD 1.63) tasks correctly. The difference is 0.40. The participants therefore overestimated their own performance by 8.06%. In the treatment "neutral", the participants assumed that they averagely solved 5.16 (SD 1.34) tasks correctly. They actually completed only 4.61 (SD 1.75) tasks correctly. The difference is 0.55, wherefore they overestimated their own performance by 11.93%.

The Wilcoxon-Rank-Sum Test does not reveal any significant differences between the treatments "positive" or "negative" and the treatment "neutral" (treatment "negative" vs. treatment "neutral": z=-0.705 p=0.4805; treatment "positive" vs. treatment "neutral": z=-0.706 p=0.4801). Therefore, hypothesis 1a for absolute overconfidence must be discarded. The overconfidence of the participants in the treatments "negative" and "positive" is not significantly higher than in the treatment "neutral". The results of the study by Ifcher und Zarghamee (2014) are hereby confirmed.

Hypothesis 1b must also be rejected for absolute overconfidence since the values of the treatment "positive" are not significantly higher than the values of the treatment "negative" (Wilcoxon-Rank-Sum Test: z=0.045 p=0.9638).

3.3 Relative Overconfidence

This subchapter presents the results on relative overconfidence. Figure 5 gives an overview on the relative overconfidence of the participants in the respective rounds and treatments. This overview, too, reveals only little differences among the treatments. The interquartile ranges are larger for relative overconfidence than for absolute overconfidence.

One reason for this is probably the difficulty that the participants experience in assessing the other participants' performance in the respective round in order to estimate their own success in comparison to the other participants.

For the large part, the boxes stretch below 0. This indicates that the participants rather underestimate than overestimate their own relative performance. It is remarkable that 9 out of 15 medians are at the level of 0 and that 12 of the 15 quartiles are on the level of 1.

