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Repeated Interaction**

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# The Effect of Positive Mood on Cooperation in Repeated Interaction

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## Abstract

Existing research supports two opposing mechanisms through which positive mood might affect cooperation. Some studies have suggested that positive mood produces more altruistic, open and helpful behavior, fostering cooperation. However, there is contrasting research supporting the idea that positive mood produces more assertiveness and inward-orientation and reduced use of information, hampering cooperation. We find evidence that suggests the second hypothesis dominates when playing the repeated Prisoner's Dilemma. Players in an induced positive mood tend to cooperate *less* than players in a neutral mood setting. This holds regardless of uncertainty surrounding the number of repetitions or whether pre-play communication has taken place. This finding is consistent with a text analysis of the pre-play communication between players indicating that subjects in a more positive mood use more inward-oriented, more negative and less positive language. To the best of our knowledge we are the first to use text analysis in pre-play communication.

## 1 Introduction

In the last 40 years, the management literature has emphasized the importance of an organizational model that incorporates employee affect, something that has been dubbed the “affective revolution” (see e.g. Barsade and Donald E. Gibson 2007). This notion is reflected in the work of psychologists and neuroscientists (e.g. Damasio (1994); Ralph and Damasio (2000); Forgas (2002); Fischer, Manstead, et al. (2008)) who have provided a wealth of evidence that mood and, more generally, emotions are an essential and adaptive

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component of social behavior.<sup>1</sup> Oswald, Proto, and SgROI (2015) show that experimentally inducing positive mood seems to invigorate individuals leading them to exert more effort in simple individual tasks. The direct implication is that happiness is good for worker productivity and in turn good for firms' profits. However, many workplace tasks are not of the individual one-shot decision-making variety but instead are likely to involve repetition, social behavior (including strategic interaction) and a degree of cooperation. Accordingly, in this paper we will try to assess the effect of positive mood ("happiness") on cooperation under *repeated* interactions.

The effect of positive mood on cooperation is rather complex, at least according to the existing literature. On one hand, empirical research suggests that people experiencing positive mood are more assertive and inward-oriented, use less information and more stereotypes, and avoid demanding, systematic thinking (e.g. Schwarz (2013) and Forgas (1998)). Proto, Rustichini, and Sofianos (2014) show that cognitive skills heavily positively affect cooperation in the repeated Prisoner's Dilemma. Putting this all together we might hypothesize that positive emotion reduces cooperation. We refer to this mechanism as the "cognitive channel". In contrast, classic studies in psychology have shown that positive mood produces more open, altruistic and helpful behavior (e.g. Isen and Geva (1987)). These studies are consistent with the more recent experimental economics literature investigating the effect of emotion in *one-shot* economic decisions that emphasize the impact of emotion on social preferences, in the sense that individuals are more altruistic and trusting (Kirchsteiger, Rigotti, and Rustichini, 2006a; Capra, 2004; Dunn and Schweitzer, 2005; Kessler, McCellan, and Schotter, 2016) and that happier individuals are better contributors (in a one-shot voluntary contribution game) than angry individuals (Drouvelis and Grosskopf, 2016).<sup>2</sup> This suggests that positive emotion might increase cooperation. We refer to this mechanism as the "social preferences channel". These conflicting channels leave open the question of how mood should affect cooperation and which channel might dominate.

The Prisoner's Dilemma (PD) provides perhaps the most well-known game that captures a fundamental tension in social interactions: the conflict between short-term losses and the long-term benefit of cooperation. The Prisoner's Dilemma has also been used to study firm behavior and the development of firms as the predominant means of production, distribution and retail in modern society Greif (2000). Moreover, laboratory-based evidence has emphasized that conventional theory does not offer clear guidance, neither in repeated play of the PD when the end date is known, where cooperation occurs despite

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<sup>1</sup>Moods are emotional states, unlike emotions; they are relatively low-intensity, diffuse, and enduring affective states that have no salient cause and little cognitive content (e.g., feeling good or feeling bad, being in a happy or sad mood). See Forgas (2002).

<sup>2</sup>Other related contributions are Guiso, Sapienza, and Zingales (2013); Lerner and Keltner (2001) on mood and risk preferences; and Ifcher and Zarghamee (2014); Pyone and Isen (2011); Drichoutis and Nayga (2013) on mood and time preferences.

backwards induction predicting otherwise (see Flood (1952) for the seminal paper, and Embrey, Fréchet, and Yuksel (2014) for a survey of the subsequent literature); nor in repeated play with an unknown end date, where neither subgame perfection nor risk dominance provide a sufficient condition for cooperation.<sup>3</sup> <sup>4</sup> What determines cooperation in the repeated PD is still, to a large extent, an unsolved puzzle.

In order to shed some light on the mechanism through which mood might affect cooperation, we need some form of controllable “happiness shock”: this would be difficult to observe in a natural setting with the effect hard to measure, but is relatively easy to observe and control in a laboratory setting. For this reason we opted for a repeated Prisoner’s Dilemma coupled with mood induction in the laboratory. Our approach is to compare the effect of induced positive and neutral mood on levels of cooperation in both the repeated PD with a known end date and with an unknown end date. Furthermore, we investigate the interaction with pre-play communication which allows us access to additional hypotheses. For instance, if positive mood induces higher level of trust we should observe higher cooperation in the sessions with pre-play communication where subjects coordinate through initial *cheap-talk*. Our key treatment is whether participants face a positive or neutral mood induction process.<sup>5</sup> We replicate this key treatment under different conditions: (a) whether participants play in a repeated Prisoner’s Dilemma with a known end round (typically called a “finite repetition” in the literature) or whether the end date is unknown (typically abbreviated to “infinite repetition” in the literature); and (b) whether participants are allowed to communicate by sending short text statements prior to interaction.

The effect of positive mood is detrimental, in the sense that subjects in the positive mood treatment cooperate less and obtain lower payoffs than subjects in the neutral mood. This happens both in the repeated PD with a known end date (where cooperation is considered irrational under Nash equilibrium) and with an unknown end date (where cooperation can occur in equilibrium). We find that pre-play communication generally increases cooperation, which is consistent with the literature (for example, Dal Bó and Fréchet (2014)), though the effect seems reduced for those in a positive mood. Therefore, our results lend support to the idea that what we defined as the “cognitive channel” dominates the “social preferences channel” when we consider the effect of positive mood on cooperative behavior under repeated interaction.

This interpretation of the data is corroborated by an analysis of the text of the pre-

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<sup>3</sup>See Dal Bó and Fréchet (2011) and Dal Bó and Fréchet (2014) for a survey of the literature.

<sup>4</sup>Results on the Prisoner’s Dilemma also extend into animal populations: for instance there exists work suggesting that animal impulsiveness reduces the incidence of cooperation (Stephens, 2002; Chia and Dubois, 2017).

