ESSAYS ON

CONTEXT-DEPENDENT PREFERENCES

AND ON CHOICE ARCHITECTURE

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PAPER STATUS AND MY CONTRIBUTIONS

Chapter 1 presents an introduction into this dissertation. It introduces the underlying conceptual approach which studies context-dependent preferences from the perspective of psychological motives. A rationale is given why this approach of context-sensitive motives is useful for economic analysis. The introduction also embeds the research papers of this dissertation into the conceptual framework and relates them to the relevant literatures. It was written exclusively by me.

Chapter 2 is based on the paper *The Influence of Induced Care and Anger Motives on Behavior, Beliefs and Perceptions in a Public Goods Game, Kiel Working Paper No. 2054, (2016)*, which is joint work by Steven J. Bosworth, Dennis J. Snower and Gabriele Chierchia. I contributed substantially to the design of the experiment, execution of the experiment, analysis of the experimental data, execution of the literature review, formulation of the theoretical argument and the writing of the paper. The working paper version can be found under:

https://www.econstor.eu/bitstream/10419/147036/1/87091684X.pdf

The paper is published in *Theory and Decision, 86(2), 205-238, (2019).*

Chapter 3 is based on a joint paper with Felix Gelhaar which is titled *When does Team Remuneration Work? An Experimental Study on Interactions between Workplace Contexts, Kiel Working Paper No. 2105, (2018).* I contributed towards the design of the experiment which includes the theoretical structure and the parametrization, execution of the experiment, analysis of the experimental data, execution of the literature review and the writing of the paper. The paper was awarded the *"Heinz Sauermann-Förderpreis"* in 2017. The working paper version can be found under:

https://www.econstor.eu/bitstream/10419/178703/1/1023169525.pdf

The paper is in preparation for submission.

Chapter 4 presents the paper *Social Comparison Nudges – Guessing the Norm Increases Charitable Giving, Economics Letters, 152, 73-75, (2017)* where I collaborated with Andreas Friedl, Felix Gelhaar and Laura Reh. I contributed extensively to the design of the experiment, analysis of the experimental data which includes the robustness analysis, execution of the literature review and the writing of

the paper. The working paper version can be found under: https://www.econstor.eu/bitstream/10419/148009/1/872467724.pdf

The paper is published in *Economics Letters*.

Chapter 5 consists of my single-authored paper *Textual Analysis of Narratives in the Context of a Public Goods Experiment.*

The paper is in preparation for submission.

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CHAPTER 1

INTRODUCTION

This dissertation studies context-dependent preferences with a focus on the interactions between motives, context and behavior. Within motivation psychology, the term "motive" commonly describes the tendency to experience certain types of incentives as pleasurable and therefore give energy and direction to one's behavior (Schultheiss and Brunstein, 2010). Motives are rooted in both personality characteristics (McClelland, 1965; Utz, 2004) and contextual stimuli of the environmental situation (Roberts and Pomerantz, 2004; for a review see Heckhausen and Heckhausen, 2010) and hence trait- and state-dependent. A long-lasting research tradition in psychology posits that various discrete motives exist that humans have access to (Mischel and Shoda, 1995; Brunstein and Maier, 2005; Fodor et al., 2006; Schultheiss and Brunstein, 2001). The psychological evidence therefore shows that individual behavior is determined by different discrete motives which are dependent on personality characteristics as well as the surrounding context. These insights and their implications have so far not been sufficiently investigated in economics.

Traditionally, economists sought to explain microeconomic behavior by preferences and strategic incentives (e.g. in a game) which also contain the constraints that the decision-maker faces. In this framework, behavioral changes are explained by the reaction of optimizing agents to changes in prices, information or technology. Based on insights from psychology, this dissertation investigates whether different discrete motives are connected with different preferences. In particular, the impact of the context-sensitive motives care, anger and wanting / resource-seeking on behavior in social dilemma situations is studied. Moreover, this dissertation also treats achievement, affiliation, fear and power / status-seeking motives[1] and connects the study of motives with narratives and choice architecture.

In addition to the influence on behavior, motives were also found to have a significant impact on beliefs and perceptions. Beliefs describe our subjective priors, or expectations about the behavior of others before their behavior could be observed. Economists have long argued that beliefs are an important source of influence for economic decisions (Fischbacher and Gächter,

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[1] Note that the motives that are studied within this thesis do not present an exhaustive list of motives, since psychologists have identified a multitude of discrete and context-sensitive motives that affect human behavior (Reiss, 2004; Heckhausen and Heckhausen, 2010).

2010). Perceptions on the other hand describe the appraised realization of the sensory inputs and impressions that surround us. The influence of motives on perceptions leads to different mental representation of strategic incentives that the context provides (Kroneberg et al., 2010). Exemplarily, one might approach an after-work tennis match with colleagues with achievement motivation to keep up the personal winning streak on one day, the motivation to affiliate with the colleagues on another and the motivation to demonstrate your superior status on yet another day. While the rules (strategic incentives) of playing tennis are identical in all three examples, these rules might be perceived differently depending on the active motive. Moreover, besides determining the objectives of behavior, motives also influence the beliefs how others will behave in a subjectively perceived context (Crocker and Canevello, 2012; Lerner and Keltner, 2001; Lerner et al., 2003; Lerner and Keltner, 2000). Therefore, this dissertation assumes a definition of preferences that is informed by motivation and social psychology: Distinct motives are associated with specific action tendencies as well as expectational and perceptional patterns. Together with the surrounding context and individual characteristics, motives give rise to context-dependent preferences. In order to accommodate these insights, chapters two, three and five of this manuscript define preferences as objectives for economically relevant decisions for which the influences of beliefs and perceptions (sections two and five) as well as traits (section three) have been accounted for while the surrounding context was experimentally controlled. This dissertation contains the following chapters:

Chapter 2 is concerned with studying the impact of different incidental motives in a social dilemma context. In particular, the motives of care and anger are induced and subsequently, the effect of the motives on behavior, beliefs and perceptions in a linear public goods game is compared between motive treatments. The results show that when one controls for subject comprehension, care motives lead to higher conditional and unconditional contributions than the control condition, while anger leads to lower conditional and unconditional contributions. This is in line with the hypothesized behavioral tendencies of care (prosocial) and anger (antisocial) motives. The results further indicate that angry subjects show a larger attentional focus towards differences in payoff and perceive the game to be significantly more often to be an interaction of strategic substitutes and hence rather competitive. In addition to the results on contributions these findings are in line with the characteristic fingerprint of the anger motive in terms of behavior and perceptions.

Chapter 3 is devoted to the study of the interaction between context, motives and personality characteristics. Individuals find themselves in a permanent interaction with the context that

surrounds them. The people we spend time with and are connected to as well as the conditions we live under and the incentives we work under are just a few real-life examples of such contexts. It is the appraised interaction with these contexts that activate different discrete motives with their corresponding objectives and behavioral outcomes. Exemplarily, visiting your children in hospital is likely to stimulate the caring motive, while encountering a grizzly bear while jogging in the forest is likely to lead to fear (should this encounter be survived, it may even lead to fear in future situations when one is jogging or spends time in the forest through recalling the encounter). While these examples may be intuitive, the scientific approach commands to systematize contexts and check whether specific contexts do indeed activate certain discrete motives. The strategic incentives that a situation contains are a natural first candidate to develop the basis of a taxonomy of contexts. When subjects interact, one can hypothesize that the strategic incentives surrounding them may either promote cooperation or competition. Let the former, a social context conducive to cooperation, be defined by strategic complements or synergies that exist between subjects. It is an interesting question whether complementary contexts do activate motives in a systematic way that leads to cooperative behavior. If this were the case, a complementary / synergetic social context would hypothetically be connected to caring and affiliative motives. On the other side, a competitive context can be defined by strategic substitutes or goals that lead to diverging behavior. Such a social context could hypothetically lead to self-interested wanting or status seeking motives. Chapter 3 studies these hypotheses and examines the interaction between social contexts and motives and investigates the two conjectures about contexts that either promote cooperation or competition. In addition, chapter 3 adds the dimension of personality traits to the study of how context-sensitive motives affect preferences. The framing of this laboratory experiment is a stylized labor context in which two experimental subjects ("workers") form a team. Each subject in a team exerts effort over 15 rounds of game play which is used to produce a stylized good. The exerted effort is costly for the subject and effort costs are increasing quadratically. Before the 15 rounds of the effort game, all experimental subjects take part in an initial team building exercise. This task serves to induce a team identity by allowing for communication between team members and entertaining joint team achievements. It is supposed to raise the external validity of the experiment by resembling real world team building events in companies. We study the impact that this team building exercise has on motives and find that it significantly increases the prosocial motives of care and affiliation and has a positive impact on achievement motivation while decreasing selfish resource seeking motives. After the team building exercise, subjects make effort decisions in the effort game under 4 different

combinations of remuneration scheme (team remuneration vs. individual remuneration) and degree of complementarity in production (high vs. low) that subjects are randomly assigned to. In the light of the previous discussion, team remuneration with high complementarity defines a cooperative context that supposedly activates prosocial motives like care and affiliation, whereas individual remuneration with low complementarity is conducive to a social setting consisting of substitutes and hence the activation of antisocial motives like selfish wanting and status seeking. Note that the Nash equilibrium for team remuneration predicts that efforts will be lower compared to individual remuneration when the same form of complementarity is present in both remuneration forms. However, the social dilemma structure of team remuneration entails the possibility to internalize profits from cooperation. Within team remuneration, we theorize that a cooperative social setting is only present in the case that complementarities in production between workers are high. Based on the behavioral tendencies of care and affiliation motives, we therefore hypothesize that the context of team remuneration and high complementarity in production will lead to the highest effort decisions by subjects as a manifestation of the associated behavioral tendency to prosocial motives. Our experimental design further enables us to control effort decisions for beliefs about the effort decision of the other team member as well as own social value orientation which measures the individual trait characteristic for prosocial behavior. Moreover, we can analyze which motives are activated by the different combinations between remuneration scheme and degree of complementarity after subjects have made effort decisions. We find that efforts under team remuneration and high complementarity are significantly the highest across treatments. At the same time the combination of team remuneration and high complementarity leads to the highest states of care, affiliation and achievement motives. Taken together, these two results lend support to the hypothesis that team remuneration with high complementarity in production between subjects is a cooperative context that activates prosocial motives which motivate prosocial behavior.

