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Happiness and Cooperation

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Happiness and Cooperation*

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Abstract

According to existing research across several disciplines (management, psychology, economics and neuroscience), positive mood can have positive effects, engendering more altruistic, open and helpful behaviour, but can also work though a more negative channel by inducing inward-orientation, assertiveness, and reduced use of information. This leaves the impact on cooperation in interactive and strategic situations unclear. We find evidence from 490 participants in a laboratory experiment suggesting that participants in an induced positive mood cooperate *less* in a repeated Prisoner's Dilemma than participants in a neutral setting. This is robust to the number of repetitions or the inclusion of pre-play communication. In order to understand *why* positive mood might damage the propensity to cooperate, we conduct a language analysis of the pre-play communication between players. This analysis indicates that subjects in a more positive mood use more inward-oriented and more negative language which supports the negative channel.

JEL codes: C72 (cooperative games), C91 (laboratory experiments), D91 (role and effects of psychological, emotional, social, and cognitive factors on decision making), J24 (productivity), J28 (life satisfaction)

Keywords: positive mood, affect, happiness, mood induction procedures, co-operation, repeated Prisoner's Dilemma, social preferences, social dilemmas, cognitive skills, productivity, inward-orientation, language analysis

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1 Introduction

In the last 40 years (in the psychology, neuroscience and management literatures) the role of mood and emotion has been seen as increasingly important in any attempt to understand behaviour: something that has been dubbed the "affective revolution" (Barsade and Gibson (2007)). This notion is reflected in the work of psychologists and neuroscientists (for instance, Damasio (1994), Ralph and Damasio (2000), Forgas (2002) and Fischer et al. (2008)) who have provided a wealth of evidence that mood and emotions are an essential and adaptive component of social behaviour. There is a growing body of work that recognises the important links between emotion and decision-making (Loewenstein and Lerner (2003) and Loewenstein and Rick (2008)), emotion and social interaction (for instance, with E and D (2005) who discuss the role of punishment as a form of emotional expression, or Heilman et al. (2010), who discuss emotion regulation) or emotion in the workplace (for instance Oswald et al. (2015) who find positive mood raises productivity). In this paper we will try to assess the effect of positive mood ("happiness") on cooperation under *repeated* interactions.[1]

The problem of obtaining cooperation in a group is part of a broader literature on social dilemmas that explores the tension between actions that are supported by individual rationality and the resulting damage to group-welfare that comes through those actions. This is perhaps most sharply demonstrated in the Prisoner's Dilemma, the most well-known and perhaps most heavily studied game that captures the conflict between short-term losses and the long-term benefit of cooperation. Motivated by a desire to understand behaviour in the face of this underlying conflict, the study of social dilemmas has been a preoccupation of economists and social scientists for almost two centuries: at least as far back as William Foster Lloyd's seminal paper on the tragedy of the commons. What has become apparent is that while individual rationality may make cooperation difficult in theory, in practice many institutions that need cooperation to function are able to do so: a point made forcefully through the field studies of Elinor Ostrom and others (Ostrom (1990)). It has also been argued that mitigating the cooperation problem is part of the rationale for the existence of firms in a capitalist economy (Greif (2000)). Investigating cooperation has been the subject of controlled experimental study since the 1950s and laboratory-based evidence has emphasized the fact that conventional theory does not offer clear guidance. In repeated play of the Prisoner's Dilemma when the end date is known, cooperation frequently occurs despite backwards induction predicting otherwise (see Flood (1952) for the seminal paper, and Embrey et al. (2014) for a survey of the

[1]Within psychology, emotions are normally considered very short-run responses to stimulus (in the ranges of seconds or at most minutes) while moods are considered to be "emotional states" that persist for much longer: minutes, hours or even days.