<sup>5</sup>We describe this in detail later, but we note here that we used a combination of the well-known “Velten mood induction process” and music-based mood induction: see (Westermann, Spies, Stahl, and Hesse, 1996). Furthermore, we check the robustness of our main results by running two sessions with a movie clip-induced mood treatment.

play communication using a text analysis tool called Linguistic Inquiry and Word Count (Pennebaker, Francis, and Booth, 2001) created to study the emotional, cognitive and structural components present in subject’s written speech samples. This has been used widely in psychology and linguistics research to correlate individual’s mental and physical state with the words they use. For example, to measure emotional expression (Kahn, Tobin, Massey, and Anderson, 2007); to reveal political sentiment (Tumasjan, Sprenger, Sandner, and Welpe, 2010); in assessing the response to disaster (Kryvasheyev, Chen, Obradovich, Moro, Van Hentenryck, Fowler, and Cebrian, 2016) and in measuring “Theory of Mind” (Kidd and Castano, 2013). To the best of our knowledge we are the first to systematically analyze the text used in pre-pay communication between subjects in a laboratory experiment in this way. We find that, consistent with their behavior in the game, subjects in the positive mood treatment use language representing more negative and less positive emotion. Perhaps even more telling, we find that subjects in a positive mood treatment more often use the first person singular, usually considered as evidence of inward orientation.

## 2 Experimental Design

The experiment in our study consisted of three parts. In the first part, we implemented a mood induction process through which laboratory participants were induced with either a positive or neutral mood. In the second part, participants played different versions of the repeated PD. In the final part, students answered a questionnaire which consisted of intelligence, demographic, personality and risk preference questions. The experimental instructions, including the questionnaire, together with logistical details about the experimental sessions are available in the Appendix.

Our primary mood induction process (MIP) was a combination of the “Velten” MIP and a music-based MIP, following studies that have found that a combination of MIPs often has greater impact (Västfjäll, 2002). The Velten MIP is the most widely accepted and used form of MIP. In this method subjects read a series of statements describing either positive self evaluations or somatic statements. In the neutral state, participants are presented with trivial and factual statements which carry no emotional load (Velten, 1968). In our experiment we used the 50 statement version of the Velten MIP following Isen and Gorgoglione (1983). In the music MIP, subjects listened to a mood-suggestive piece of classical or modern music chosen from a list of publications that have successfully used the music MIP (Västfjäll, 2002).<sup>6</sup> Participants were provided with headphones for

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<sup>6</sup>An example of a positive statement is: “If your attitude is good, then things are good, and my attitude is good” and an example of a neutral statement is “The orient express travels between Paris and Istanbul”. A detailed list of all the statements used in the experiment is available in Appendix C. For music, in the positive treatment we used the allegro from Mozart’s *Eine Kleine Nacht Musik* and for the neutral treatment, we used the music *Aerial Boundaries* from Michael Hedges.

this part of the experiment and did not know if the other participants also read or listened to the same items. In our treatments participants read the statements and listened to the music simultaneously. The process lasted for approximately 6 minutes 45 seconds, with 7.5 seconds for reading each statement. We also used an alternative MIP in some sessions to confirm that our results were not due to the specific MIP but rather to the mood induced by the MIP. The alternative MIP was a comedy clip taken from the Charlie Chaplin movie “City Lights” following Kirchsteiger, Rigotti, and Rustichini (2006b), in the positive mood sessions and a neutral clip entitled “Abstract Shapes” following Gross and Levenson (1995) in the neutral mood sessions.

Table 1 shows the Prisoner’s Dilemma stage game used in our study, following Embrey, Fr chet te, and Yuksel (2014). The unique Nash equilibrium, which coincides with the unique dominance solvable outcome, is “Defect, Defect” offering a payoff of 39 to each player.

We explicitly study two variants of the repeated Prisoner’s Dilemma: a variant with a known end stage where participants play the game for exactly 11 rounds and the number of rounds is known to all players; and a variant with an unknown end stage where participants are told the game will be played for at least 10 rounds. In practice in the laboratory the unknown end stage treatment (unknown only from the perspective of the participants) lasted for 12, 10 and 11 rounds in the three super-games.<sup>7</sup> Participants played in only one variant each (either with a known end date or not) playing exactly three times with different partners each time (under a perfect strangers design).

In some sessions (which we label the “chat” treatment hereafter) we allow participants the opportunity to engage in pre-play communication. Communication allows participants to send “cheap talk” signals about their future choice, at least in principle, favouring coordination. In the “chat” treatments, prior to playing each of the three repeated Prisoner’s Dilemma super-games, participants were allowed to chat for 180 seconds with their partner. In the control sessions, participants were not allowed to chat and waited for 60 seconds before moving on to the next task.

After completion of the Prisoner’s Dilemma games, participants were asked to attempt 30 visual puzzles from the Raven Progressive Matrices (RPM) test (Raven et al., 2003). We allowed 30 seconds for each puzzle to be completed. Participants were paid £1 each for three randomly-chosen answers if they proved to be correct. Following the Raven test, participants completed a survey which included demographic questions. Appendix B contains the full set of instructions including the list of questions. Next, a 30-item DOSPERT questionnaire was used to elicit the risk preferences of participants (Blais and Weber, 2006) and the “BIG Five Inventory” was used to measure the personality traits of

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<sup>7</sup>The durations of 12, 10 and 11 in the treatment with an unknown end stage were set to give an average of 11, leaving the average duration the same as in the known end stage treatment. No participant took part in more than one treatment or session and so this relationship would not have been derivable to participants.

subjects following John and Srivastava (1999). Participants were also asked to recall and assess how they felt after listening to the music at the beginning of the session on a 5-point scale from “Very Happy” (coded 1) to “Not at all Happy” (coded 5): such self-reports are usually held to be a valid approach for the measurement of emotions (Robinson and Clore, 2002). A full list of personality questions and risk questions are available in appendices E and D respectively. The characteristics of the different groups in the different mood inductions is detailed in table 2. The table indicates that participants in the positive mood treatment recalled being in a significantly better mood than those in the neutral treatment suggesting that our mood induction was successful. The other characteristics are on average not significantly different.

Participants were recruited using the SONA online recruitment system at the University of Warwick. Most participants were undergraduate and postgraduate students at the university. We excluded economics students and any others with prior knowledge of game theory. In total, 490 students participated between June 2015 and May 2017 over 28 sessions, with roughly half in the positive treatment and half in the neutral treatment. A detailed description of the experimental schedule is available in Appendix A. Each session lasted for about 90 minutes and on average subjects earned £17 including a show up fee of £5. The experiment was implemented using Z-tree (Fischbacher, 2007). The Ethical Approval for the design was granted by the Humanities and Social Sciences Research Ethics Committee at the University of Warwick under the DRAW (Decision Research at Warwick) Umbrella Approval (Ref: 97/14-15).

### 3 Results

First we reiterate that our main treatment seems successful in inducing positive mood. Following convention, at the end of each section we asked participants to recall their mood after the mood induction procedure from 1 (high) to 5 (low). Stated mood in the positive mood sessions is significantly higher than in the neutral mood sessions: using a Mann-Whitney test, we find that the hypothesis that two samples are from populations with the same distribution is rejected with a  $p - value < 0.005$ .