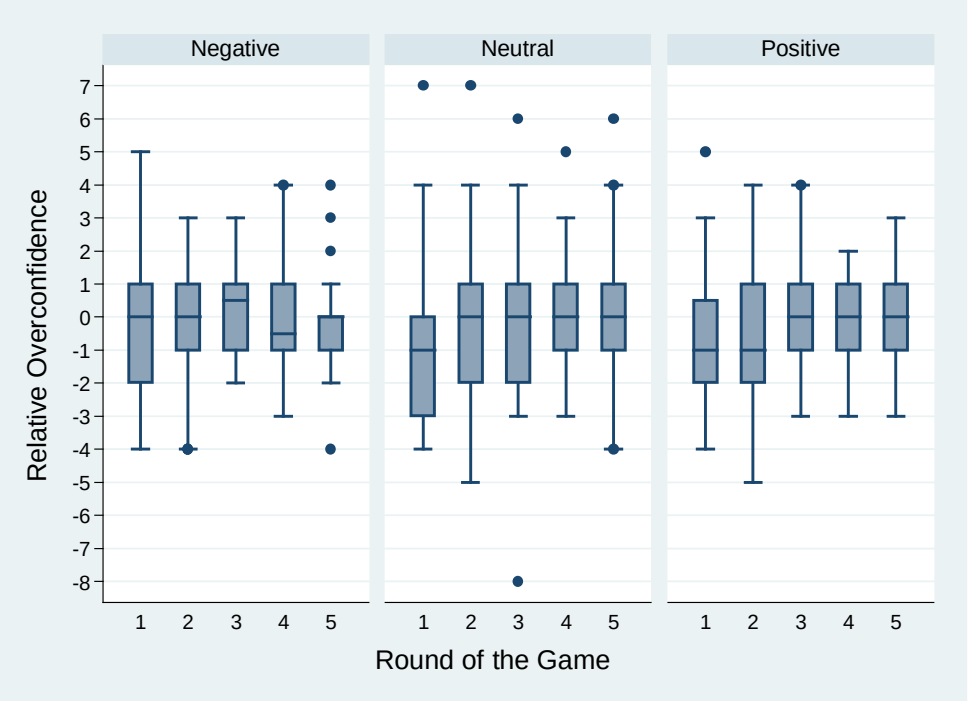

Figure 5: Participants' Relative Overconfidence in the Rounds and Treatments

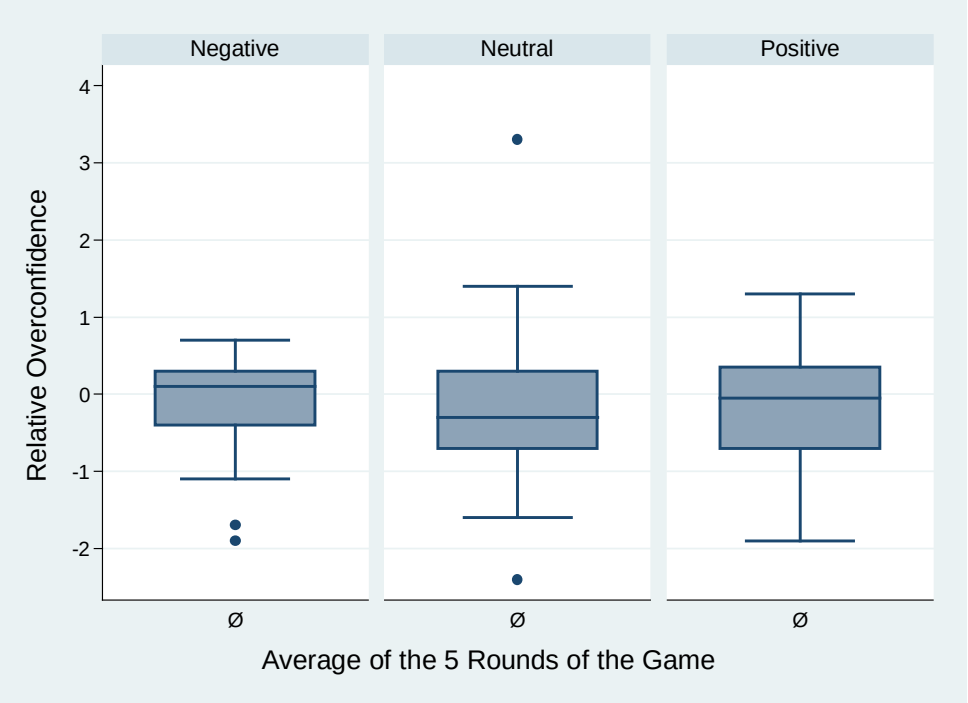

Figure 6: Participants' Relative Overconfidence per Treatment

Figure 6 shows the average values of the five rounds per treatment concerning relative overconfidence. As is the case for the findings on absolute overconfidence, the values for relative overconfidence are similar. It can be clearly seen that 80% of the boxes are below 0. Only 20% are above 0.

Different to absolute overconfidence, the participants overestimate their own performance with regard to relative overconfidence (table 5). In the treatment "negative" 38.2% underestimate their relative success, with 45.6% in the treatment "positive" and 44.2% in the treatment "neutral". Overestimation can also be observed. In the treatment "negative" 35.9% overestimate their success relative to the other participants' performance, with 33.8% overestimation in the treatment "positive" and 29.5% in the treatment "neutral". A correct self-assessment was given by 25.9% of the participants in the treatment "negative", by 20.6% in the treatment "positive" and by 26.3 % in the treatment "neutral".

Table 5: Participants' Self-assessment Relative to the Other Participants (Relative Overconfidence) per Treatment

Treatment	#	Relative Self-assessment in %		
		Underesti-mation	Accurate Self-assessment	Overestima-tion
Negative	34	38.2	25.9	35.9
Neutral	38	44.2	26.3	29.5
Positive	32	45.6	20.6	33.8

Table 6: Participants' Relative Overconfidence per Round

Treatment	#	Average ROC Values per Round (Standard Deviation)					
		1	2	3	4	5	Ø
Negative	34	-0.38 (1.94)	-0.18 (1.78)	0.29 (1.22)	-0.12 (1.74)	-0.18 (1.53)	**-0.11 (0.64)**
Neutral	38	-0.84 (2.26)	-0.26 (2.24)	-0.13 (2.42)	-0.08 (1.63)	0.11 (2.08)	**-0.24 (0.96)**
Positive	32	-0.69 (2.05)	-0.66 (2.21)	0.00 (1.48)	-0.09 (1.40)	0.13 (1.50)	**-0.26 (0.74)**

Please note: the significant values are printed in bold (*** p<0.01; ** p<0.05, * p<0.1).