subsequent literature). This also carries through to repeated play with an unknown end date, where neither subgame perfection nor risk dominance provide a sufficient condition to rule out cooperation. The role of repetition in admitting cooperation as a plausible rational response is crucial for us in allowing us to go beyond characterising play as rational or not and also allows us to consider the very different real-world settings captured by repeated play: frequent interaction, reputation-building, learning about your partner and the role of implied punishments. Communication also becomes more powerful in a setting where there are multiple equilibria as in the repeated Prisoner's Dilemma. See Dal Bó and Fréchette (2011) and Dal Bó and Fréchette (2014) for a survey of the vast and complex literature on repeated play.[2]

While there is no work that is directly relevant to the question of how mood affects the likelihood of cooperation in the repeated Prisoner's Dilemma, the following papers may provide some guidance. Oswald et al. (2015) show that experimentally inducing positive mood seems to invigorate individuals, leading them to exert more effort in simple individual tasks; however, their chosen task was of the single-shot non-interactive variety and so has little to say about cooperation or social interaction more generally.There is also a large psychology literature which investigates the impact of positive mood on problem solving and negotiation (Carnevale and Isen (1986), Isen et al. (1987) and Isen (2008)). Classic studies in psychology have shown that positive mood produces more open, altruistic and helpful behaviour (Isen (1970) and Isen and Levin (1972)) other work links altruism to cooperative behaviour (Burkart et al. (2014)). These studies are also consistent with the more recent experimental 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 (for instance Kirchsteiger et al. (2006), Capra (2004) and Dunn and Schweitzer (2005)). Work of this sort might suggest that positive emotion could increase cooperation. While the effects described in this literature might work through social preferences, beliefs or elsewhere, they share the common feature in that they provide some channels through which positive mood might boost cooperation. For this reason we refer to this potential mechanism as the "positive channel".

In contrast, there is empirical research that suggests people experiencing a positive mood are more assertive and inward-oriented, use less information and more stereotypes, and avoid demanding, systematic thinking (see Schwarz (2013) and Forgas (1998)). There is also work that shows cognitive skills heavily positively affect cooperation in the re-

[2]Alongside repeated play by the same pair of individuals which we can consider a single supergame, we also allow three separate supergames: in this setup we can also check whether play changes across supergames as players learn about the game over time, as distinct from learning about their partner.

peated Prisoner's Dilemma (Proto et al. (2017)). Perhaps the most relevant of all is work on "mood maintenance" which refers to the idea that people try to preserve the state of their mood, especially positive mood (see Isen and Geva (1987). Isen 1970 and Isen and Levin 1972). In essence those with a higher mood have more to risk when considering cooperation which requires them to trust the other player and involves a chance of receiving a very low payoff: the individually rational strategy that does not involve attempting to secure cooperation by contrast involves a safer payoff. Taken as a whole this literature might lead us to hypothesize that positive emotion *reduces* cooperation. Since this competing mechanism is much more negative about the relationship between mood and cooperation we will refer to this potential mechanism as "negative channel".

Not all work fits cleanly into either channel and indeed many present a very nuanced set of findings: take for instance Drouvelis and Grosskopf (2016) who suggest that happier individuals are better contributors (in a one-shot setting) than angry individuals but also find no significant difference in behaviour between positive mood and neutral mood.

To go further and to shed light on how mood might affect cooperation directly, we need some form of controllable "happiness shock": this would be difficult to observe and measure in nature, but is relatively easy to observe and control in a laboratory. Our key treatment is whether participants face a positive or neutral mood-induction process. We use a commonly accepted method of mood induction known as the "Velten procedure", which uses a series of positive or neutral statements which we combine with music taken from the literature on mood induction (see Velten (1968) and Västfjäll (2002)). We also test robustness to another commonly used mood-induction procedure (the use of movie clips following Kirchsteiger et al. (2006) and Oswald et al. (2015)). We discuss mood induction in much greater detail in the experimental design section below.[3] We replicate this key treatment under different conditions: (a) whether participants play in a repeated Prisoner's Dilemma with a known end round or whether the end date is unknown; and (b) whether participants are allowed pre-play communication (short texts sent prior to interaction). Full details of the experimental instructions are presented in part A of the appendix.