The main result is visible in figure 1. Pooling together the treatments with and without pre-play communication, we can see that *participants in the neutral mood treatment cooperate and gain more on average than participants in the positive mood treatment, independently of whether interactions have a known or unknown end date*. Indeed, the overall pattern of cooperative behavior is remarkably similar with or without a known end date.

While the Velten procedure is the most commonly accepted method of mood induction, we also check the robustness of the main result to a different form of mood induction. In two sessions we induced mood using a movie clip. We used 5 minutes from the film “The

City of Light” by Charlie Chaplin in the positive mood session following Kirchsteiger, Rigotti, and Rustichini (2006a), and a clip of the same length entitled “Abstract Shapes” in the neutral mood session following Gross and Levenson (1995). The main results are reported in figure 3, and are not qualitatively different from the ones obtained with the Velten procedure.

Figure 2 shows cooperation rates in the four variants of the game (i.e. with pre-play communication and without, with a known end date and with an uncertain end date). We note that in all 4 treatments participants in the positive mood sessions have lower cooperation rates.

In order to analyse the determinants of cooperation in more detail, we estimate an econometric model of choice. The results are reported in table 3. First of all, we note that in the neutral mood sessions, participants are likely to be more cooperative at any round, an effect that continues throughout the 3 super-games played each session. As we might expect, communication increases cooperation in general, possibly as an aid to coordination, and this effect seems bigger when both defection and cooperation can be sustained in equilibrium as in the sessions with an unknown end date. However, this coordinating effect is weaker in the positive mood sessions. This suggests that individuals in a positive mood have, if anything, lower levels of trust in their partners, working against the “social preference channel” described in the introduction.

Table 3 seems to reveal another interesting pattern: participants in the positive mood sessions seem to be more reactive to partner choices. Periods of mutual cooperation at time  $t - 1$  seem to be more likely followed by a cooperative choice at time  $t$  among those in a positive mood. This suggests a stronger tendency to follow a common norm.

Finally, from table 4 we note that in the last period of the repeated treatment with a known end date individuals in a positive mood are less likely to cooperate than individuals in a neutral mood.

### 3.1 Text Analysis

We also analyse the text contained within the pre-play communication in the relevant sessions. In the bottom four panels of figure 4 we calculate the positive and negative emotion contained within the words included in the text messages transmitted between partners prior to the start of each super-game using text-analysis software (Pennebaker, Francis, and Booth, 2001). Details of the method and some example words and how they score are included in Appendix F. We observe that the text within the pre-play messages feature less positive emotion and more negative emotion than in the sessions with positive mood induction. Recall that mood induction occurs prior to the opportunity to engage in pre-play communication, and so the text analysis seems to be indicating that participants in the positive mood induction treatment are less positive in their dialogues with their



partners.

The “cognitive channel” described earlier lists inward-orientation as a feature of positive mood. In order to test this idea we analysed the use of the pronoun “I”, a common indicator for inward-orientation. In the first two panels of figure 4 we observe that participants in the positive mood treatment make more use of the pronoun “I” than do participants in the neutral mood treatment. This is strongly suggestive that higher levels of inward-orientation are indeed induced by positive mood as opposed to neutral mood and as suggested by the “cognitive channel”.

## 4 Concluding Remarks

Our results suggest that individuals in a more positive mood are less likely to cooperate and play less efficiently in a repeated Prisoner’s Dilemma. This supports what we described as the “cognitive channel” in the introduction, and suggests that this channel dominates the “social preferences channel” in a situation involving repeated play and strategic interaction. This is true both for the repeated Prisoner’s Dilemma with a known and unknown end date and for sessions both with and without pre-play communication. We also show that the result is not specific to a particular form of mood induction. Finally, analysis of the text used in pre-play communication suggests that those in a more positive mood use more negative language, less positive language and display greater inward-orientation (through the greater use of the “I” pronoun) than those in a neutral mood which also supports the “cognitive channel”.

These results are very different from results in the literature typically obtained in one-shot games, which do not involve strategic interaction which seem to operate more in line with what we describe as the “social preferences channel” (for instance, see (Drouvelis and Grosskopf, 2016)). A simple explanation is that repeated interaction games involve more complex tasks where cognitive ability plays a crucial role and subjects in a neutral mood are better equipped for these kind of tasks. Proto, Rustichini, and Sofianos (2014)) provides support for this reasoning.

The results in the current paper qualifies the main finding in Oswald, Proto, and Sgroi (2015): that paper suggests that better mood boosts productivity in individual experimental tasks. The current paper suggests that tasks that involve social interactions might well be better undertaken by those in a neutral mood.<sup>8</sup> Taken together the two papers suggest that individual and social dimensions of tasks need to be considered separately when considering the effect of positive mood and the right well-being policies to adopt.

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<sup>8</sup>Furthermore, a recent paper by Coviello, Deserranno, Persico, and Sapienza (2017) indicates that positive mood decreases productivity in a field experiment conducted in a call centre where distracting factors linked to the social environment can influence individuals’ performances.

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## Tables & Figures

Table 1: **Stage Game.**

	Cooperate	Defect
Cooperate	51, 51	22, 63
Defect	63, 22	39, 39

Table 2: **Differences in Means across Treatments.** Notes: † Raven data was missing from session 14 (which included 18 subjects) which accounts for the reduced value of N; † † Personality data was missing from one subject in session 4, hence N is listed as 489 rather than 490.

Variable	Neutral	Positive	Differences	Std. dev	N
Age	21.392	21.025	0.367	3.563	490
Female	.62	.642	-.022	.483	490
Extraversion	3.298	3.293	.005	.473	489††
Agreeableness	3.63	3.591	0.047	.534	490
Conscientiousness	3.555	3.507	.048	.517	490
Neuroticism	2.941	3.012	-.069	.598	490
Openness	3.416	3.342	.074	.474	490
Risk Aversion	.554	.567	-.013	.121	490
Raven†	17.509	17.504	.004	4.218	472
Stated Mood	3.632	3.771	-.139**	.792	490

Table 3: **The Effect of Mood and other Treatments on Cooperation.** The dependent variable is the choice to cooperate, sessions with and without chat are pooled together. The non cooperative outcome at  $t-1$ , i.e.  $(D, D)_{t-1}$ , is the baseline outcome. The 1st two columns refer to the 1st super-games of each session, the last two consider all three super-games together. Controls for: big 5 personality traits, gender, IQ, and risk aversion are included in the regression but not reported in the table. Panel Logit with random effect estimator. Robust Standard Errors clustered at the individual levels in brackets; \*  $p - value < 0.1$ , \*\*  $p - value < 0.05$ , \*\*\*  $p - value < 0.01$ .