Chapter 4 presents a field study that employs social comparison nudges in the context of charitable giving. In our study, subjects were given a lottery scratch ticket and had to decide whether to keep it for themselves or donate it to a charity. In the descriptive social comparison nudge treatment, we provided subjects with the nudge that two-thirds of the German population donated to a charity in the last year before subjects made their donation decision. In the guess social comparison nudge treatment, subjects were asked about their expectation, or belief, how many in the German population have donated in the last year before they received our descriptive information about this figure (two-thirds). We find that the guess social comparison

nudge leads to significantly more donations than the descriptive social comparison nudge. Since our randomization procedure led to no significant differences in sample characteristics across treatments, this study provides another piece of evidence that preferences are context-dependent, can be influenced through choice architecture that is informed by motivation psychology and that beliefs play an important role in this process. Our results suggest that when individuals state their beliefs about a norm which can be publicly compared with a social norm, individuals are more willing to follow the social norm than when they can just consume the normative information. We hypothesize that the reason for this lies in the effect on attention towards the social norm. Asking subjects to state their belief about the social norm increases their attention towards how their stated belief evaluates in comparison to the social norm information. The links between our findings and motivation psychology are as follows. Note that social comparisons can be related to achievement and status-seeking motives (Wigfield and Eccles, 2000; Ames and Archer, 1988; Abrams and Hogg, 1988; Festinger, 1954). In the treatment in which subjects had to express their belief about donation behavior to the face of the research assistant who conducted the study, the subjects revealed information about themselves. This information, in combination with the social information about the actual donation behavior that followed and the final decision of the subject whether to donate or not enables the possibility to interpret the behavior of the subject. This interpretation affects the social esteem of subjects. Those subjects that would like to express that they are prosocial types, potentially motivated by status or achievement motives, may donate in order not to be evaluated as antisocial. This indicates that an increased attention towards the social information when subjects are asked to state their belief about the norm provides a context that could activate achievement or status-seeking motives which is a conjecture that should be explored further in future research.

Narratives have recently gained more attention from economists (Shiller, 2017; Akerlof and Snower, 2016). Narratives can be internal and external. External narratives like the "American Dream" or "Space Race" enable malleable cooperation between large numbers of humans through their ability to coordinate actions towards common goals and norms (Harari, 2014; Searle, 2010). Internal narratives about the own biography and events that occurred in it give a structure to our identity and enable us to see causal relationships between life events. This feature of narratives allows to make sense about the own identity, the past and to predict future outcomes (Conway and Holmes, 2004; McAdams, 2001, 2006, see Holland and Kensinger, 2010 for a review). Further, psychologists have presented evidence that personal and social

identities are formed through narratives which implies that narratives are a mechanism through which attitudes and motives are influenced (Habermas and Bluck, 2000). Narratives also motivate behavior by means of social norms, values and the provision of a blueprint of how these norms and values should be interpreted (Pillemer, 2003; Rai and Fiske, 2011). Narratives instruct and motivate how one should behave in a social world and therefore provide a social context. For this reason, narratives and context-sensitive motives are closely interlinked. Narratives can be analyzed through the application of insights from motivation- and social psychology in order to study the impact of narratives on economic decisions and cooperation. I investigate narratives in chapter 5 of this text. The contribution of this chapter is twofold. First, it offers a way to causally study the impact of narratives on behavior, beliefs, perceptions and self-reported affective states through the lens of motives. This is achieved by means of a controlled laboratory setting in which subjects recalled personal narratives and were either subsequently observed in a public goods game setting or stated the influence that the narratives had on own motivation. Narratives were analyzed by means of automated textual analysis methods of Latent Dirichlet Allocation (LDA) and the dictionary method. These methods allow to study exactly, which components of narratives have an influence on self-reported motives as well as behavior, beliefs and perceptions in the public goods game. The second contribution of this paper is a methodological one. To the best of my knowledge, it is the first study that introduces LDA as a method for textual analysis in the context of an experimental economics study. Furthermore, three different approaches for textual analysis of narratives are compared with respect to their performance on predicting motivational state changes after subjects were exposed to narratives as well as their performance in revealing the influence of narrative components on behavior: LDA, dictionary method and the assessment of motivational content of narratives by student assistants. I find that topics within narratives that were synthesized by LDA as well as categories of words counted from the narratives have a significant influence on motivational states as well as behavior, beliefs and perceptions in the public goods game. In particular, LDA topics show convergent validity since the identical topics that predict motivational state changes also predict behavior in the public goods game in directions as hypothesized by insights from motivation psychology. Specifically, the topic "helping others in public", has a significant and positive influence on self-reported states of care motives (or prosocial compassion motivation) and at the same time a positive effect on contributions and beliefs in the public goods game. The dictionary method does not show such convergent validity. The only word category that indicates convergent validity between motivation and behavior is the anger words category. Interestingly, the only reasonable result I find for coding

of motivations in narratives by student assistants is that the higher the assessment of anger within a narrative, the less likely subjects are to be a conditional cooperator in the public goods game. My results indicate that insights from motivation psychology are essential for interpreting the results from the dictionary method and LDA methods and therefore to a quantitative analysis of the impact of narratives in general. My paper also presents an application of textual analysis methods to investigate text as data in an experimental economics context.

In the remainder of this chapter, I will introduce some key concepts that are relevant to this dissertation, embed my thesis into the existing literature, connect the investigated concepts to different schools of thoughts and disciplines and illustrate the policy relevance of my work.

Importantly, motives need to be distinguished from emotions. Broadly, *emotions* describe affective feelings that are caused by events or situations an individual finds herself in. The perception of emotions can either occur consciously or unconsciously. The perception is accompanied by physiological states, patterns of cognition and reactional tendencies that are specific to the perceived emotion (Ekman and Davidson, 1994). *Motives* are conceptualized as personality dispositions to experience particular types of incentives as pleasurable (Schultheiss, 2013). Early research in personality psychology considered motives to be partly genetically predetermined (McClelland, 1965; McClelland et al., 1989) and that personality traits exhibit a strong propensity to activate particular behavior (see Utz et al., 2004; Utz, 2004). In parallel, it was also found that depending on the surrounding stimuli, motives can be aroused and behavior is not solely determined by personality, but also by contextual stimuli (McClelland et al., 1953; Coan and Allen, 2007; Lench et al., 2011; for reviews see Heckhausen and Heckhausen, 2010). Previous evidence has accumulated that investigated how both, personality traits and context interact with motives to drive behavior (Brunstein and Maier, 2005; Fodor et al., 2006; Maner et al., 2007; Mischel and Shoda, 1995; Roberts and Pomerantz, 2004; Shah et al., 1998). The working definition of motives of this dissertation can therefore be summarized as: Motives are both trait- and state-dependent. Specific contextual stimuli that interact with a person's trait disposition selectively activate motives. The remainder of the text focuses on motives instead of emotions since motives are a more relevant behavioral determinant connected to contextual stimuli and personal trait dispositions (Chierchia et al., 2018).

There exists a close interaction between emotions and motives. For one, the need to achieve something may arise out of the wish to experience feelings of accomplishment and avoid feelings of failing (Covington, 2000). Contrariwise, feelings accompanying a failure that one

experienced can motivate individuals to change behavior such that these feelings will not occur again. Motives focus on objectives one tries to reach with one's behavior and not on physiological experiences or affective states. Exemplarily for fear and anger, there exists some overlap between emotions and motives. Heckhausen and Heckhausen (2010) note on the connection between motives and emotions that emotions "navigate" motivations since they signal to the individual how close it has come to achieving its goal and are responsible for giving feedback whether the current course of action is still adequate for reaching the goal. It should be noted that motives have also distinguishable "fingerprints" in the domains of beliefs, perception, cognition, affect and biological correlates that are well-documented and testable with empirical methods.[2]

The following introduces motives that are treated later on. *Achievement* motives lead to excelling behavior and motivate to strive for winning in competitive situations as well as to be excellent in activities that are perceived as important for the individual (Murray, 1938; McClelland, 1965). The *affiliation* motive describes the need to be accepted by others as well as the wish to accept others (Koestner and McClelland, 1992; Heckhausen, 1989; Deci and Ryan, 1980). The *care* motive is closely related to the affiliation motive but there exist important differences between the two. Whereas the affiliation motive is supposedly more concerned with the need to be accepted, the care motive is more focused on wanting to accept and care for others (Murray, 1938; Weinberger et al., 2010; Heckhausen, 2000). This care for others is expressed through generally prosocial behavioral tendencies, compassion (Goetz et al., 2010) and was previously conceptualized as intimacy (McAdams, 1980; McAdams and Powers, 1981) and altruism / help (Heckhausen, 2000). Another core motive is the *power / status-seeking* motive which is characterized by the need to have an impact, the urge to influence others and be strong (Winter, 1973; McClelland, 1975). In contrast, the *wanting / resource-seeking* motive was not classically studied by psychologists but can nevertheless be synthesized from the psychology literature and describes closest what economists understand under the behavior of "homo economicus". Individuals motivated by wanting and resource-seeking behave in a self-centered and non-social way and are very sensitive to incentive and reward-related contextual cues (McDougall, 1932; Reiss, 2004; Deci and Ryan, 2005). Finally, *fear* and *anger* were previously described as core emotions (Averill, 1983, 2012; Lang, 1985) and motives alike (McDougall, 1932; Thorndike, 1898; Lewin, 1936; Hull, 1943; Murray,

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[2] Details are omitted here for brevity but will be presented for the studied motives in the different chapters of this dissertation.

1938; Heckhausen, 1989; Reiss, 2004 and Trudewind, 2000). This dissertation can therefore be related to previous work in economics that investigated the influence of emotions on economic decision making (Drouvelis and Grosskopf, 2016; see Rick & Loewenstein, 2008 or Lerner, Li, Valdesolo & Kassam, 2015, for extensive reviews). I do not claim that the list of motives introduced above is exhaustive. It represents a parsimonious selection and identifies major objectives that humans seek to meet in different contexts.

The different objectives that are associated with different motives need to be formally modeled in order to be relevant for economic analysis that is based on theory. Exemplarily for the care motive, we will show how motives can be modeled and how predictions for behavioral tendencies under the care motive that are informed by psychological findings can be derived.