Table 6 shows the values for relative overconfidence. The average values of the five rounds are striking because they are negative in the three treatments. It can be concluded that, on average in the five rounds, the participants underestimate their own performance relative to the other participants' performance in the session.

In the treatment "negative", the participants assumed that they averagely completed 0.23 (SD 1.87) fewer tasks correctly than the average of the other participants. In fact, they fulfilled only 0.12 (SD 1.96) fewer tasks successfully than the average of the other participants. The difference is 0.11. In the treatment "positive", the participants assumed that they averagely completed 0.26 (SD 1.71) fewer tasks correctly than the average of the other participants. However, it turned out that they accomplished exactly as many tasks as the average of the other participants (0,00 (SD 1.68)). The difference is 0.26. In the treatment "neutral", the participants assumed that they averagely completed 0.34 (SD 1.71) fewer tasks correctly than the average of the other participants. In fact, they fulfilled only 0.10 (SD 1.81) fewer tasks successfully than the average of the other participants. This makes a difference of 0.24.

To answer the question whether there are significant differences between the treatments, the Wilcoxon-Rank-Sum Test was used (treatment "negative" vs. treatment "positive": z= 0.779 p= 0.4361; treatment "negative" vs. treatment "neutral": z= 1.459 p= 0.1445; treatment "positive" vs. treatment "neutral": z= 0.579 p= 0.5627). No significant differences between the three treatments can be established. Hypothesis 1a must be discarded for relative overconfidence. The participants in the treatments "negative" and "positive" do not show a significantly higher relative overconfidence than the participants in the treatment "neutral". These results are contradictory to the results by Ifcher and Zarghamee (2014), who detected a stronger manifestation of relative overconfidence in positive and negative moods than in a neutral mood. Hypothesis 1b must also be neglected for relative overconfidence because the relative overconfidence in the treatment "positive" was not significantly higher than the relative overconfidence in the treatment "negative".

3.4 Learning Effects

This subchapter will analyze if the participants experienced any learning effects. To assess hypotheses 2a and 2b the values of absolute overconfidence in the first three rounds were compared to the values of absolute overconfidence in the last two rounds. This is reasonable because the participants might need more than one feedback on their performance to improve their self-assessment, or in order to experience a learning process.

To compare the first three rounds of the game to the last two rounds, the Wilcoxon-Signed-Rank Test was administered.

In the treatment "neutral", significant learning effects could be established (z= 3.187 p= 0.0014). Those participants taking part in the treatment "neutral" were obviously able to use the feedbacks of the first round to improve their self-assessment over time.

Therefore, hypothesis 2a cannot be neglected. The results by Clark and Friesen (2009) and by Proeger and Meub (2014) can be confirmed.

The results for the treatments "positive" and "negative" are fundamentally different. The Wilcoxon-Signed-Rank Test shows that the results of the last two rounds do not significantly differ from the results of the first three rounds (treatment "positive" (z= 1,600 p= 0,1096), treatment "negative" (z= 1,301 p= 0,1934)).

This indicates that both positive and negative moods prevent the participants from having any learning effects and from achieving more realistic self-assessment.

The same approach was taken to assess relative overconfidence. The values of the relative overconfidence in the first three rounds were compared to the values of the absolute overconfidence in the last two rounds. No learning ef-

fects can be detected in neither the treatment "neutral" nor in the treatments "positive" or "negative". The relative self-assessment in the first three rounds does not significantly differ from the relative self-assessment in the last two rounds (Wilcoxon-Signed-Rank Test for the treatment "neutral": z= -1.588 p= 0.1122; for the treatment "positive": z= -1.562 p= 0.1183; for the treatment "negative": z= 0.342 p= 0.7323). Regarding relative overconfidence, hypothesis 2a must therefore be discarded. The assessment of hypothesis 2b for learning effects concerning relative overconfidence is thereby omitted.