	1st Supergame Infinite b/se	1st Supergame Finite b/se	All Infinite b/se	All Finite b/se
choice				
Positive Mood	-0.57508* (0.3339)	-1.45644** (0.5743)	-0.54612** (0.2694)	-0.69244** (0.3504)
Positive Mood x Chat	-0.75955** (0.3513)	0.17256 (0.4522)	-0.61901** (0.2852)	0.04545 (0.2429)
Chat	1.02885*** (0.3076)	0.76438** (0.3430)	1.22149*** (0.2274)	0.71560*** (0.1879)
Positive Mood* $(D, C)_{t-1}$	0.69451 (0.4457)	0.72023 (0.5511)	0.83207** (0.3630)	0.24292 (0.4143)
Positive Mood* $(C, D)_{t-1}$	0.49655 (0.4847)	0.21176 (0.5969)	0.23395 (0.3610)	0.19497 (0.4514)
Positive Mood* $(C, C)_{t-1}$	0.74537 (0.5725)	1.88135** (0.7559)	0.82756* (0.4446)	0.76017* (0.4474)
$(D, C)_{t-1}$	0.35557 (0.3396)	0.38957 (0.4166)	0.48841** (0.2483)	0.73471** (0.2963)
$(C, D)_{t-1}$	0.21767 (0.4149)	-0.03007 (0.5261)	0.67508*** (0.2585)	0.67519* (0.3653)
$(C, C)_{t-1}$	4.07055*** (0.4885)	3.34346*** (0.6367)	4.49532*** (0.3201)	4.12313*** (0.3551)
Clip	-0.19203 (0.2315)		-0.12501 (0.1729)	
Supergame Fixed-Effect	No	No	Yes	Yes
N	3036	1940	8280	5820

Table 4: **The Effect of Mood and other Treatments on Cooperation in the Final Round of the Finitely Repeated Treatment.** The dependent variable is the choice to cooperate, sessions with and without chat are pooled together. Logit estimator. Robust Standard Errors clustered at the session levels in brackets; \*  $p$  - value < 0.1, \*\*  $p$  - value < 0.05, \*\*\*  $p$  - value < 0.01.

	Last Rounds	
	Finite b/se	Finite b/se
choice		
Positive Mood	-0.90961*** (0.3496)	-1.06431** (0.5101)
Positive Mood x Chat		0.30032 (0.6308)
Chat	1.09662*** (0.3337)	0.92093*** (0.3384)
Openness	0.09411 (0.4405)	0.07361 (0.4491)
Conscientiousness	1.11782*** (0.3978)	1.11204*** (0.4024)
Extraversion	-0.56204 (0.5256)	-0.57259 (0.5330)
Agreeableness	-0.00221 (0.3262)	0.00540 (0.3235)
Neuroticism	0.35580 (0.2654)	0.36287 (0.2679)
Female	0.63331* (0.3722)	0.64869* (0.3823)
Raven	0.05636 (0.0579)	0.05586 (0.0576)
Risk Aversion	-0.29174 (1.6577)	-0.33302 (1.7091)
N	194	194



Figure 1: **Cooperation Rates in the Different Treatments.** The panels report the cooperation rates computed over observations in all neutral and positive mood sessions, aggregated separately for all different treatments. Only 1st super-games have been considered. Bands represent 95% confidence intervals.



Figure 2: **Cooperation Rates in the Different Treatments with and without Pre-play Communication.** The panels report the cooperation rates computed over observations in all neutral and positive mood sessions with and without pre-play communication, aggregated separately for all different treatments. Only 1st super-games have been considered. Bands represent 95% confidence intervals.



Figure 3: **Cooperation Rates in the Different Treatments with Clip Induced Mood.** The panels report the cooperation rates computed over observations in the neutral and positive clip-induced mood sessions, aggregated separately for different treatments. Only 1st super-games have been considered. Bands represent 95% confidence intervals.

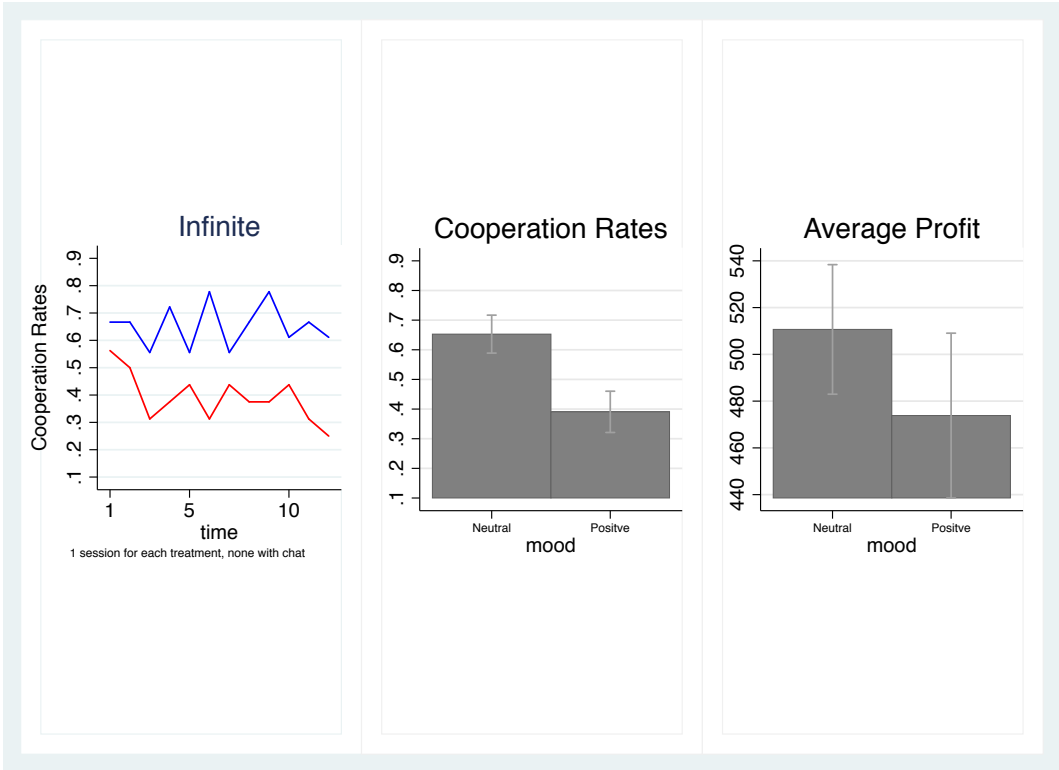
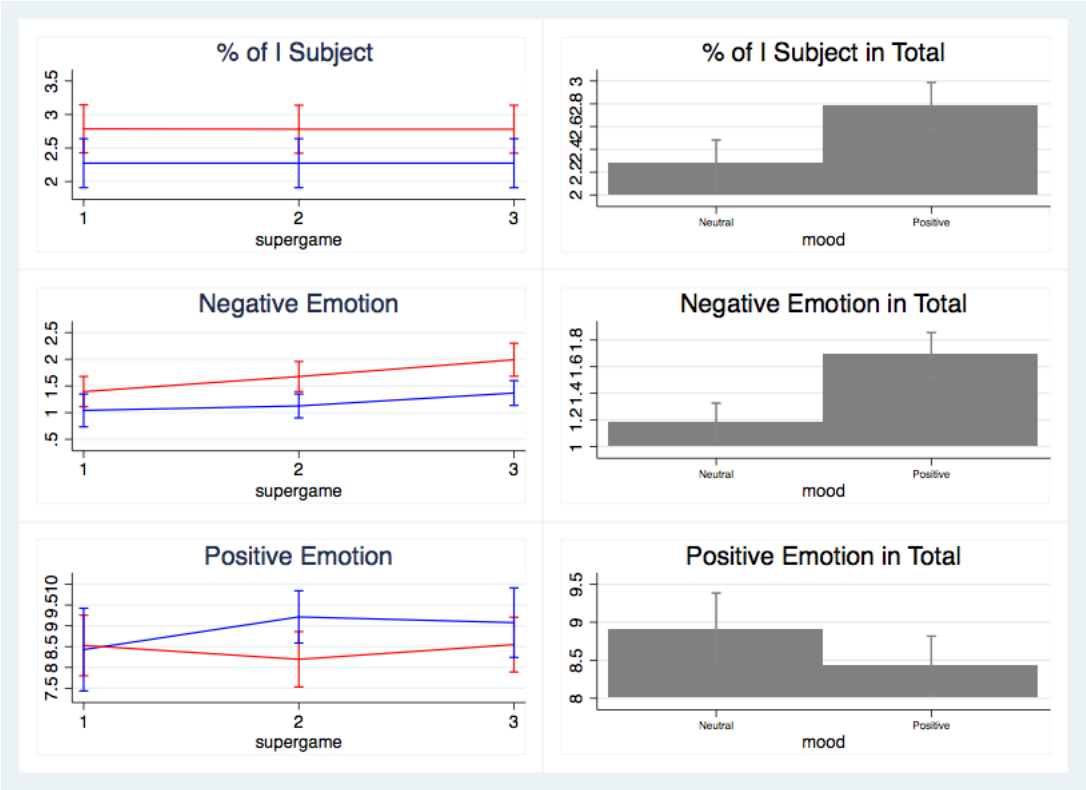