Behavioral tendencies under the care motive: Based on both, psychological insights and previous studies in economics that model social preferences, the care motive may be linked to altruism.[3] Levin (1998; based on e.g. Edgeworth, 1881) models altruistic utility such that the utility of another person is treated as the own utility, discounted by a discount-rate. This is in line with the previous exposition of action tendencies under the care motive which are characterized by prosocial concerns. Formally,

$$U_i(x) \equiv (1 - \kappa)\Pi_i(x) + \kappa \sum_{j \neq i} \Pi_{j \neq i}(x) \tag{1.1}$$

where Π_i is i's material well-being from outcome x, $\Pi_{j \neq i}(x)$ is the well-being of other individuals for which i cares from the same outcome and κ parametrizes the degree of other regard in i's utility. Care-motivated individuals feel cooperative with others and seek possibilities to fulfill their needs through cooperation with other people. They feel responsible for others and view themselves as an origin of others' well-being (Crocker and Canevello, 2012). Therefore, care-motivated individuals perceive desired outcomes as having a nonzero-sum or win-win quality. Also, care motivated individuals are sensitive to deservingness of care in order not to be exploited from free-riders (Goetz et al., 2010).[4] Thus, we expect that subjects under care motives will engage in activities that are promoting the well-being of others, given

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[3] Psychology: McAdams' "intimacy" (1992), Murray's "nurturance" (1938), H. Heckhausen's earlier "help" (1989) and J. Heckhausen's "prosocial altruism" (2000) motives and finally "compassion" (Goetz, Keltner & Simon-Thomas, 2010; Condon and Feldman Barrett, 2013; Crocker and Canevello, 2012). Economics: Andreoni, (1990); Levin, (1998); Fehr and Gächter, (2000); Rotemberg, (1994).

[4] Note that this also constitutes a perceptional tendency.

that one wants to care for them, they are deserving of care and the subjective appraisal of the context does not indicate that the other has the objective to exploit the care.

Beliefs under the care motive: Since care motivation leads people to create environments in which cooperation flourishes, these actions increase their beliefs that others taking part in this environment will be cooperative as well (Crocker and Canevello, 2012).

Perception and attention under the care motive: The care motive is associated with a high attention to others' well-being, care-motivated individuals show a reduced cognitive focus on their own needs relative to others' (Batson and coauthors, 1987, 1983).

It follows that the literature in psychology has produced evidence which allow to infer characteristic fingerprints of different motives according to their behavioral, expectational and perceptional tendencies. These fingerprints can be observed empirically when one accounts for the context that subjects are in.

Several renowned economists advised to turn towards social psychology to gain insights for a new and truly microfounded formulation of preferences and prices (Kreps, 1997; Rabin, 1998; Hirshleifer, 2001; Blanco et al., 2011; Fehr and Hoff, 2011; Bosworth et al., 2016; Shiller, 2017). In a similar vein, it was argued that preferences are endogenous to institutions and cultural factors (Bowles, 1998; Lichtenstein and Slovic, 2006, chapter 1). The discipline of economics has however strong reservations to accept changes in preferences as an explanation for changes in behavior. Exemplarily:

> "... one does not argue about tastes for the same reason that one does not argue over the Rocky Mountains – both are there, will be there next year, too, and are the same to all men." (Stigler and Becker, 1977, p. 76)

Within economics, this view remains influential up to now and commands a dogmatic view on the stability of preferences: Preferences are stable, coherent and individuals are perfectly able to express what they prefer. At the core, critics of context-dependent preferences worry that the consideration of a preference change introduces so many degrees of freedom and potentially unobservable cues that the researcher can explain anything and hence nothing at all. Representatives of this view assert that any unforeseen behavior might be rationalized ex post by finding a suitable preference relation. However, the reverse is also true. Klaus Schmidt is supposed to have said that:

> "... Give me a real world contract and I give you an appropriately chosen extensive form game whose equilibrium "predicts" the existence of the contract." (Rosser et al, 2010, p. 72).

This implies that it is possible for rational choice theorists to explain any revealed preference outcome that can be observed in the real world in a rational and self-interested way through the ex post design of an adequate model or game environment. In such an environment, the sequence of action (who moves when?), the nature of the choice variable (nature of the good or price) or the degree of information that is available (who knows what?) all can be modeled such that different equilibria are consistent with selfish rational behavior (Sutton, 1990). Environmental parameters of the extensive game form like those just described are usually considered as "hard" constraints and therefore, it is considered as permissible that agents change behavior as a response to changes in constraints. Note that the availability of many different constraint settings also introduces a considerable amount of degrees of freedom.

Progress in the domains of experimental and econometric methods, statistics and natural language processing (see chapter five) have made the exact measurement of preferences possible (Moffatt, 2015; Smith, 2010). At the time when Stigler and Becker wrote down their views, these techniques and the insights that result from their application were not available. Today, we have well-founded bodies of empirical evidence in different domains of preferences such as risk preferences (Andersen et al., 2008); time preferences (Andreoni and Sprenger, 2012) and social preferences (Charness and Rabin, 2002; Fehr and Fischbacher, 2002; Fischbacher et al., 2001; Fehr and Hoff, 2011). These bodies of evidence make it difficult to justify anything one finds in an experiment with preferences that were fitted to the data ex post. Therefore, reasoning a la Becker and Stigler can be considered outdated due to empirical advances. Specifically, this dissertation studies preference changes by means of conditional contribution schedules that control for beliefs about other's behavior in combination with perceptions of the game form as well as empirical beliefs (chapter 2); preference changes due to changes in social settings through controlling for personality traits and beliefs (chapter 3); and a detailed analysis of the effects of components of personal narratives (chapter 5).

Unfortunately, several barriers make the causal study of context-dependent preferences indeed difficult. Most importantly, a context is constituted by a myriad of cues. To name just a few: the weather, the way of communicating that potentially reminds a subject of a relative, the appearance of another person with their encompassing signals they send, …, all may have an influence on what the outcome of a social decision situation will be. Moreover, the "hard"

natural sciences are only beginning to understand the connection between body and mind.[5] It is known that thoughts, emerge from neural processes in the brain. It is however unknown to a large extent how neurons lead to thoughts and what exactly "thoughts" or "consciousness" are in biological terms. The "hard problem of consciousness" seeks to find an explanation for the relationship between subjective mental states and electrochemical processes in the brain (Chalmers, 1997). It was postulated that neuronal correlates could be viewed as causing consciousness (Koch, 2006; Koch et al., 2016; Fleming and Dolan, 2012). The current state of research is as advanced as acknowledging that consciousness depends on a highly interconnected biological system that is complex and adaptive (Churchland, 2002; Churchland, 2007; Squire et al., 2012). It is assumed that every subjective state is correlated with neural correlates at the biological level. This is a testable conjecture and was investigated lately with success (Adamantidis, 2007, Faivre et al., 2015; Merrick et al., 2014; Gallace and Spence, 2008).

One contribution of this dissertation which studies the feedback between motives, context and behavior is to investigate a form of reasoning about preferences that takes current findings from social neuroscience as well as social psychology into account. So far, they have been mostly overlooked in economics (Verweij et al., 2015). It was found that emotions are responsible for shaping reasoning, perception and hence behavior even though the individual may not be aware of the emotion (Damasio, 1999; Panksepp, 2005; LeDoux, 2008; Purves, 2010). This gives rise to the possibility of non-deliberate decision making which is not reconcilable with the dogma within economics that humans are always able to express consciously what they prefer and consistently so. Moreover, it was found that social emotions and social cognition are closely interlinked and mutually dependent (Phelps et al., 2014; Inzlicht et al., 2015), implying that what I feel as a member of society influences my decision making in society. Further, one of the most prominently discussed models of decision-making in affective and social neuroscience is the somatic marker hypothesis (Damasio, 1994, 2003). It theorizes that when some individual encounters a "primary or secondary inducer" which can be an event, object or past memory (secondary), then it initially appraises and categorizes this object which can either happen consciously or unconsciously. Then, the affective state (emotion) that is activated by the

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[5] If you want to get lost in a rabbit hole whose exploration should shock most economists' self-understanding how much the economics discipline actually can explain, check: "problem of mental causation" (Kim, 2009; Yoo, 2007) and the "problem of other minds" (Avramides, 2000).

appraisal and categorization leads to bodily changes that are evaluated by the brain and which subsequently influence decision-making. In the conceptualization of this dissertation, objects, events, memories, persons and institutions are all viewed as context which is subjectively appraised and perceived by the individual. This appraised context leads to an activation of a motive which subsequently has an influence on behavior via the behavioral tendency of the motive. Conceptually, this approach is therefore close to the somatic marker hypothesis, but short-cuts the exact inner brain processes, as economists are not trained on them and focuses on motives due to their relevance for economically relevant decisions that are observable with methods that the standard empirical economist has command over (laboratory and field experiments).

The policy implications of acknowledging that preferences are shaped by the interplay between the individual, the context and the motives that are activated by the interaction of personality and appraised context are important. People are interdependent and their prosocial motivation is important for achieving cooperation towards global problems – such as climate change, over exploitation of natural resources, financial crises, and extreme poverty and inequality. These exemplary global problems share the character of a social dilemma in which the exclusive pursuit of the interests of minorities are disadvantageous for the whole global community. In order to foster more global other-regard which implies expanding our communities of common interests, contexts and incentives should be provided by policy-makers that activate more prosocial motives. Exemplarily, care and compassion for others may become an educational goal that is achieved through compassion training for school children and adults alike (Klimecki et al., 2012; Singer and Klimecki, 2014). Also, cross-cultural education programs and the duty to spend time for social purposes after leaving school are viable policies to enable insights that humans irrespective of their background seek to live a happy, safe and fulfilled life.

The vast expansion of market activities has led to enormous increases in production and material well-being (Stark, 2007). At the same time, markets and market-like practices displayed in politics and media are spreading their influence within many domains of human life (Sandel, 2012). Resting on the framework of motivation-based decision making, one can assert that markets and related activities establish contexts that rather foster our resource- and status seeking motives in comparison to prosocial caring motives (Falk and Szech, 2013). Already today, market-oriented public policy and incentives have adverse side-effects. To name a few debatable examples: the privatization of health care, prisons and military services

has shown to have disadvantageous effects (Berwick and Hackbarth, 2012; Manchikanti et al., 2012; Donahue and Donahue, 1989; Singer, 2007). Often, economists advice public policy to maximize a social welfare function that is the sum of the welfare functions of selfish, rational individuals. Inherently, this often results in recommended incentives and constraints (laws) that are the best response to agents that rationally maximize their own material well-being. When implemented, such legislation and incentives constitute a context that promotes self-interested and selfishly-rational motives and crowd out prosocial motives (Bosworth et al., 2016; Frey and Jegen, 2001; Gneezy et al., 2011; Bowles and Polanía-Reyes, 2012). Therefore, homo economicus might become a self-fulfilling prophecy with potentially devastating consequences for later generations (Ferraro et al., 2005). Research that acknowledges that motives with their encompassing preferences are sensitive to context enables to understand that decisions are not shaped by monetary incentives alone, but also by the social context in which interactions occur. This understanding can inform policy work on framing, choice architecture and nudging.