Our results indicate that participants in an induced positive mood tend to be less cooperative than the control group. Since the Prisoner's Dilemma rewards those who are willing to cooperate in the long-run, we find that participants in a positive mood also achieve correspondingly lower payoffs. We might wonder if this is due to higher levels of rationality, recalling that in a finitely repeated Prisoner's Dilemma cooperation is strictly dominated. However, we also find lower levels of cooperation in repeated settings

[3]To be precise, note that throughout the paper whenever we refer to the impact of positive mood we mean the treatment effect generated by our mood induction procedure.

where the number of repetitions is unknown to participants, and where cooperation is then no longer strictly dominated. This suggests that the lower levels of cooperation among those who have undergone positive mood induction is not generated by a greater propensity to act rationally. We also check if this is robust to introducing communication between players, in order to check whether individuals who faced positive mood induction might find it easier to communicate effectively. However, if anything the addition of pre-play communication makes cooperation less likely for subjects who faced positive mood-induction. In order to better understand our results we make use of the text generated by participants during pre-play communication. In particular, using methods from psychology but novel in economics (Pennebaker et al. (2001)) we perform an analysis of the text and find that *subjects in a more positive mood tend to use more inward-oriented and more negative language* which supports our own findings and provides support for the "negative channel"' outlined above.

The paper continues with section 2 which presents the experimental design. Most of the results are presented in section 3, while the language analysis is reserved for section 4. Some concluding remarks are presented in section 5. The full experimental instructions are provided in the appendix.

2 Experimental Design

The experiment in our study consisted of three parts. In the first part, we implemented a mood-induction process through which 490 laboratory participants were induced with either a positive or neutral mood. In the second part, the same participants played different versions of the repeated Prisoner's Dilemma. In the final part, the participants answered a questionnaire which consisted of intelligence, demographic, personality and risk preference questions. The experimental instructions, including the questionnaire, are shown in part A of the Appendix. Logistical details are provided in table 1 below.

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 (see for instance Västfjäll (2002)). The Velten MIP is the most widely accepted and used form of MIP. In this method participants 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

Table 1: **Experimental Schedule.** The table details the dates and details of the key experimental sessions. Unless otherwise mentioned mood induction was performed using a combination of Velten statements and music. The number of repetitions of the PD were either known or unknown and communication (chat) was allowed or not.

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

that have successfully used the music MIP (Västfjäll (2002)).[4] Participants were provided with headphones for 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 et al. (2006) in the positive mood sessions, and a neutral clip entitled "Abstract Shapes" following Gross and Levenson (1995) in the neutral mood sessions.

Table 2 shows the Prisoner's Dilemma stage game used in our study, following Embrey et al. (2014). The unique Nash equilibrium, which coincides with the unique dominance solvable outcome, is "Defect, Defect" offering a payoff of 39 to each player.

Table 2: **Stage Game.**

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

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.[5] 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).

[4] 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 part B of the Appendix. 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* by Michael Hedges.

[5] The durations of 12, 10 and 11 in the treatment with an unknown end stage were randomly determined in advance and set to give an average of 11, leaving the average duration the same as in the known end stage treatment. Note that any finite repetition of the game admits only one Nash equilibrium: defect in every period, while a repetition with an unknown end date does allow cooperation to be sustained as part of a Nash equilibrium. Including both settings therefore allows us to check whether the availability of cooperation as part of a Nash equilibrium changes behaviour. In our experiment, no participant took part in more than one treatment or session and so this relationship would not have been derivable to participants.

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. Part A of the Appendix gives 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 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 D and C respectively.

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 over 28 sessions, with roughly half in the positive mood treatment and half in the neutral mood treatment. 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)).