Figure 4: **Use of the Pronoun “I” and Emotions in the Text Analysis of the Pre-play Communication.** The two top panels report the percentage of pronouns “I” used in the pre-play communication at the beginning of each supergame, aggregated separately in the positive mood and neutral mood sessions. The panels in second and third row report the average positive and negative emotions calculated from the text in the pre-play communication at the beginning of each supergame. The red lines represent the positive mood sessions and the blue lines the neutral mood sessions, bands represent 95% confidence intervals.



# Appendix

## A Experiment Schedule

Table A.1: **Experimental Schedule.**

Date	Total Session	Mood	Chat	Repeated	Participants
12/06/2015	1	Happy	Yes	Infinite	18
12/06/2015	2	Neutral	Yes	Infinite	18
15/06/2015	3	Happy	Yes	Infinite	14
15/06/2015	4	Neutral	Yes	Infinite	20
15/06/2015	5	Happy	Yes	Infinite	14
16/06/2015	6	Neutral	Yes	Infinite	16
16/06/2015	7	Happy	Yes	Infinite	16
10/02/2016	8	Happy	Yes	Finite	18
10/02/2016	9	Neutral	Yes	Finite	18
10/02/2016	10	Happy	Yes	Finite	20
10/02/2016	11	Neutral	Yes	Finite	18
11/02/2016	12	Neutral	Yes	Finite	16
11/02/2016	13	Happy	Yes	Finite	18
11/02/2016	14	Neutral	No	Finite	18
11/02/2016	15	Happy	No	Finite	18
15/02/2016	16	Happy	No	Finite	16
15/02/2016	17	Neutral	No	Finite	16
16/02/2016	18	Happy	No	Finite	18
16/02/2016	19	Neutral	No	Finite	18
17/03/2016	20	Happy	No	Infinite	18
17/03/2016	21	Neutral	No	Infinite	20
26/05/2016	22	Neutral	Yes	Infinite	18
04/05/2017	23	Happy-Clip	No	Infinite	16
04/05/2017	24	Neutral-Clip	No	Infinite	18
05/05/2017	25	Happy	No	Infinite	18
05/05/2017	26	Neutral	No	Infinite	18
05/05/2017	27	Happy	No	Infinite	18
05/05/2017	28	Neutral	No	Infinite	18
				Total	490

## B Experimental Instructions

Good morning and thank you for coming to participate in our economic experiment. Before we begin, can you please confirm that the number on the card handed to you while coming in matches with the number on the cubicle that you are seated in. Just a few points before we begin:

- Please read all the instructions carefully, there are 3 parts of the experiment and detailed instructions for each part will be coming on your screen.
- In the first part, you will be asked to read some simple statements while listening to an audio track. You have been provided with headphones for this part of the experiment, you will need this only for the first part of the experiment, so you can keep it aside after that. Try turning the volume in your headphones to maximum if you cannot hear properly.
- In the second part, you will take part in decision tasks and your payoff will be based on your performance in these tasks. You will be paid for one of these tasks, randomly chosen.
- In the third and final part there will be some questions for you to answer.
- Please do not talk to each other at any point, if you have any questions, raise your hand and the experimenter will come to you.
- Also bear in mind that you may have to wait few moments during the experiment, as we want everyone to finish at the same time, you will see the message *Please wait* on your screen when this is applicable.
- Any questions? We will now begin the first part of the experiment.

### Start Mood Induction

In the first part of this experiment, you will be shown a series of screens with statements typed on them and you will hear some music in the background. The success of this part of the experiment will largely depend on your willingness to be receptive and responsive to the idea in each statement, and to allow each idea to act upon you without interference. These ideas are called suggestions.

First, as each statement appears, you will simply read it to yourself, then go over each statement again in your head with the determination and willingness to really believe it. You will try to experience each idea, you will concentrate your full attention on it and exclude other ideas which are unrelated to the mood; like, “I’ll see if this will work.” Following these statements, there will be a brief series of simple tasks to perform, and following those, there will be a brief questionnaire that you will have to answer.

### **Start PD 1**

For this part of the experiment I will explain the task on the board, please feel free to ask any questions you might have. You will also see instructions on your screen.

In this task, each of you will be randomly matched with someone in this room to make decisions in several rounds. On your screen you will see a similar screen like what is shown on the board. The computer will ask you to make a choice between C and D. Your payoff will be presented on the left table and your partner's payoff will be presented on the right table. In each table, your decisions (C or D) are represented in the rows and your partner's decisions are represented in the columns. The payoffs of each round will depend on both your decisions as well as your partner's.

For example, according to the table:

“If you choose C and your partner chooses C, your payoff will be 51 and your partner's payoff will be 51.”

“If you choose D and your partner chooses C, your payoff will be 63 and your partner's payoff will be 22.”

“If you choose C and your partner chooses D, your payoff will be 22 and your partner's payoff will be 63.”

“And finally, if you choose D and your partner chooses D, your payoff will be 39 and your partner's payoff will be 39.”