CHAPTER 2

THE INFLUENCE OF INDUCED CARE AND ANGER MOTIVES ON BEHAVIOR, BELIEFS AND PERCEPTIONS IN A PUBLIC GOODS GAME[6]

2.1 Introduction

This paper presents an investigation into how psychological motives are responsible for "multi-directed behavior" in a public goods game. In conventional neoclassical and behavioral theories of economic behavior, people are assumed to be "uni-directed". By contrast, this paper provides evidence that people have access to multiple motives, each associated with different preference sets, different perceptions, and different beliefs. In particular, motives determine the objectives of behavior, or *preferences*. Motives also inform the individual's understanding of her environment through beliefs about how much others contribute, and their perceptions of the incentive structure and attention to particular outcomes. We analyze all of these influences in order to gain a better understanding of how decisions to contribute to public goods are made in different motivational contexts.

Motivation psychologists have long argued that human decisions are driven by a number of fundamental motives which can be understood not only as stable traits of an individual, but also as context-sensitive states (Heckhausen and Heckhausen, 2006). By implication, preferences are not unique and temporally stable, since individuals' environments are subject to change. As a result, these changes can activate different motives which are associated with different preferences and therefore behavior. In contrast to standard economic theory, individuals are not identified entirely through their preferences, since these preferences arise from individuals' interplay with their environment (Bosworth et al., 2016). We examine the phenomenon of multi-directedness by exploring the variability of contributions to public goods across contexts.

A motive is a force that gives direction and energy to one's behavior, thereby determining the objective of the behavior, as well as its intensity and persistence (see Elliot and Covington,

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2001; following Atkinson, 1964). Since preferences are thought of as determining objectives of behavior in economics it therefore becomes apparent that psychologists attribute this determining influence on objectives to motives. These motives depend on interactions between situations and personality characteristics and can selectively be activated in certain contexts by specific stimuli (see Mischel and Shoda, 1995; Roberts and Pomerantz, 2004; Emmons and McAdams, 1991; Pang, 2010; Heckhausen and Heckhausen, 2006). Therefore, people's objectives ("preferences" in the terminology of economics) depend on the motivations that they experience in particular contexts. In addition to their importance shaping preferences, motives also affect beliefs and perceptions. Whereas preferences affect behavior by shaping the objectives of decision making, perceptions do so by affecting people's awareness of their choice set (Lerner and Keltner, 2001), and beliefs do so by influencing the information set underlying the decision making, based on these perceptions.

Since humans are fundamentally social creatures, many of our motives are evolved to allow us to respond to different social interactions with different socially-oriented objectives. In this paper, we consider two important psychological motives which are particularly relevant for social behavior. First, while people sometimes pursue selfish objectives, at other times they are known to care for the well-being of other people (Mikulincer and Shaver, 2010). This Care motive is focused on supporting others, helping behavior, preventing others from harm and the desire to promote others' well-being (Crocker and Canevello, 2012). Its accompanying emotional facets can be described as feelings of warmth, love and concern for the others (Singer and Steinbeis, 2009). Anger, by contrast, is a key emotion with fundamentally different motivational implications than Care, since it motivates antisocial behavioral tendencies (Lerner and Tiedens, 2006; Berkowitz, 1993).

Public goods, being a social interaction of mixed incentives (i.e. opportunities for both mutual gain as well as gain at another's expense), are ideal environments in which to see how choices differ under the influence of different motives. We therefore investigate how induced motives drive preferences, beliefs and perceptions in an otherwise identical public goods game. Much evidence has accumulated that different contexts such as frames, primes, or environmental cues elicit different contributions to public goods which present otherwise identical material and strategic incentives (Andreoni, 1995; see Cartwright, 2016 for a review). By "context" we mean a combination of objective strategic incentives (i.e. a game) and the subjective attention to the situational stimuli. Therefore, the context we analyze in this study is the combination of the public goods game and the appraisal of this game by subjects who received different motive

induction treatments. Furthermore, by treating subjects to be either motivated by Care or by Anger, but keeping the strategic incentives and the frame of the public goods game identical between treatments, we study how exactly choices are affected by the motives. Specifically, we investigate how different motives affect the comprehension of the game's incentives, the perception of an aspect of the game form (i.e., game "harmony", see below) as well as the attention that subjects devote to differences in possible payoffs within their group.

We report results of an experiment in which we induce the motives of Care and Anger through autobiographical recall. Participants were asked to recall memories associated with particular motivational quality. Subjects in a comparable control condition were asked to write about recent or typical experiences of a neutral character. Following this, we collected contribution decisions and incentivized belief and norm assessments about contributions. We also elicit mouse-tracking data about attention targeted towards respective payoffs and insights into perceptions about the strategic nature of a public goods game. Our analysis casts particular insight into how motives shape preferences in this game by analyzing conditional contribution schedules and types (per Fischbacher et al., 2001). We use these measures to test psychologically-informed predictions about preferences and (attentional) perceptions associated with the motives of Care and Anger in a public goods game.

We find that subjects' conditional contribution schedules (i.e. contributions conditional on beliefs about contributions of others) differ significantly by motivational state. Furthermore, among subjects demonstrating full comprehension of the game's incentives we find that those motivated by Care contribute significantly more than those motivated by Anger. This finding is only partially mediated by descriptive beliefs. This suggests that our treatments induced different preferences. We do not find that subject comprehension differs across our motivating states, or that this accounts for differences in contributions. Moreover, we find suggestive evidence that subjects' perceptions and attention to the game's payoffs vary across our conditions. In particular, the Anger motive leads subjects to perceive the public goods game to have a competitive nature (perceived strategic substitutability) around twice as often compared to Care and Control. Furthermore, subjects under Anger pay the most attention towards their other group member's hypothetical payoff from the game.

The rest of the article is structured as follows: Section 2.2 reviews the relevant literatures and presents the argument theoretically; Section 2.3 lays out the design of our experiment and states our hypotheses; Section 2.4 presents our results and Section 2.5 provides a concluding discussion.

2.2 Background

2.2.1 Public Goods

Many of the important social problems faced by humanity such as carbon emissions abatement have the structure of public goods. Though public policy may be able to solve some public goods problems, for example by governments agreeing to regulate emissions, the effectiveness of policies depends on the public's (sometimes fickle) support. Political leaders influence the public desire to contribute to these global public goods by using affective framing in their communication. Whereas Barack Obama may stress preventing climate change as a reachable goal so as to evoke people's need for achievement, Donald Trump may on the other hand evoke anger that foreign countries will use the United States' contributions to carbon abatement to "out-compete" it.

Public goods games have been studied extensively in the experimental economics literature (see Ledyard, 1995; Zelmer, 2003; Chaudhuri, 2011 for reviews). Participants are generally willing to finance public goods if others do as well (see Andreoni and Scholz; Fischbacher et al., 2001). This pattern of behavior has traditionally been modeled in terms of consistent preferences for reciprocity (Rabin, 1993; Dufwenberg and Kirchsteiger, 2004), (im-)pure altruism (Andreoni, 1990), or guilt aversion (Battigalli and Dufwenberg, 2007). Not only do we investigate the preferences associated with the Care and Anger, motives, we are also interested how these motives affect descriptive beliefs about behavior in the public goods game. Subjects' contributions have been found to be positively correlated with their stated beliefs about contributive behavior of the other players in their group (Croson, 2007; Fischbacher and Gächter, 2010). We depart from this literature by exploring the possibility that giving behavior is not driven by fixed objectives, and that motives for giving and their intensity may fluctuate with context.

The present study also speaks to the literature that investigates how different frames affect contributions to public goods. A number of studies have documented that "giving" to provide a public good elicits more cooperation than "taking" from a commonly shared resource, even when the payoff structure is equivalent (most prominently Andreoni, 1995; see Cartwright, 2016 for a review). The mechanisms underlying these framing effects for public goods have been explored to a limited extent. Recent development in this literature has investigated how frames affect people's ability to comprehend the game's incentives. Fosgaard et al. (2014;

2017) find that contribution strategies do not significantly differ across frames after excluding subjects who could not identify the selfish best-response and the social welfare maximizing strategies in a comprehension quiz; though Gächter et al. (mimeo) find framing effects which are robust to controlling for subject comprehension.

We extend this line of inquiry by the phenomenon of "motivational carry-over". We do not directly alter the description of the game but expose subjects to a game-unrelated autobiographical recall[7] and then investigate how this extends to the game itself. In other words, we study how different internal motivational states could drive subjects to spontaneously frame the game in different ways (as suggested by Eriksson and Strimling, 2014). More precisely, we observe how different motives lead to different appraisals of the decision situation and how this appraised context affects behavior, beliefs and perceptions in the game.

2.2.2 Psychological Background

The impact of emotions on economic decision making has previously been investigated in a number of studies (e.g., Polman et al., 2013; see Rick & Loewenstein, 2008 or Lerner et al., 2015, for extensive reviews). We depart from the previous literature by working within a novel "motive-based framework of economic decision making", rather than an emotion-based one. Motives, such as affiliation, power or achievement, are defined as dispositions to experience particular types of incentives as rewarding, to strive for certain types of goals, and hence to activate particular behavioral tendencies and decisions (Atkinson, 1964; Emmons & McAdams, 1991; McClelland, 1965; Pang, 2010; Rheinberg & Engeser, 2010; Schultheiss & Strasser, 2012). Emotions and motives can interact in different ways. The drive to achieve something can stem from the desire to experience success and avoid feelings of failure (Covington, 2000). The reverse is also true: experienced feelings surrounding a failure can motivate individuals to change behavior in order to avoid these feelings in the future. Motives thus focus on the goal-oriented component of many emotions, which are not simply a cluster of subjective/physiological experiences, but something that can causally direct behaviors towards certain types of goals. Motives are more generally held to constitute context-sensitive

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[7] Rick and Loewenstein (2008) call such states Incidental and note about them: *"... Any influence of incidental emotions would suggest that decisions are influenced by factors unrelated to the utility of their consequences."* P. 139 f..

dispositions, which also have a stable (e.g., trait-related) component (Mischel and Shoda, 1995; Roberts and Pomerantz, 2004; Emmons and McAdams, 1991; Pang, 2010; Heckhausen and Heckhausen, 2010). Though the range of human motivations is potentially vast, connections may be drawn for tendencies within broader motivation systems. For instance, Heckhausen's "aggression" (1989), McDougall's (1932) and Panskepp's "rage" (2006), or Reiss's "vengeance" motives could be subsumed under a general Anger motive, while McAdams' "intimacy", Murray's "nurturance", H. Heckhausen's earlier "help" (1989) and J. Heckhausen's "prosocial altruism" (2000) motives and finally "compassion" (Goetz et al., 2010; Condon and Feldman Barrett, 2013; Crocker and Canevello, 2012) could be subsumed under a more general Care motive. As Crocker and Canevello note: "Compassionate goals implicitly or explicitly involve caring". We note that there is frequently some overlap between emotions and motives and the case of Anger is a case in point. Roseman (2011) reviews literature that investigates this connectedness between emotions and motives. He finds that several authors speak of "emotivational goals" in order to highlight the focus on the motivational component of many emotions. Our framework is consistent with these approaches, yet to further specify that we intend Care and Anger as motives, rather than emotions, we henceforth capitalize the two terms.