3 Results

Our first check is whether our main treatment successfully induces positive mood. Following (Oswald et al. (2015)) at the end of each experimental session we asked participants to recall their mood after the mood induction procedure.[6] The characteristics of the different

[6]Asking participants to state their mood immediately after mood induction would undoubtedly have boosted our chances of detecting a statistically significant difference between the two treatments, but would also possibly have stimulated an experimental demand effect through which subjects might have tried to second guess our objectives.

groups in the different mood inductions is detailed in table 3. The table indicates that participants in the positive mood treatment *recalled* being in a statistically significantly (at the 5% level) better mood than those in the neutral treatment suggesting that our mood induction was successful: since mood was been scaled to be between 1 and 5 the effect represents a rise of about 3.5 percentage points in stated mood even though the request for them to recall their mood took place towards the very end of the experiment). Stated mood in the positive mood sessions is significantly higher than in the neutral mood sessions: using a Mann-Whitney test, we reject the hypothesis that the two samples are from populations with the same distribution with a $p-value < 0.005$. Having established that the treatment was statistically significant, we focus on the traditional treatment effect (rather than using recalled mood) in the results to follow. As expected, the other characteristics are on average not statistically significantly different.

Table 3: **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.* $p-value < 0.1$, ** $p-value < 0.05$, *** $p-value < 0.01$.

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

We begin with a focus on behaviour in the very first round of each supergame. We see from table 4, which presents this analysis (pooling sessions with and without chat), that mood does not have a statistically significant effect at the start of each supergame. This provides some explanation for why studies that look at only single-shot Prisoners'

Dilemma (which by their nature are investigating a very different form of interaction from any study of repeated interaction) may not see such a strong role for mood.

Table 4: **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	Infinite	Finite	Finite
	b/se	b/se	b/se	b/se
choice				
Positive Mood	–0.14669	0.20029	–0.52022	–0.36555
	(0.2909)	(0.3541)	(0.3276)	(0.4075)
Positive Mood x Chat		–1.02789**		–0.30802
		(0.4997)		(0.5725)
Chat	0.81713**	1.37854***	0.64080**	0.82327*
	(0.3524)	(0.4622)	(0.2867)	(0.4645)
Clip	–0.68275***	–0.66125**		
	(0.2501)	(0.2786)		
Openness	0.35176	0.35428	0.28767	0.30207
	(0.2971)	(0.3135)	(0.4881)	(0.4909)
Conscientiousness	–0.00325	0.03175	0.00863	0.01539
	(0.3378)	(0.3355)	(0.5942)	(0.5901)
Extraversion	0.04760	0.04305	–1.02918	–1.02738
	(0.3816)	(0.3611)	(0.7744)	(0.7752)
Agreeableness	0.50822	0.45158	–0.62616	–0.62924
	(0.4132)	(0.4306)	(0.4811)	(0.4840)
Neuroticism	0.42652	0.42220	0.23465	0.21786
	(0.3397)	(0.3272)	(0.3024)	(0.3085)
Female	–0.20244	–0.18680	0.38130	0.37260
	(0.3540)	(0.3663)	(0.5248)	(0.5243)
Raven	0.02418	0.01749	0.16793***	0.16816***
	(0.0365)	(0.0354)	(0.0521)	(0.0518)
Risk Aversion	–1.45846	–1.40080	0.71279	0.76790
	(1.5519)	(1.6063)	(1.1536)	(1.1577)
N	277	277	194	194

The main result is visible in figure 1 below. Pooling together the treatments with and without pre-play communication, we can see that *participants in the neutral mood treatment cooperate more and gain more on average than participants in the positive mood treatment.*

Figure 1: **Cooperation Rates in the Different Treatments with Velten/Music Mood Induction.** The panels report the cooperation rates computed over observations in all neutral and positive mood sessions (where mood was induced via the Velten/music mood induction procedure), aggregated separately for all different treatments. Only 1st super-games have been considered. Bands represent 95% confidence intervals and indicate statistical significance across the neutral and positive mood sessions in all four bar graphs. In the left-most graphs the higher lines (in blue) corresponds to the neutral induction sessions, while the lower lines (in red) correspond to the positive mood sessions.