The payoffs you see in the table are in experimental units. Each unit corresponds to 30 pence. This task will be repeated for exactly 11 rounds (at least 10 rounds for the treatment with an unknown end date). You will be paid for one of these rounds, chosen randomly by the computer. Just before you play this we will allow you to chat with your partner (only for sessions with communication). Just remember to not mention your identities, if we see your names or computer ID no we will have to cancel your responses from the chat. So feel free to talk about anything (non-abusive!) and no identities.

### **Start PD 2**

Thank you for completing the task successfully! You will now be randomly matched with *a different person* in the room. You will now complete the same task with your new partner, that is, you will chat with your partner for 3 minutes in an anonymous and non-abusive manner (only in communication treatment), followed by playing the same game exactly 11 rounds (at least 10 rounds).

### **Start PD 3**

Thank you for completing the task successfully! You will now be randomly matched with *another different person* in the room. You will now complete the same task with your new partner, that is, you will chat with your partner for 3 minutes in an anonymous and non-abusive manner (only in communication treatment), followed by playing the same game exactly 11 rounds (at least 10 rounds). This is the last time you will play this. We

will then proceed to a different task.

### **Start RAVEN**

You will now perform a visual puzzle. There will be 30 puzzles for you to solve. You will be paid for three randomly selected correct answers, so you can earn up to 3 in this task. You will see an example on your screen before you begin.

### **Start Questionnaire**

Thank you. Now you will answer some questions about yourself, while we calculate your payoff from today's experiment.

- How old are you?
- What is your year of study?
- What is your gender?
- What is your country of origin?
- Is English your native language?
- In high school, what was the highest possible mark?
- What is your current degree course?
- Would you consider your degree course mostly quantitative or qualitative?
- Personality Questions (Big Five 120 questions)
- Risk preference questions (DOSPERT 30 item )
- Please recall and describe how you felt (your mood) after reading the statements and listening to music at the beginning of the experiment. (5 item Likert scale, Very happy - Not at all happy)
- How dissatisfied or satisfied are you with your life in general? (7 item Likert scale; Not satisfied at all - Completely satisfied)



## C Velten Statements

### Statements for positive mood subjects

1. Today is neither better nor worse than any other day.
2. I do feel pretty good today, though.
3. I feel light hearted.
4. This might turn out to have been one of my good days.
5. If your attitude is good, then things are good, and my attitude is good.
6. I've certainly got energy and self-confidence to spare.
7. I feel cheerful and lively.
8. On the whole, I have very little difficulty in thinking clearly.
9. For the rest of the day, I bet things will go really well.
10. I am pleased that most people are so friendly to me.
11. My judgement about most things is sound.
12. I am full of energy and ambition; I feel like i could go a long time without sleep
13. This is one of those days when I can grind out school work with practically no effort at all.
14. My judgement is keen and precise today; just let someone try to put something over on me.
15. If I set my mind to it, I can make things turn out fine.
16. I feel enthusiastic and confident now.
17. Some of my friends are so lively and optimistic.
18. I feel talkative; i feel like talking to almost anybody.
19. I am full of energy, and I am really getting to like the things I'm doing on campus.
20. I am able to do things accurately and efficiently.
21. I know good and well that I can achieve the goals I set.
22. Now that it occurs to me, most of the things that have depressed me wouldn't have if I'd just had the right attitude.
23. I have a sense of power and vigour.
24. I feel so vivacious and efficient today; sitting on top of the world.
25. It would really take something to stop me now!
26. In the long run, it's obvious that things have gotten better and better during my life.
27. I know that in the future i won't over-emphasize so-called "problems".
28. I am optimistic that I can get along very well with most of the people I meet
29. I am too absorbed in things to have time for worry.
30. I am feeling amazingly good today!
31. I am particularly inventive and resourceful in this mood.
32. I feel superb! I think I can work to the best of my ability.
33. I can find good in almost anything.

34. I feel so happy and playful today I feel like surprising someone by telling a silly joke.
35. I feel an exhilarating animation in all I do.
36. I feel highly perceptive and refreshed.
37. In a buoyant mood like this one, I can work fast and do it right the first time.
38. I can concentrate hard on anything I do.
39. My thinking is clear and rapid.
40. Life is so much fun; it seems to offer so many sources of fulfilment.
41. I feel industrious as heck; I want something to do!
42. I can make decisions rapidly and correctly and I can defend them against criticism easily.
43. Life is firmly in my control.
44. I wish somebody would play some good loud music!
45. This is great; I really do feel good, I feel elated about things.
46. I am really feeling sharp now.
47. This is just one of those days when I am ready to go!
48. I feel like bursting out with laughter; I wish somebody would tell a joke and give me an excuse!
49. I am full of energy
50. God, I feel great!

### **Statements for neutral mood subjects**

1. Oklahoma City is the largest city in the world in area, with 631.166 square miles.
2. At the end appears a section entitled "bibliography notes."
3. We have two kinds of nouns denoting physical things: individual and mass nouns.
4. This book or any part thereof must not be reproduced in any form.
5. Agricultural products comprised seventy per cent of the income.
6. Saturn is sometimes in conjunction, beyond the sun from the earth, and is not visible.
7. Some streets were still said to be listed under their old names.
8. The system is supervised by its board of regents.
9. There is a large rose-growing centre near Tyler, Texas.
10. The typography, paper and bind were of the highest quality.
11. The machine dominated county posts for as long as anyone could remember.
12. The desk was old and scratched into its surface was a profusion of dates, initials, and leading messages.
13. The Orient Express travels between Paris and Istanbul.
14. When the banyan bent down under its own weight, its branches began to take root.
15. The Hope Diamond was shipped from South Africa to London through the regular mail service.
16. The review is concerned with the first three volumes.

17. The ship was ancient, and would soon be retired from the fleet.
18. Slang is a constantly changing part of the language.
19. There is a small article in the local newspaper which indicates acceptance of the kidnappers' terms.
20. There are some forms in which no oath is required.
21. Two men dressed as repairmen will appear shortly after the van pulls up.
22. The wood was discoloured as if it had been held in a fire.
23. A light was noticed in the dark outside, and it moved eerily towards the house.
24. Painting in a few other non-European countries is treated in a separate volume.
25. Provoked arousal and orientation are accompanied by steeper negative shifts.
26. The names on the Christmas mailing list are alphabetically ordered.
27. Significantly, these changes occur during the full moon.
28. West Samoa gained its independence in 1965.
29. The magazine's report was slanted, as usual.
30. The map would prove useless as a beginning guide.
31. The speaker outlined a plan whereby the current deficits could be eliminated.
32. Black and white pictures are arranged in ten sections.
33. The papers had been front-paging it for days.
34. The notice made it clear that coffee breaks were being limited.
35. No man worked harder than he.
36. Potter wrote numerous satires on social cynicism.
37. Boeing's main plant in Seattle employs 35,000 people.
38. The doorkeeper was dressed in red.
39. During the next ten years, the group participated in politics.
40. The organization depended on the people for support.
41. In 1965, Elizabeth made the first state visit by a British monarch to Germany in 56 years.
42. It was their sixth consecutive best seller.
43. It all fitted in with the officer's story.
44. The merger did not change the company's policy.
45. The mansion was rented by the delegation.
46. Changes were made in transport of lumber after the border incident.
47. The Chinese language has many dialects, including Cantonese, Mandarin, and Wu.
48. Things were booming once again in the little cold rush town of angel.
49. At low tide the hulk of the old ship could be seen.
50. A free sample will be given to each person who enters the store.