2.2.2.1 Care: Psychological Evidence and Predictions

The following introduces how the Care motive affects preferences, beliefs and perceptions. The Care motive can be defined as a state arising from witnessing another's suffering and which motivates a subsequent behavioral tendency to help and to reduce that suffering. (Goetz et al., 2010; Condon and Feldman Barrett, 2013). Different emotions such as tenderness, sympathy, compassion and empathic concern are connected with this motivation to increase the welfare of others in need. Crucially however, Care motives are differentiated from empathy. Empathy, describes the capacity to share the feelings of others (while understanding that others are the source of those feelings). The Care motive however also entails a concern for the other person which then motivates prosocial behavior towards this person.

The Care motive is associated with prosocial preferences and a high attention to others' well-being. Furthermore, individuals who are motivated by Care show a reduced cognitive focus on their own needs relative to others': It has been reported that participants even display costly helping despite a potential escape option (Batson et al., 1987, 1983). Batson and Shaw (1991) show that Care motivates altruistic behavior towards those in need at the cost to the self.

Care-motivated individuals are especially attentive towards *"(...) suffering, responsibility, vulnerability, and other harm-related concerns, (...)"* (Goetz et al., 2010). Furthermore, Care-motivated individuals feel cooperative with others and seek possibilities to fulfill their needs through cooperation with other people. Therefore, Care-motivated individuals perceive desired outcomes as having a nonzero-sum or win-win quality. They feel responsible for others and view themselves as an origin of others' well-being (Crocker and Canevello, 2012).

Since Care motivation leads people to create environments in which cooperation flourishes, these actions increase their beliefs that others in this environment will be cooperative as well (Crocker and Canevello, 2012). These facets of the Care motive make it a promising candidate to investigate how this motive drives behavior, perceptions and beliefs in a social dilemma context due to their clearly pro-social characteristics.

We synthesize these insights about the Care motive below:

- *Preferences under Care:* Care motive leads to behavior that is directed at improving the well-being of other individuals even if this comes at a cost to oneself.

- *Perceptions under Care:* Subjects under *Care* display an increased attention towards other's well-being and a decreased focus towards own needs. Subjects focus on how to reach an outcome that is advantageous for all involved parties and which is obtained through cooperation when they encounter new contexts with an active Care motive.

- *Beliefs under Care:* Subjects under *Care* believe that other subjects will also follow the Care motive.

2.2.2.2 Anger: Psychological Evidence and Predictions

The Anger motive is associated with the corresponding emotional state of anger (Ekman, 1992; Novaco and Taylor, 2000; Averill, 1982). Anger affects preferences, perceptions and beliefs in the following ways: Anger can lead to antisocial behavioral tendencies such as aggression (Lerner and Tiedens, 2006; Berkowitz, 1993). Moreover, anger becomes the main driver of behavior and cognition when a person senses threatening behavior from an outside force and takes action in order to stop it (DiGuiseppe and Tafrate, 2007). Hence, anger generally motivates actions that remove the problematic components of a situation (Frijda et al., 1989).

The Anger motive leads individuals to help less (Rudolph et al., 2004) and prefer antisocial welfare decisions (Small and Lerner, 2008). Moreover, in a literature review on anger, Van

Kleef et al. (2008) conclude that the Anger motive tends to motivate individuals to pursue more competitive behavior, thus potentially increasing the focus on how one's own payoff compares with another's. Of special interest to our study is that anger is associated with a high infusive potential: The affective state carries over from past anger-evoking events to unrelated situations and influences judgements and decisions in these new situations (Lerner and Tiedens, 2006). This is demonstrated by the finding that individuals who are motivated by Anger do not discriminate between recipients in their punitive reactions (Lerner et al., 1998). Pillutla and Murnighan (1996) use self-reports to argue that small offers in the ultimatum game are rejected because they make receivers angry.

In terms of attentional tendencies related to the Anger motive, there is evidence that when people are primed to associate an object with anger they are more likely to desire this object (Aarts et al., 2010). Also, the Anger motive has been associated with the apperception of injustice (Smith and Lazarus, 1990). Finucane (2011) finds that anger increases selective attention generally. In another study, it has further been found that subjects who were motivated by Anger had different perceptions of routine events and public policy preferences than sad subjects (Lerner et al., 2003).

The Anger motive has also been found to influence beliefs. Evidence from social psychology indicates that Anger leads people to believe that they will get what they want in the context of social relations and other areas (Lerner and Keltner, 2001; Lerner et al., 2003; Lerner and Keltner, 2000).

Hence, the Anger motive elicits behavior, perceptions and beliefs that are associated with a clear anti-social direction in a social dilemma context which makes it an ideal candidate to be juxtaposed to the Care motive in order to study the context-dependence of preferences.

The insights about the Anger motive lead to the following insights about preferences, perceptions and beliefs for subjects under the *Anger* treatment in the public goods game:

- *Preferences under Anger: Anger* motivates antisocial and more competitive behavior that leads to antisocial consequences in terms of welfare.

- *Perceptions under Anger:* Subjects under *Anger* display an increased attention towards perceived injustice in their disfavor. They also show increased attention towards outcomes that they desire. The Anger motive can limit the depth of reasoning which can lead to a bias in perception.

- *Beliefs under Anger:* Subjects under *Anger* believe that they will get what they desire.

2.2.3 Theoretical Background

The insights from the previous psychological background section established that once an individual is motivated by a certain motive, this motive determines the set of objective criteria that individuals seek to satisfy with their decisions. This can be used as a "psychological microfoundation" to formulate a representation of objectives under different motives in the form of motive-specific utility functions.

We now define player i's utility under Care and Anger. When i is motivated by Care, her utility from the outcome $c = (c_i, c_{-i})$ is

$$U_i(c) = (1 - \kappa)u_i\big(\pi_i(c)\big) + \kappa \sum_{j \neq i} u_j\big(\pi_j(c)\big) \tag{2.1}$$

where $0 < \kappa \leq 1/2$ parameterizes i's degree of other regard or care for the other person. This utility function captures that under the Care motive, an individual's utility positively depends on others' utilities.

People motivated by Anger seek to reduce others' well-being. We conceive of this as being the inverse of Care. This is represented by a utility function of the form:

$$U_i(c) = (1 - \alpha)u_i\big(\pi_i(c)\big) - \alpha \sum_{j \neq i} u_j\big(\pi_j(c)\big) \tag{2.2}$$

Here α parametrizes the degree to which individual i wants to harm others at a material cost to herself; α therefore represents the relative weight put on anger concerns. The Anger motive utility function stipulates that when an individual has the opportunity to increase her material well-being without increasing the well-being of any other person by more, she will take it. It also implies that the individual may reduce others' material wealth as long as the cost to herself is not too high (i.e. certainly lower than the amount by which she reduces others' payoffs).

We apply the utility functions under Care and Anger motives to a linear public goods setting. Formally, N players indexed by i each voluntarily contribute some amount $c_i \in [0, e]$ from an endowment e to a public good. The monetary payoff to player i can be expressed as:

$$\pi_i(c_i, c_{-i}) = e - c_i + m \sum_{j=1}^{N} c_j \tag{2.3}$$

where m is referred to as the marginal per capita return (MPCR). In the following, we denote by $u_i(\pi_i)$ the utility that player i derives from monetary payoff π_i. We assume that $u_i(\cdot)$ is concave.

One reason for this assumption is that subjects who have utility that is a linear function of the monetary payoffs will choose to either invest nothing, or their entire endowment, in the public good. This is because the marginal utility of contributing is constant for subjects with linear utilities in the linear public goods game. If this marginal utility is positive (negative) then the best response is to contribute one's entire endowment (nothing). Prominent utility representations that contain a concern for others' gains are linear in payoffs (e.g. Fehr and Schmidt, 1999) and can therefore not rationalize the empirical regularity that the majority of subjects supposed to adhere to such preferences contribute a positive fraction of their endowments (usually around half in one-shot games). Potentially, this could be overcome by allowing for social preference utility functions that are non-linear in monetary payoffs like Bolton and Ockenfels (2000) propose. However, this complicates analytical and intuitive tractability and further misses to account for a well-known observation: Subjects in general, and in economic experiments in particular, do not have utility that increases linearly in money. This can be observed in subjects who display risk aversion over extremely small stakes (Rabin and Thaler, 2001), or in Andreoni and Miller (2002)'s demonstration that most subjects have convex indifference curves over distributions of income between themselves and another person. The fact that experimental participants have nonlinear utility over monetary payoffs is so recognized that there is even a literature on payment mechanisms to *experimentally induce* linear utility in subjects (Berg et al., 1986). We do not need to speculate on *why* subjects have nonlinear utility in monetary payoffs to exploit this stylized fact in producing more reasonable predictions for linear public goods games under Care and Anger motives.