The fact that the assessment of relative overconfidence has not returned any learning effects even in the treatment "neutral" is probably owing to the complexity of assessing one's own performance in comparison to the other participants' achievements (relative overconfidence) as opposed to assessing one's own performance (absolute overconfidence). More time is needed to reflect on the other participants' performance in the session in order to assess one's own relative capability.

3
Summary

The present study examines the phenomenon of overconfidence and addresses two research questions: (1) The study examines the influence of positive and negative emotions on self-assessment. (2) The study also addresses the question if any learning effects through self-assessment are influenced by positive or negative emotions.

The economic experiment was conducted with 122 students of the Faculties of Business, Automotive Engineering and Public Health Services of the Ostfalia University of Applied Sciences.

Positive, negative and neutral movie clips were used for mood induction. Absolute and relative overconfidence were equally assessed.

The study produced the following results:

1. The participants' moods were successfully induced using positive, negative and neutral movie clips. The average moods in the three treatments are significantly different. The treatment "negative" shows an average mood value of 3.28, the treatment "neutral" an average mood value of 5.52 and the treatment "positive" an average mood value of 7.03.
2. The participants' overconfidence in the treatments "negative" and "positive" is not significantly higher than their overconfidence in the control group (treatment "neutral"). This is equally true for the absolute overconfidence and the relative overconfidence. Therefore, hypothesis 1a must be discarded.
3. Furthermore, the treatment "positive" does not present a significantly increased tendency towards overconfidence when compared to the treatment "negative". This is equally true for the absolute overconfidence and the relative overconfidence. Hence, hypothesis 1b must also be neglected.
4. Participants with a neutral mood (control group) achieve striking learning effects regarding absolute overconfidence. In the last two rounds, they assess their own performance significantly more accurately than in the first three rounds. This is why hypothesis 2a cannot be neglected.
5. Participants with a positive or a negative mood (treatment "positive" and treatment "negative") do not achieve any considerable learning effects regarding absolute overconfidence. They do not assess their performance more accurately in the last two rounds than in the first three rounds. It can hence be established that both positive and negative emotions can influence possible learning effects. Therefore, hypothesis 2b must be neglected.
6. Regarding relative overconfidence, no learning effects could be detected. In neither of the treatments "neutral", "positive" or "negative", the participants can forecast their relative performance over the course of the

game more accurately than in any other. In all three treatments, the relative overconfidence of the first three rounds does not significantly differ from the relative overconfidence in the last two rounds.

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Appendices

Appendix 1: Instructions

The Game

In each part of this game you will be given 10 tasks. You have 45 seconds to complete each task. There are 5 rounds in total. In the following, you are presented two examples:

- Question: What is the capital of the federal country of Saarland?
  Answer: Saarbrücken

- Task: Please add the five numbers given below and enter your result into the input field:
  26 16 86 05 41
  Answer: 174

First, you will complete the tasks. Then you will watch a short movie clip that is shorter than 5 minutes. After that, you will be asked to assess your own performance by answering the following two questions:

- How many tasks did you complete correctly?

- How many tasks did you complete correctly in comparison to the other participants? How many more or less?

    - Example 1: I think that I gave three correct answers fewer than the average of the participants. Hence, you enter -3.

    - Example 2: I think that I gave three correct answers more than the average of the participants. Hence, you enter +3.

You have 45 seconds to complete the self-assessment. After each round of the game, you will receive feedback on your actual performance.

Award for Points

For each correct answer, you will receive **2 points**.

For each correct self-assessment, you will receive **8 points**.

You can be awarded 180 points in total.

The Payout

The basic payout is € 2.50. For each point, you will receive € 0.15. You can earn up to € 29.50 in total.

Please note

Please keep quiet during the experiment!

Please do not look at your seatmate's monitor!

You are **not** allowed to use any auxiliary devices (calculator, smartphone etc.). All electronic devices must be switched off!

Please note the timing given in the upper right hand corner of the monitor. If you do not enter an answer in the given time, you will not be awarded any points for the respective task.