## D DOSPERT

### The DOSPERT Scale (from Blais, & Weber, 2006)

For each of the following statements, please indicate the **likelihood** that you would engage in the described activity or behavior if you were to find yourself in that situation. Provide a rating from *Extremely Unlikely* to *Extremely Likely*, using the following scale:

1	2	3	4	5	6	7
Extremely Unlikely	Moderately Unlikely	Somewhat Unlikely	Not Sure	Somewhat Likely	Moderately Likely	Extremely Likely

1. Admitting that your tastes are different from those of a friend. (S)
2. Going camping in the wilderness. (R)
3. Betting a day's income at the horse races. (F/G)
4. Investing 10% of your annual income in a moderate growth diversified fund. (F/I)
5. Drinking heavily at a social function. (H/S)
6. Taking some questionable deductions on your income tax return. (E)
7. Disagreeing with an authority figure on a major issue. (S)
8. Betting a day's income at a high-stake poker game. (F/G)
9. Having an affair with a married man/woman. (E)
10. Passing off somebody else's work as your own. (E)
11. Going down a ski run that is beyond your ability. (R)
12. Investing 5% of your annual income in a very speculative stock. (F/I)
13. Going whitewater rafting at high water in the spring. (R)
14. Betting a day's income on the outcome of a sporting event (F/G)
15. Engaging in unprotected sex. (H/S)
16. Revealing a friend's secret to someone else. (E)
17. Driving a car without wearing a seat belt. (H/S)
18. Investing 10% of your annual income in a new business venture. (F/I)
19. Taking a skydiving class. (R)
20. Riding a motorcycle without a helmet. (H/S)
21. Choosing a career that you truly enjoy over a more secure one. (S)
22. Speaking your mind about an unpopular issue in a meeting at work. (S)
23. Sunbathing without sunscreen. (H/S)
24. Bungee jumping off a tall bridge. (R)
25. Piloting a small plane. (R)
26. Walking home alone at night in an unsafe area of town. (H/S)
27. Moving to a city far away from your extended family. (S)
28. Starting a new career in your mid-thirties. (S)
29. Leaving your young children alone at home while running an errand. (E)
30. Not returning a wallet you found that contains \$200. (E)

*Note.* E = Ethical, F = Financial, H/S = Health/Safety, R = Recreational, and S = Social.

## E BFI

### BIG FIVE INVENTORY (BFI)

#### Reference

John, O. P., & Srivastava, S. (1999). [The Big-Five trait taxonomy: History, measurement, and theoretical perspectives](#). In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (Vol. 2, pp. 102–138). New York: Guilford Press.

#### Description of Measure:

44-item inventory that measures an individual on the Big Five Factors (dimensions) of personality (Goldberg, 1993). Each of the factors is then further divided into personality facets.

The Big Five Factors are (chart recreated from John & Srivastava, 1999):

<b>Big Five Dimensions</b>	<b>Facet (and correlated trait adjective)</b>
Extraversion vs. introversion	Gregariousness (sociable) Assertiveness (forceful) Activity (energetic) Excitement-seeking (adventurous) Positive emotions (enthusiastic) Warmth (outgoing)
Agreeableness vs. antagonism	Trust (forgiving) Straightforwardness (not demanding) Altruism (warm) Compliance (not stubborn) Modesty (not show-off) Tender-mindedness (sympathetic)
Conscientiousness vs. lack of direction	Competence (efficient) Order (organized) Dutifulness (not careless) Achievement striving (thorough) Self-discipline (not lazy) Deliberation (not impulsive)
Neuroticism vs. emotional stability	Anxiety (tense) Angry hostility (irritable) Depression (not contented) Self-consciousness (shy) Impulsiveness (moody) Vulnerability (not self-confident)
Openness vs. closedness to experience	Ideas (curious) Fantasy (imaginative) Aesthetics (artistic) Actions (wide interests) Feelings (excitable) Values (unconventional)

For more information about the Big Five, visit this website:

<http://www.uoregon.edu/~sanjay/bigfive.html#where>



### Abstracts of Selected Related Articles:

Bouchard, T. J. & McGue, M. (2003). Genetic and environmental influences on human psychological differences. *Journal of Neurobiology*, 54, 4-45.

Psychological researchers typically distinguish five major domains of individual differences in human behavior: cognitive abilities, personality, social attitudes, psychological interests, and psychopathology (Lubinski, 2000). In this article we: discuss a number of methodological errors commonly found in research on human individual differences; introduce a broad framework for interpreting findings from contemporary behavioral genetic studies; briefly outline the basic quantitative methods used in human behavioral genetic research; review the major criticisms of behavior genetic designs, with particular emphasis on the twin and adoption methods; describe the major or dominant theoretical scheme in each domain; and review behavioral genetic findings in all five domains. We conclude that there is now strong evidence that virtually all individual psychological differences, when reliably measured, are moderately to substantially heritable.

Tkach, C., & Lyubomirsky, S. (2006). How do people pursue happiness?: Relating personality, happiness-increasing strategies, and well-being. *Journal of Happiness Studies*, 7, 183-225.

Five hundred ethnically diverse undergraduates reported their happiness strategies – that is, activities undertaken to maintain or increase happiness. Factor analysis extracted eight general strategies: Affiliation, Partying, Mental Control, Goal Pursuit, Passive Leisure, Active Leisure, Religion, and Direct Attempts at happiness. According to multiple regression analyses, these strategies accounted for 52% of the variance in self-reported happiness and 16% over and above the variance accounted for by the Big Five personality traits. The strongest unique predictors of current happiness were Mental Control (inversely related), Direct Attempts, Affiliation, Religion, Partying, and Active Leisure. Gender differences suggest that men prefer to engage in Active Leisure and Mental Control, whereas women favor Affiliation, Goal Pursuit, Passive Leisure, and Religion. Relative to Asian and Chicano(a) students, White students preferred using high arousal strategies. Finally, mediation analyses revealed that many associations between individuals' personality and happiness levels are to some extent mediated by the strategies they use to increase their happiness – particularly, by Affiliation, Mental Control, and Direct Attempts.

Shiota, M.N., Keltner, D., & John, O. P. (2006). Positive emotion dispositions differentially associated with Big Five personality and attachment style. *The Journal of Positive Psychology*, 1, 61-71.