Theoretically, one can predict the following contribution behavior given the setup presented in equations (2.1) – (2.3):

The care-motivated individual maximizes

$$U_i(c) = (1 - \kappa)u_i\left(e - c_i + m\sum_{j=1}^{N} c_j\right) + \kappa \sum_{j \neq i} u_j\left(e - c_j + m\sum_{k=1}^{N} c_k\right). \qquad (2.4)$$

Setting the derivative of U_i with respect to c_i equal to zero, we find

$$(1 - \kappa)(1 - m)u_i'\left(e - c_i + m\sum_{j=1}^{N} c_j\right) = \kappa m \sum_{j \neq i} u_j'\left(e - c_j + m\sum_{k=1}^{N} c_k\right). \qquad (2.5)$$

We now consider the case that $m < 1$, since this will mirror the chosen parametrization for the experiment we report. The left-hand side of (2.5) is increasing in c_i while the right hand side is decreasing in c_i (due to the concavity of $u()$). Thus, for some parameterizations of $\kappa, m, e,$ $N, u_i(\cdot), u_j(\cdot)$ and $E(c_{-i}) = \bar{c}_{-i}$, there will be an interior optimum where the care-motivated

individual contributes some of her endowment. Under the Anger motive, the individual maximizes utility

$$U_i(c) = (1 - \alpha)u_i\left(e - c_i + m \sum_{j=1}^{N} c_j\right) - \alpha \sum_{j \neq i} u_j\left(e - c_j + m \sum_{k=1}^{N} c_k\right). \qquad (2.6)$$

Setting the derivative of U_i with respect to c_i equal to zero, we find

$$(1 - \alpha)(m - 1)u_i'\left(e - c_i + m \sum_{j=1}^{N} c_j\right) = \alpha m \sum_{j \neq i} u_j'\left(e - c_j + m \sum_{k=1}^{N} c_k\right). \qquad (2.7)$$

For $m < 1$, this agent's utility is always decreasing in c_i, and so she invests nothing in the public good. Comparing the first order conditions (2.5) and (2.7) therefore establishes that theoretically, subjects motivated by Care should contribute a positive amount to the public good while subjects motivated by Anger should contribute nothing.

As noted previously, it is an established empirical fact that most subjects in previous public goods games studies contribute a share of their individual endowment to the public good (see for example Ledyard (1995)). This implies that subjects show a degree of other concern which may be modeled like an other-regarding utility function of the type (2.1), that they maximize (2.4). It follows from this maximization that an inner solution exists where they contribute some share of their endowment, which is implied by comparative statics of (2.5). Note that within (2.1) and (2.4) the degree to which other-regarding concerns or Care are weighted is parametrized by κ. The higher κ, the more other-regard is present in one's objective. By means of our Care motive induction that is described in section 2.3.1 below in more detail, we specifically aim to increase the κs of subjects in the Care treatment. Assuming that we are successful in increasing the degree of other regarding concerns with the treatment manipulation, this implies that subjects' κs under the Care treatment are higher than under control. Differentiating (2.5) with respect to κ yields[8]:

$$(-1)(m - 1)u_i'\left(e - c_i + m \sum_{j=1}^{N} c_j\right) + m \sum_{j \neq i} u_j'\left(e - c_j + m \sum_{k=1}^{N} c_k\right). \qquad (2.8)$$

Recall that m, the parameter for the MPCR is < 1. Therefore, (2.8) is > 0, implying that the cross (or second) derivative of increasing c_i and κ is positive. In other words: the marginal utility of increasing c_i is increasing in κ. This is intuitive when one considers the form of (2.1). The higher is κ, the more the own payoff depends on the payoff of the other and the more should be contributed. Therefore, we theoretically expect that Care leads to higher contributions than Control, since Care leads to a higher κ. These theoretical considerations lead

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[8] Due to symmetry of second derivatives, or Schwarz's theorem, the same result materializes if we first differentiate (2.4) w.r.t. κ and subsequently derive the resulting equation after c_i.

us to expect that angry subjects contribute nothing, subjects under Control contribute a positive amount and subjects under Care contribute a positive amount that is bigger than that under Control.

2.3 Experimental Design

Subjects made contribution decisions in a linear one-shot public goods game in groups of 2 participants. Subjects were informed that they would never learn about the identity of their other group member. The payoff structure was symmetric and entailed a marginal per capita return (MPCR) of 0.75. Each subject i was endowed with €10 of which they had to decide how much $c_i \in \{0, \dots, 10\}$ in whole Euro amounts to contribute to the public good. The monetary payoff for subject i was

$$\pi_i = 10 - c_i + 0.75 \times (c_i + c_j) \tag{2.8}$$

Where c_i is subject $i's$ contribution to the public good and c_j is the contribution of $i's$ other group member j to the public good.

Each session of our experiment consisted of two parts which were run back-to-back. First, a motive induction part induced the motives of Care or Anger (or did not induce a motive in the case of the Control treatment). The second, decision-making part, followed directly after the motive induction. In this second part, subjects viewed example calculations and answered comprehension questions, made unconditional and conditional contribution decisions, stated their beliefs and norms[9] about contributions and stated their impressions of the game under the influence of the just-induced motive. Figure 1 depicts the sequence in the experiment.

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[9] How we elicited empirical beliefs about group members' contributions as well as normative beliefs about what subjects perceive to be the contribution norm can be found in Appendix A.1 under task 3b).
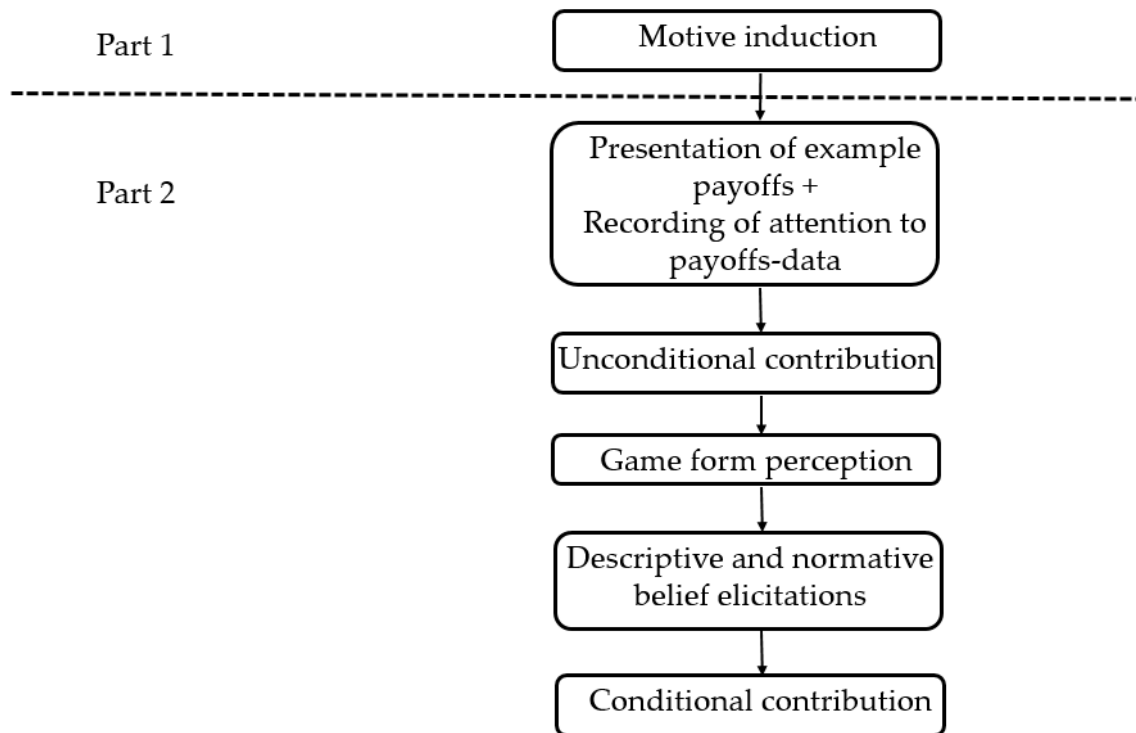
Figure 1 Sequence of the experiment

We implemented several procedural design features intended to reduce potential experimenter demand effects (EDEs) by using non-deceptive obfuscation (as suggested by Zizzo, 2010). Different experimenters administered each part of the session and were only in the lab for the duration of their respective part. The experimenter administering the second part of the session was blind to the motive induction conducted in the first part. Subjects were also recruited separately for each part: only subjects who had already signed up for the first part were invited to the second. The recruitment email for the second part was sent from a different researcher[10], and stated that a session would take place directly after the one that they had already signed up for. Subjects were not required to participate in both parts of the session. Subjects who wished to participate only in the first part left the lab with the experimenter and were paid for their participation. We therefore collected no choice data from these subjects. Likewise, some subjects who signed up for the first part but were sent away because they showed up late were allowed to participate in the second part if free places were available. We do not report data from these subjects. Around 90% of the subjects that took part in the first part of the session stayed in the lab for the second part. No deception was used at any point in our experiment.

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[10] Both are coauthors on this study.

2.3.1 The Autobiographical Recall Method

In the first session, motives were induced through an autobiographical recall technique in which subjects wrote essays about personal experiences relevant to the respective motive that was induced (Frijda et al., 1989, Mauro et al., 1992). This technique has been used in the experimental economics literature (Capra, 2004, Capra, 2010, Lin et al., 2006, Kausel and Connolly, 2014, Elliott et al., 1998, Derbaix and Vanhamme, 2003; see also: Rand et al., 2012) and has been found effective to induce different states according to meta-analyses (Westermann et al., 1996; Lench et al., 2011). Subjects were paid a fixed amount of €4.50 for the motivation induction session, which lasted around 30 minutes.

Our design relies on the assumption that subjects' activated angry or caring motivational states (associated with angry and caring i.e. compassionate, tender or empathically concerned emotions, respectively) will carry over to an abstract cooperation problem that contains a stranger as another group member. There is strong evidence that emotions have the ability to focus one's cognition not only towards what initially led to the feeling of the affective state but also to unrelated events. This finding is called the carryover of incidental emotion (Lerner and Tiedens, 2006; Bodenhausen, 1993; Loewenstein and Lerner, 2003). We also know that the effects of emotions can drive choices when the decision environment contains real monetary incentives (Lerner et al., 2004) and even in the presence of incentives to disregard irrelevant influences.