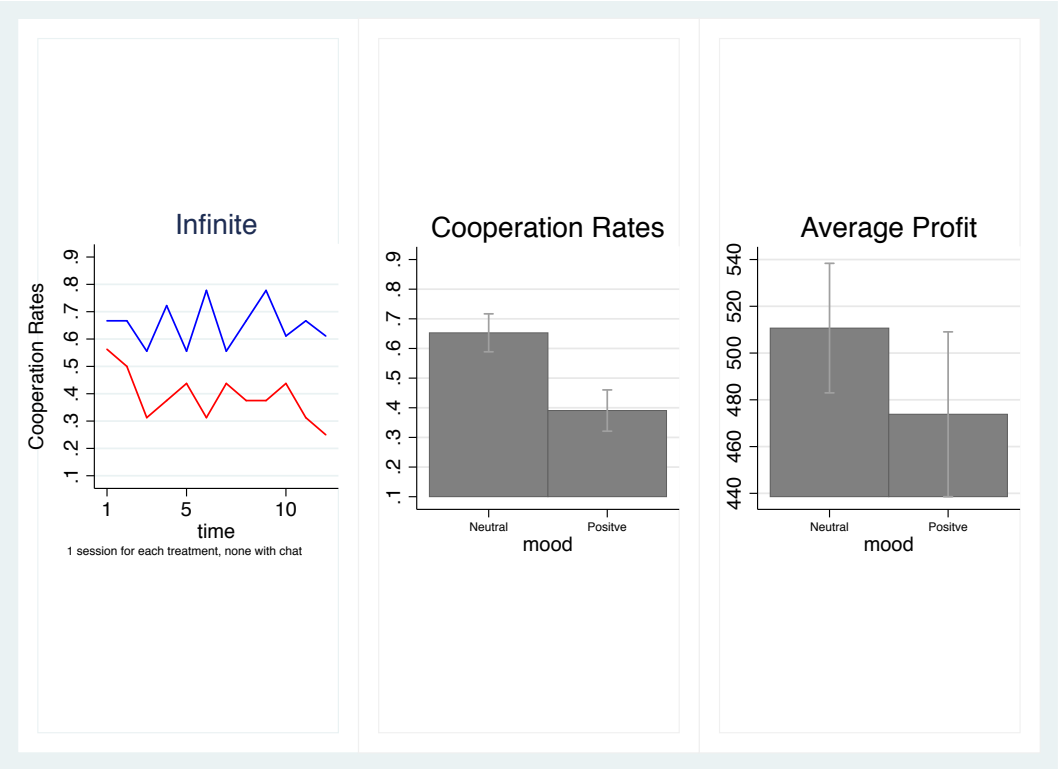
Moreover, the overall pattern of cooperative behaviour in figure 1 is remarkably similar with or without a known end date. Following the discussion in the design section, this suggests that the effect of mood does not hinge on whether cooperation can form part of a Nash equilibrium strategy or not.

The result is also robust to the inclusion of pre-play communication as shown in figure 2 below where we observe that participants in the positive mood sessions have lower cooperation rates in all four variants of the game (with pre-play communication and without, with a known end date and with an uncertain end date).

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 and indicate statistical significance across the neutral and positive mood sessions in all four bar graphs.

We also check the robustness of the main result to the use of movie clips as an alternative form of mood-induction: 5 minutes from the film "City Lights" by Charlie Chaplin in the positive mood session following Kirchsteiger et al. (2006), and a clip of the same length entitled "Abstract Shapes" in the neutral mood session following Gross and Levenson (1995). The results are reported in figure 3 and are not qualitatively different from the ones obtained with the Velten procedure.

Figure 3: **Cooperation Rates in the Different Treatments with Movie Clip Mood Induction.** 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 and indicate statistical significance across the neutral and positive mood sessions in both bar graphs.In the left-most graph the higher lines (in blue) corresponds to the neutral induction sessions, while the lower lines (in red) correspond to the positive mood sessions. Notice that there was no communication in the movie clip treatment sessions and so cooperation levels are generally lower than in Figure 1.