Although theorists have proposed the existence of multiple distinct varieties of positive emotion, dispositional positive affect is typically treated as a unidimensional variable in personality research. We present data elaborating conceptual and empirical differences among seven positive emotion dispositions in their relationships with two core personality constructs, the "Big Five" and adult attachment style. We found that the positive emotion dispositions were differentially associated with self- and peer-rated Extraversion, Conscientiousness, Agreeableness, Openness to Experience, and Neuroticism. We also found that different adult attachment styles were associated with different kinds of emotional rewards. Findings support the theoretical utility of differentiating among several dispositional positive emotion constructs in personality research.

**Scale:**

**The Big Five Inventory (BFI)**

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement.

Disagree strongly 1	Disagree a little 2	Neither agree nor disagree 3	Agree a little 4	Agree Strongly 5
---------------------------	---------------------------	------------------------------------	------------------------	------------------------

I see Myself as Someone Who...

- |  |  |
|--|--|
| ___ 1. Is talkative                            | ___ 23. Tends to be lazy                           |
| ___ 2. Tends to find fault with others         | ___ 24. Is emotionally stable, not easily upset    |
| ___ 3. Does a thorough job                     | ___ 25. Is inventive                               |
| ___ 4. Is depressed, blue                      | ___ 26. Has an assertive personality               |
| ___ 5. Is original, comes up with new ideas    | ___ 27. Can be cold and aloof                      |
| ___ 6. Is reserved                             | ___ 28. Perseveres until the task is finished      |
| ___ 7. Is helpful and unselfish with others    | ___ 29. Can be moody                               |
| ___ 8. Can be somewhat careless                | ___ 30. Values artistic, aesthetic experiences     |
| ___ 9. Is relaxed, handles stress well         | ___ 31. Is sometimes shy, inhibited                |
| ___ 10. Is curious about many different things | ___ 32. Is considerate and kind to almost everyone |
| ___ 11. Is full of energy                      | ___ 33. Does things efficiently                    |
| ___ 12. Starts quarrels with others            | ___ 34. Remains calm in tense situations           |
| ___ 13. Is a reliable worker                   | ___ 35. Prefers work that is routine               |
| ___ 14. Can be tense                           | ___ 36. Is outgoing, sociable                      |
| ___ 15. Is ingenious, a deep thinker           | ___ 37. Is sometimes rude to others                |
| ___ 16. Generates a lot of enthusiasm          | ___ 38. Makes plans and follows through with them  |
| ___ 17. Has a forgiving nature                 | ___ 39. Gets nervous easily                        |
| ___ 18. Tends to be disorganized               | ___ 40. Likes to reflect, play with ideas          |
| ___ 19. Worries a lot                          | ___ 41. Has few artistic interests                 |

- \_\_\_\_ 20. Has an active imagination
- \_\_\_\_ 21. Tends to be quiet
- \_\_\_\_ 22. Is generally trusting
- \_\_\_\_ 42. Likes to cooperate with others
- \_\_\_\_ 43. Is easily distracted
- \_\_\_\_ 44. Is sophisticated in art, music, or literature

**Scoring:**

BFI scale scoring (“R” denotes reverse-scored items):

Extraversion: 1, 6R, 11, 16, 21R, 26, 31R, 36  
Agreeableness: 2R, 7, 12R, 17, 22, 27R, 32, 37R, 42  
Conscientiousness: 3, 8R, 13, 18R, 23R, 28, 33, 38, 43R  
Neuroticism: 4, 9R, 14, 19, 24R, 29, 34R, 39  
Openness: 5, 10, 15, 20, 25, 30, 35R, 40, 41R, 44



## F Language Analysis

We use a text analysis tool called Linguistic Inquiry and Word Count (LIWC) to study the emotional, cognitive and structural components present in subjects’ written speech samples. The LIWC determines the rate at which certain cognitions and emotions (such as positive or negative emotions) are present in the text. The framework is based on an internal default dictionary containing more than 4500 words, which has been compiled and validated using panels of human judges and statistical testing. Each *target word* (words that are read and analyzed by LIWC) is processed and if the *target word* matches the *dictionary word*, the appropriate word category scale (or scales) for that word is incremented. Each of the default LIWC2007 categories is composed of a list of dictionary words that define that scale, for example, the words *agony*, *pain* or *ugly* are counted as representatives of the construct “negative emotion”. There are over 80 output word categories and each word or word stem defines one or more word categories. For example, the word *cried* is part of five word categories: “sadness”, “negative emotion”, “overall affect”, “verb”, and “past tense verb” (Pennebaker, Francis, and Booth, 2001).

In our study we concentrate on three output categories, namely, “first person singular” (a sub-category of “pronouns”), “positive emotion” and “negative emotion” (a sub-category of “affective processes”). Table A.2 shows some examples of the dictionary categories, sample scale words, and relevant scale word counts used in our study.

Table A.2: LIWC Variable Information.

Category	Examples	Words in Category
1st Person Singular	I, I’ve, me, mine, myself	12
Positive Emotion	Love, Nice, Agreed, Profit, Play	406
Negative Emotion	Hurt, Ugly, Nasty, Bore, Problem	499

## G Additional Tables

Table A.3: **Effect of Mood and other Treatments on Cooperation in the First Round.** The dependent variable is cooperative choice. Sessions with and without chat are pooled together. Logit estimator. Robust Standard Errors clustered at the session levels in brackets; \*  $p - value < 0.1$ , \*\*  $p - value < 0.05$ , \*\*\*  $p - value < 0.01$ .

	1st Rounds			
	Infinite b/se	Infinite b/se	Finite b/se	Finite b/se
choice				
Positive Mood	-0.14669 (0.2909)	0.20029 (0.3541)	-0.52022 (0.3276)	-0.36555 (0.4075)
Positive Mood x Chat		-1.02789** (0.4997)		-0.30802 (0.5725)
Chat	0.81713** (0.3524)	1.37854*** (0.4622)	0.64080** (0.2867)	0.82327* (0.4645)
Clip	-0.68275*** (0.2501)	-0.66125** (0.2786)		
Openness	0.35176 (0.2971)	0.35428 (0.3135)	0.28767 (0.4881)	0.30207 (0.4909)
Conscientiousness	-0.00325 (0.3378)	0.03175 (0.3355)	0.00863 (0.5942)	0.01539 (0.5901)
Extraversion	0.04760 (0.3816)	0.04305 (0.3611)	-1.02918 (0.7744)	-1.02738 (0.7752)
Agreeableness	0.50822 (0.4132)	0.45158 (0.4306)	-0.62616 (0.4811)	-0.62924 (0.4840)
Neuroticism	0.42652 (0.3397)	0.42220 (0.3272)	0.23465 (0.3024)	0.21786 (0.3085)
Female	-0.20244 (0.3540)	-0.18680 (0.3663)	0.38130 (0.5248)	0.37260 (0.5243)
Raven	0.02418 (0.0365)	0.01749 (0.0354)	0.16793*** (0.0521)	0.16816*** (0.0518)
Risk Aversion	-1.45846 (1.5519)	-1.40080 (1.6063)	0.71279 (1.1536)	0.76790 (1.1577)
N	277	277	194	194