Instructions (see chapter A.1) for the autobiographical recall induction were distributed to the participants and read out loud by the experimenter. For all three treatments of the autobiographical recall parts of the session, subjects were instructed to write a total of two personal essays about own past experiences. The topics of the experiences that subjects were asked to recall were selected to represent particular aspects of the target motive we sought to induce. After the instructions for each essay were read out, the experimenter read out a corresponding example essay to the subjects meant to exemplify the length and depth of such an essay. This took approximately three minutes. After the example essay was read out, subjects were told to imagine their personal memory as vividly as possible for two minutes. After this reflection time, subjects wrote down their personal essay for eight minutes. Subjects completed this procedure twice, with two different topics per motive induction treatment. For the Care motive induction, the two topics were 1) a situation in which subjects either helped or thought about helping another person even though this person may not have expected to be

helped and 2) a situation in which subjects felt compassion and feelings of warmth for another person as well as the motivation to improve that other person's well-being. In the induction for the Anger motive the topics were 1) a situation that frustrated the subject but where the subject was not responsible for the cause of the frustration and 2) a situation of verbal harassment or insult. In the control condition, subjects were asked to recall 1) the course of a typical day in their lives and 2) a description of what they did yesterday. Previous findings in the motivation psychology literature suggest that dangerous stimuli such as harassment (Berkowitz and LePage, 1967) as well as situations leading to frustration (Kornadt, 1984, Herrero et al., 2010) represent threats to physical or psychological integrity that can elicit angry responses. The autobiographical recall topics for the Care motive induction follow precisely from the stated definition and insights about compassionate states above.

2.3.2 Manipulation Validation

Prior to the main experiment, we validated the autobiographical recall procedure described above. This was done in a separate set of pilot sessions which used the procedures described in the previous subsection. In this manipulation check pilot, subjects first participated in one of the treatments of the autobiographical recall procedure. Subsequently, subjects took part in a questionnaire probing their feelings and motivational states. In particular, subjects indicated with a mark on a continuous scale ranging from "not at all" on the one side to "very much" on the other, "to which degree they feel like one of the following motivations and emotions in this very moment". Each subject provided such ratings for 22 adjectives, which comprised words related to several motives, such as Anger (5 words), Care (5), Fear (5), and Achievement (5), as well as the affective states of being happy and sad. These words were selected to be maximally specific indicators for distinct motives (Chierchia et al., mimeo). A complete list of words can be obtained upon request. These ratings were compared between the Care, Anger and Control treatments. Achievement motives are associated with positive valence, because of the hope of success or because of the pride of having accomplished something (Pang, 2010). We elicited words related to the Achievement motive in this manipulation check to verify that the Care treatment increased ratings on Care words and not on positively-valenced words in general. Likewise, Fear motives, like Anger motives, are associated with negatively-valenced feelings (Avram et al., 2010) and therefore ratings of Fear words serve as a manipulation check that the Anger treatment did not just led to an increased focus to negative valence. Moreover, the Anger motive induction asked subjects to recall experiences of being harassed and insulted

which might have also primed fear. Finally, we checked for the implications of the Care and Anger motive inductions on positive and negative affect in the form of happiness and sadness.

Hypothesis M.1: Subjects under the Care motive induction report higher ratings on Care words than subjects under the Control condition.

Hypothesis M.2: Subjects under the Anger motive induction report higher ratings on Anger words than subjects under the Control condition.

Data for the manipulation check were collected between September and November 2015. Subjects came from the Kiel University subject pool and studied diverse subjects. In total 133 subjects participated in this manipulation check. The share of women in the sample was 51%. Three of these subjects have been excluded from analysis because they did not have a sufficient command of the German language. Of these 130 subjects, 45 participated in the control treatment, 41 in the Anger induction treatment, and 44 in the Care induction treatment. We compare the mean ratings of words within specific motivational categories between the treatments. We use Somers' D[11] for this comparison of means. We find that the Care motive induction treatment increases self-reported ratings of Care words compared to Control at $p = .005$. We also find that the Anger treatment increases self-reported ratings on Anger words compared to Control at $p < .001$. Relative to these ratings under the Control condition, both Care and Anger decrease ratings on Achievement motive words. While this effect of the Anger treatment is with $p = .081$ only marginally significant, it is with $p = .008$ significant under the Care motive induction. However, this can be interpreted as evidence that our Care motive induction increases Care motives specifically and does not work primarily over perceived positive valence. The Anger motive induction increases ratings on Fear motive related words at $p = .026$. This effect is however considerably weaker[12] than the aforementioned effect of the Anger motive induction on Anger-related words. The affective states of happiness and sadness are largely unaffected by our motive induction treatments[13]. We take this as evidence that later results obtained after the Care motive induction are not driven by mood changes. Table 1

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[11] A variant of the rank-sum test accounting for clustering at the subject level.

[12] The mean of the anger-fear difference in ratings is significantly larger for subjects in the Anger induction compared to Control treatments at $p=.039$ according to a rank-sum test.

[13] The Care motive induction however slightly increases ratings of sadness. This is unsurprising, given that previous studies have established that compassion and unpleasant feelings can often co-occur (e.g., when viewing others suffer, Condon and Feldman Barrett, 2013).

presents an overview of the data and results from the manipulation check. We therefore find evidence for the two hypotheses of the manipulation check sessions: Our autobiographical recall procedure successfully activates Anger and Care motives.

2.3.3 Hypotheses and Design Details of Decision-Making Session

This subsection presents the hypotheses that we sought to test in the public goods game in the second session of the experiment. These follow from the behavioral and perceptual tendencies of our target motives outlined in the previous section and relates them concretely to the public goods game.

Table 1 Results of manipulation check sessions - Differences in mean ratings over motive specific words after autobiographical recall motive induction

Treatment	Anger			Control			Care		
Observations	41			45			44		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Anger words	0	10	3.01***	0	8.49	1.55	0	8.78	1.58
S.E.			(.34)			(.25)			(.22)
Care words	0	10	4.24	0	10	4.71	0	10	6.04***
S.E.			(.32)			(.34)			(.32)

Significantly different from respective mean rating under *Control* (*** = $p < 0.01$). Robust standard errors clustered at the individual subject level in parentheses. This table describes mean self-reported subject ratings over words that represent Care and Anger motives. Subjects indicated how much they feel like a motive-specific word after motives were induced with the autobiographical recall method. Ratings were made on a continuous scale from "not at all" (0) to "very much" (10).

Hypothesis 1 – Contributions: Subjects under Care contribute more to the public good than subjects under Control, while contributions under Anger are lower than contributions under Control. This is driven in part by different preferences.

In our experiment, subjects make a one-shot contribution decision because we are interested in how the motive inductions affect subjects' choices in the absence of learning effects, strategic considerations, and reputational concerns. Subjects are also asked to complete four comprehension questions involving payoff calculations about the game. We investigate

whether the induced motives lead to differences in the comprehension of the incentives of the public goods game (per Fosgaard et al., 2014). If a subject cannot correctly compute payoff outcomes, it is very likely that this subject has not understood the game. Making correct inferences about the motivation behind observed behavior is problematic as recently pointed out and investigated by Cason and Plott, (2014). At the beginning of the decision session, the experimenter distributes the instructions and reads them out loud. The first explicit decision task is the contribution decision to the public good. However, before subjects enter their unconditional contribution decision we implicitly collect data on how subjects' attention to their own and their other group members' hypothetical payoffs vary between treatments. In particular, we randomly generate example contributions and record how often subjects look at the resulting payoffs to themselves vs. the resulting payoffs to their other group member using a mouse tracking interface within z-Tree (Fischbacher, 2007). Concretely, we present them with two randomly generated examples showing their own payoff and their partner's payoff in two boxes onscreen. For these two examples, the resulting payoffs from the example contributions only become visible to the subjects if they hover over the respective boxes with the mouse and only for as long as the mouse arrow is over the box. In different one-shot games, an eye-tracking study by Polonio and colleagues (Polonio et al., 2015) has suggested that subjects' social preferences can be inferred from how attentive they are towards (i) strategies that maximize the distance between their own payoff compared to their partner's payoff and (ii) strategies that minimize this comparison. Since we hypothesize that different motives entail different social preferences, we assume that subjects motivated by Care or Anger could focus more on the payoffs of others, albeit for opposite reasons, namely, to respectively increase vs. decrease the payoff of others.

Hypothesis 2 – Attention: Both Care and Anger increase subjects' attentions to the others' payoffs relative to Control.

Directly after these two mouse-over example screens, subjects decide how much to contribute to the public good. Once subjects enter this unconditional contribution decision we ask subjects whether they perceiv*e the decision environment* of the public goods game as either a cooperative or a competitive context. This elicitation seeks to investigate whether the motivational inductions can affect the way subjects spontaneously frame the game. The public goods game is one of mixed incentives – i.e. incentives are not completely aligned since free-riding increases one's own payoff at the expense of the other, but incentives are not completely opposed since both players benefit from higher mutual contribution levels. At the individual

level it depends on the subject's belief about the other group member's contribution as well as the nature of the subjects' (social) preferences how harmonious the interests in the public goods game are perceived. Similar to Zizzo and Tan (2007), subjects are asked to indicate in a binary choice whether they perceive the public goods game to be more similar to a purely cooperative game that provides strategic complementarity (a pure coordination game) or to a purely competitive game with substitutability in strategies (matching pennies)[14]. This decision is not incentivized. Since the Care motive increases one's focus on mutually beneficial outcomes and Anger motive leads to an increase in competitive objectives we test the following hypothesis about perceptions:

Hypothesis 3 – Perceptions: Care subjects perceive the nature of the public goods game as significantly more cooperative than Control subjects. Subjects under Anger perceive the game as significantly more competitive than Control subjects.

Subsequently, we elicit subject's beliefs about their other group member's contribution to the public good. These are incentivized as in Gächter and Renner (2010). Subjects are asked how many Euros they think their other group member has previously put into the group account. If a subject guesses the other's contribution correctly, she earns an additional 1 Euro. Incorrect guesses are not rewarded. Following the belief elicitation, the amount that subjects think that both they and their other group member should have contributed (contribution norm) is elicited using a similar mechanism adapted from Krupka and Weber (2013).

In general, it is known that subjects with pro-social preferences also exhibit prosocial beliefs about others (Yamagishi et al., 2013). There is evidence that this could possibly hold because subjects could self-project their own preferences to others (Krueger et al., 2012). Caring subjects are therefore conjectured to believe that their own prosocial behavior leads others to also act pro-socially. As we have seen in the previous section, the evidence in the case of *Anger* points in two directions concerning beliefs that subjects could hold. On the one hand, angry individuals may expect deference from their partners in the form of higher contributions. On the other, subjects under *Anger* may reasonably expect that their counterparts are angry too and hence infer that they will not contribute much.