In order to analyse the determinants of cooperation in more detail, we estimate an econometric model of choice reported in table 5. 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 greater 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.

Table 5 seems to reveal another 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. There is also a general tendency for cooperation to decline over time as shown by the negative

Table 5: **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		All	
	Infinite	Finite	Infinite	Finite
	b/se	b/se	b/se	b/se
choice				
Positive Mood	–0.56547*	–1.49871**	–0.53989*	–0.79198**
	(0.3420)	(0.5829)	(0.2762)	(0.3621)
Positive Mood x Chat	–0.78545**	0.19443	–0.62746**	0.01757
	(0.3663)	(0.4616)	(0.2977)	(0.2571)
Chat	1.09138***	0.80316**	1.29828***	0.82561***
	(0.3256)	(0.3562)	(0.2373)	(0.1996)
Positive Mood*$(D,C)_{t-1}$	0.65029	0.67413	0.80840**	0.18066
	(0.4523)	(0.5735)	(0.3727)	(0.4446)
Positive Mood*$(C,D)_{t-1}$	0.46750	0.15466	0.19812	0.13873
	(0.4822)	(0.5928)	(0.3589)	(0.4518)
Positive Mood*$(C,C)_{t-1}$	0.71519	1.91939**	0.81483*	0.90227*
	(0.5841)	(0.7749)	(0.4546)	(0.4692)
$(D,C)_{t-1}$	0.28500	0.20606	0.39691	0.47620
	(0.3484)	(0.4310)	(0.2534)	(0.3089)
$(C,D)_{t-1}$	0.09711	–0.22144	0.56572**	0.38979
	(0.4218)	(0.5073)	(0.2548)	(0.3645)
$(C,C)_{t-1}$	3.99875***	3.25483***	4.41930***	3.99866***
	(0.5142)	(0.6578)	(0.3268)	(0.3764)
Clip	–0.21722		–0.16430	
	(0.2435)		(0.1809)	
Period	–0.05751***	–0.10412***	–0.09343***	–0.18652***
	(0.0184)	(0.0306)	(0.0146)	(0.0266)
Supergame Fixed-Effect	No	No	Yes	Yes
N	3036	1940	8280	5820

and significant period variable (which tracks the number of periods of play). We also report in table 6 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.

Table 6: **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	Finite
	b/se	b/se
choice		
Positive Mood	–0.90961***	–1.06431**
	(0.3496)	(0.5101)
Positive Mood x Chat		0.30032
		(0.6308)
Chat	1.09662***	0.92093***
	(0.3337)	(0.3384)
Openness	0.09411	0.07361
	(0.4405)	(0.4491)
Conscientiousness	1.11782***	1.11204***
	(0.3978)	(0.4024)
Extraversion	–0.56204	–0.57259
	(0.5256)	(0.5330)
Agreeableness	–0.00221	0.00540
	(0.3262)	(0.3235)
Neuroticism	0.35580	0.36287
	(0.2654)	(0.2679)
Female	0.63331*	0.64869*
	(0.3722)	(0.3823)
Raven	0.05636	0.05586
	(0.0579)	(0.0576)
Risk Aversion	–0.29174	–0.33302
	(1.6577)	(1.7091)
N	194	194

We have seen that our results are robust to whether repetition is with a known or unknown end date and that the impact is sustained to the very last round of each supergame. This suggests that it is only across the entire supergame (up to and including in the final round) that the effect of mood becomes visible.

4 Language Analysis

We allow pre-play communication in some sessions, and in particular this comes soon after mood induction and just prior to playing the repeated PD. Given the timing of the communication there is scope for the conversation to play an important role in what is

to follow: and moreover, we are able to perform a novel and direct analysis of the text used by participants, differentiating between those who face positive mood induction and those who experienced neutral mood induction.

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 ((Pennebaker et al., 2001)). The LIWC determines the rate at which certain cognitive processes 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 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".

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 7 shows some examples of the dictionary categories, sample scale words, and relevant scale word counts used in our study.

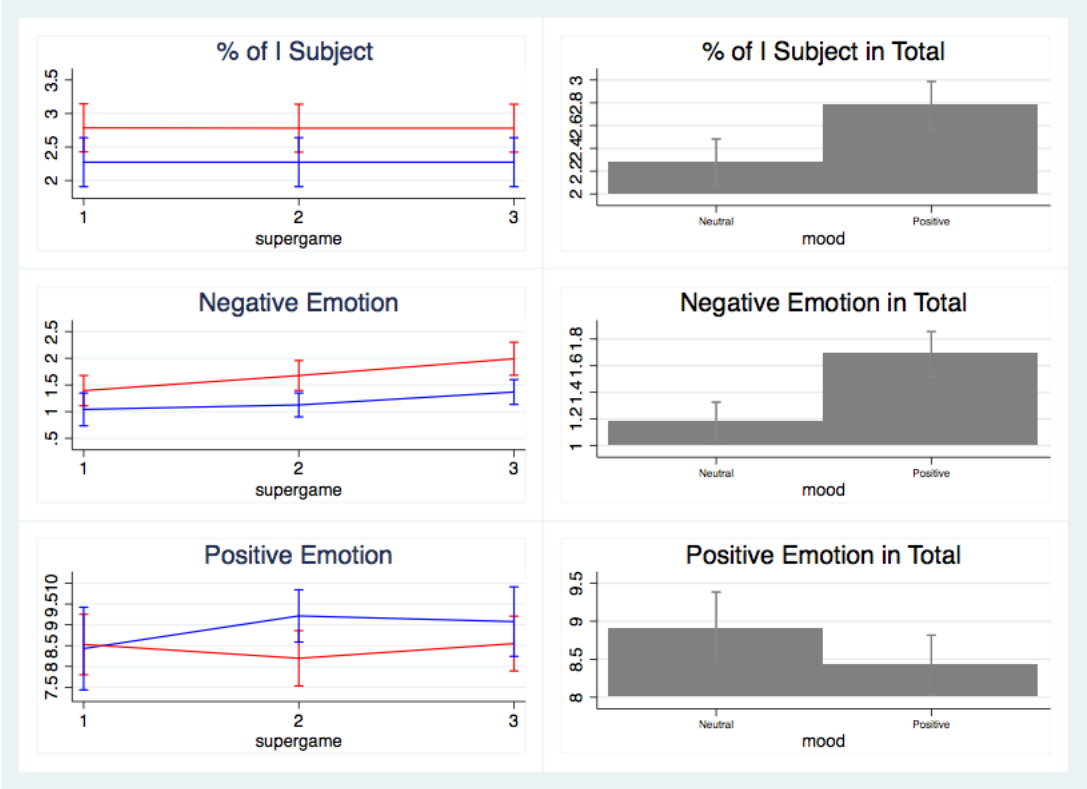
Table 7: **LIWC Variable Information.**

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

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 the text-analysis software. We observe that the text within pre-play messages featured less positive emotion and more negative emotion than in the sessions with positive mood induction. Since mood induction occurs prior to pre-play communication, the text analysis seems to indicate that participants in the positive mood induction treatment are more negative in their dialogues with their partners

(the story on the positivity of words is less clear with a statistically significant difference between treatments only in the second supergame).

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. Bands represent 95% confidence intervals and indicate statistical significance in all fur of the bar charts, and in the top two line graphs: in the bottom line graph there is overlap in the 1st and 3rd supergame indicating that positive emotion is not detectably different in those cases. The red lines represent the positive mood sessions and the blue lines the neutral mood sessions.



The "negative 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.[7]

[7]Velten statements are typically written in the first-person and so might prime individuals to use similar first-person statements in their communication with others, therefore bolstering the measured level of inward-orientation in the language analysis. We counter this problem by also checking whether the movie-clip mood induction treatment (which included no statements, first-person or otherwise) also generates a statistically significant difference in inward-orientation between the neutral and positive mood sessions and find that it does: results are presented in the Appendix in Table A.1

5 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 "negative channel" in the introduction, and suggests that this channel dominates the "positive 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. The result holds right through to the final round of play, though it does not hold if we analyse only the very first round of each supergame.

A novel analysis of the text used in pre-play communication, to our knowledge the first of its kind in an economics laboratory experiment, suggests that those in a more positive mood use more negative language and display greater inward-orientation (through the greater use of the "I" pronoun) than those in a neutral mood which also supports the "negative channel". We confirm that inward orientation is not specific to any one form of mood induction (it applies equally well to the use of movie clips or Velten statements and music) an our language analysis is. Our findings also support the concept of "mood maintenance" which explains why those with a higher level of happiness might shy away from the risks involved in cooperation: they have more to lose and less to gain compared to those at lower levels of happiness: this is most apparent when looking at the choice of defect where positive mood is associated with a 7.2 percentage point reduction (p-value 0.0232) in the cooperation.

These findings are very different from results in the literature typically obtained in one-shot games or which do not involve strategic interaction. A simple explanation (supported by Proto et al. (2017)) is that repeated-interaction games involve more complex tasks where cognitive ability plays a crucial role. Taken together with one of the key findings in the "negative channel" described earlier, that cognitive ability may be negatively related to positive mood, this might explain why subjects in a neutral mood are better equipped for more complex strategic settings.

Finally, we should note that in our study we were specifically interested in the impact of general positive or neutral mood shocks and so elected to have everyone within a session face the same shock. Randomization then occurred across sessions not within sessions. This works well if we wish to consider a situation where everyone faces the same shock. Our work is not well-placed to study situations where individuals face different shocks and in judging how these might interact, for instance if one player has recently become happier while another has not. This is a potential topic for future study.

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Appendix

A 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 if 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)

B 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.

C 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.

D 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):

Big Five Dimensions	Facet (and correlated trait adjective)
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	Disagree a little	Neither agree nor disagree	Agree a little	Agree Strongly
1	2	3	4	5

I see Myself as Someone Who...

____1. Is talkative

____2. Tends to find fault with others

____3. Does a thorough job

____4. Is depressed, blue

____5. Is original, comes up with new ideas

____6. Is reserved

____7. Is helpful and unselfish with others

____8. Can be somewhat careless

____9. Is relaxed, handles stress well

____10. Is curious about many different things

____11. Is full of energy

____12. Starts quarrels with others

____13. Is a reliable worker

____14. Can be tense

____15. Is ingenious, a deep thinker

____16. Generates a lot of enthusiasm

____17. Has a forgiving nature

____18. Tends to be disorganized

____19. Worries a lot

____23. Tends to be lazy

____24. Is emotionally stable, not easily upset

____25. Is inventive

____26. Has an assertive personality

____27. Can be cold and aloof

____28. Perseveres until the task is finished

____29. Can be moody

____30. Values artistic, aesthetic experiences

____31. Is sometimes shy, inhibited

____32. Is considerate and kind to almost everyone

____33. Does things efficiently

____34. Remains calm in tense situations

____35. Prefers work that is routine

____36. Is outgoing, sociable

____37. Is sometimes rude to others

____38. Makes plans and follows through with them

____39. Gets nervous easily

____40. Likes to reflect, play with ideas

____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

Table A.1: **Differences in mean use of 'I' in text across Treatments. The results reported are based on the sessions where video clips were used to induce positive and neutral mood**.* $p-value < 0.1$, ** $p-value < 0.05$, *** $p-value < 0.01$.

Variable	Neutral	Positive	Differences	Std. dev	N
Use of I	3.081	4.106	-1.024**	0.619	40