After this elicitation of contribution norms, the experiment continues by eliciting subjects' conditional contribution schedules. Following Fischbacher et al. (2001), we ask subjects how

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[14] The descriptions used may be found in appendix A1 of this chapter.

they would change their contribution if they knew how much their other group member had contributed. Without knowing how much their other group member actually contributed, subjects fill in a contribution table in a strategy method design (Selten, 1967*)*. Subjects indicate for each of the 11 possible contributions that their other group member could have made how much they would want to contribute in response. This measures one's preferences for contributing to the public good because it specifies the desired contribution for each possible information set. Subjects have an incentive to state their true preferences in the conditional contribution schedule, because for one randomly-selected subject within each group the conditional contribution decisions are carried out to determine the final payoff and not the initial contribution decision.

After subjects complete their work on these tasks, they are called one by one into another room to receive their payment from the study privately.

2.4 Results

Data were collected over the months of March and April 2016. Subjects came from the University of Kiel subject pool and studied diverse subjects. The experiment was organized and administered with the software hroot (Bock et al., 2014) and programmed with the software z-Tree (Fischbacher, 2007). In total 184 subjects participated in both the motive induction and public goods sessions. Of these, 57 participated in the *Control* treatment, 62 in the *Anger* induction treatment, and 65 in the *Care* induction treatment. Subjects earned on average €18.20 combined for the two sessions, which together lasted around 90 minutes.

45% of subjects were male and 55% were female. There are no significant gender differences across the three treatments.

Comprehension of the public goods game's payoffs was widely distributed in our subject pool. The quiz had four questions. The mean number of incorrectly answered questions were 0.8 in *Control* (*sd* = 1), 0.7 in *Anger* (*sd* = 1.1) and 0.9 in *Care* (*sd* = 1). According to rank-sum[15] tests none of the pairwise comparisons in the number of incorrectly answered questions produce significant differences between treatments. It should also be noted that none of the distributions over shares of subjects who made a certain number of mistakes (0 – 4) differ in

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[15] Two-sided *p*-values are reported throughout.

pairwise comparisons across our treatments. Also, over all three treatments, the distribution of scores is not significantly different (both these insights stem from Fisher's exact tests).

However, only 97 of the 184 subjects correctly calculated payoffs on all of the post-game comprehension questions. We have strong reasons to expect that the effect that different motives have on choices will be observable with the least distortion for those who fully understood the game. This is because motives concern the objectives of choice. Choices made by those who did not understand the game do not convey clear information about their objectives. For this reason, we report results for both the full sample, as well as the subsample of participants who passed the comprehension quiz and whose native language was German (one additional subject is excluded on this basis). We denote this the "comprehension sample," and henceforth emphasize the results for these subjects. Table 2 reports the averages of the main variables of interest, broken out by treatment, for both the full and comprehension samples.

Result 1: In the comprehension sample, subjects under Care contribute significantly more than subjects under Anger, with Control condition subjects clearly in the middle. Hypothesis 1 is therefore supported in the comprehension sample.

Figure 2 displays the mean contribution levels across the three treatments. In the full sample there are no significant differences. In the comprehension sample by contrast, contributions in the care induction treatment are over €1.50 higher than in the anger induction treatment. This difference is significant at the $p=.039$ level according to a rank-sum test. A Cuzick[16] test also confirms that there is a significant ordering of contributions by treatment in the comprehension sample, with contributions under anger lower than those under control in turn lower than those under care ($p=.049$). Figure 3 shows the full histograms of contributions by treatment for both the full and comprehension samples.

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[16] An extension of the rank-sum test for trends. See Cuzick (1985).
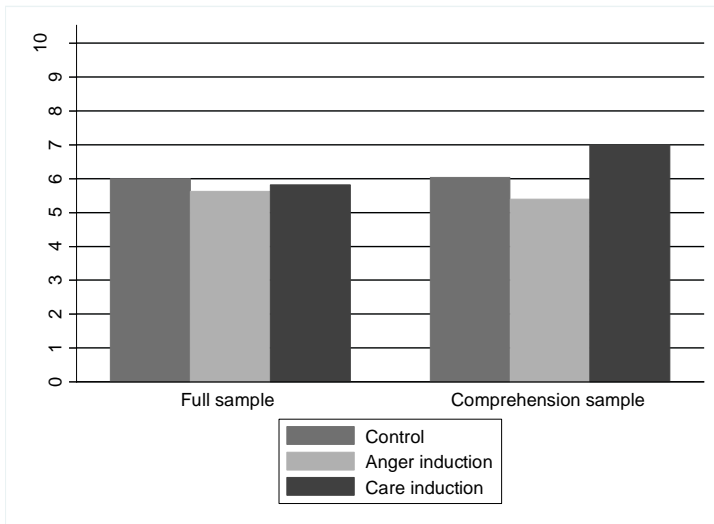
Figure 2 Average contributions across treatments
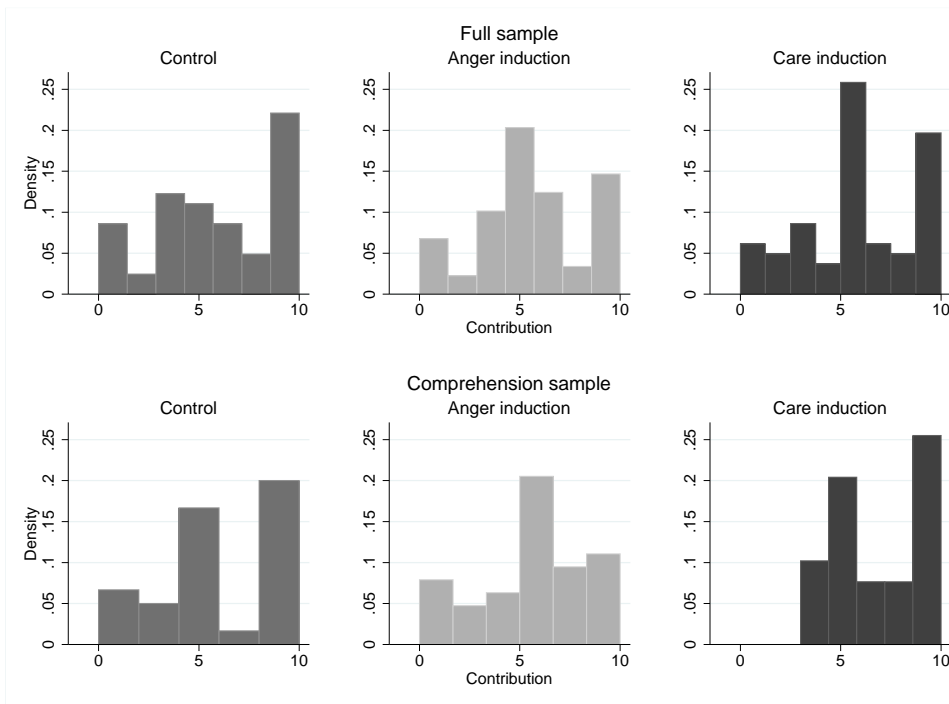
Figure 3 Histograms of contributions across treatments

In the following, we expand on this result by documenting the induced motives' effects on preferences, beliefs, and perceptions.

Table 2 Means of the outcome variables by treatment, along with differences

Full sample

	Control	Anger induction	Diff. (Anger-control)	Care induction	Diff. (Care-control)	Diff. (Care-anger)
Contribution	6.00	5.63	-.371	5.82	-.185	.186
	(.438)	(.368)	(.569)	(.374)	(.572)	(.525)
Belief	4.86	5.21	-.350	5.11	.248	-.102
	(.406)	(.323)	(.514)	(.352)	(.534)	(.479)
Norm	8.47	8.44	-.038	8.75	.280	.318
	(.318)	(.343)	(.470)	(.276)	(.419)	(.438)
Own payoff views	5.88	5.73	-.151	5.17	-.708*	-.557
	(.382)	(.386)	(.544)	(.346)	(.515)	(.517)
Other's payoff views	4.23	4.68	.449	3.80	-.428	-.877
	(.311)	(.405)	(.517)	(.204)	(.363)	(.447)
Perceived as competitive	.140	.323	.183**	.246	.106	-.076
	(.046)	(.060)	(.077)	(.054)	(.072)	(.080)

Comprehension sample

	Control	Anger induction	Diff. (Anger-control)	Care induction	Diff. (Care-control)	Diff. (Care-anger)
Contribution	6.03	5.39	-.639	7.00	.967	1.61**
	(.639)	(.484)	(.786)	(.485)	(.811)	(.701)
Belief	4.93	5.03	.093	6.04	1.10	1.01
	(.527)	(.372)	(.628)	(.583)	(.784)	(.662)
Norm	8.70	8.79	.089	8.93	.229	.139
	(.407)	(.362)	(.545)	(.411)	(.579)	(.550)
Own payoff views	5.97	5.87	-.098	5.39	-.574	-.476
	(.495)	(.567)	(.775)	(.538)	(.730)	(.806)
Other's payoff views	4.13	5.08	.946	3.89	-.240	-1.19
	(.295)	(.625)	(.751)	(.310)	(.427)	(.776)
Perceived as competitive	.167	.316	.149	.214	.047	.102
	(.069)	(.076)	(.106)	(.079)	(.105)	(.112)

Result 2: Subjects' preferences, as elicited by their conditional contribution schedules, differ significantly across induced motives in the comprehension sample, and to a lesser extent also in the full sample. The Care induction treatment leads to significantly more pro-social preferences. The Anger induction treatment does not change conditional contributions significantly.

Figure 4 plots subjects' contribution schedules averaged across all subjects in each treatment. The mean contribution schedules for each treatment are graphed, with the full sample in the left panel and the comprehension sample in the right. In the full sample, average contributions are slightly higher in the care induction than in the *Control* treatment at all hypothesized partner contributions, with around the same slope. Subjects in the anger induction treatment give slightly higher than those in the other treatment at low partner contributions and lower than those in the control or care induction treatments at higher contributions (i.e. the slope is shallower). In the comprehension sample, care-induced subjects give the most at all hypothesized partner contributions, followed by *Control* subjects and then by anger-induced subjects. There are significant pairwise differences (at the 10% level) between care-induced subjects and *Control* subjects at hypothetical partner contributions of €0, €6, €7, €8, €9 and €10 in the comprehension sample according to rank-sum tests. There is also a significant difference between care-induced and anger-induced subjects in the full sample for a hypothetical partner contribution of €10 (at $p=.05$) and between the anger-induced and *Control* subjects in the full sample for a hypothetical partner contribution of €0 ($p=.09$).
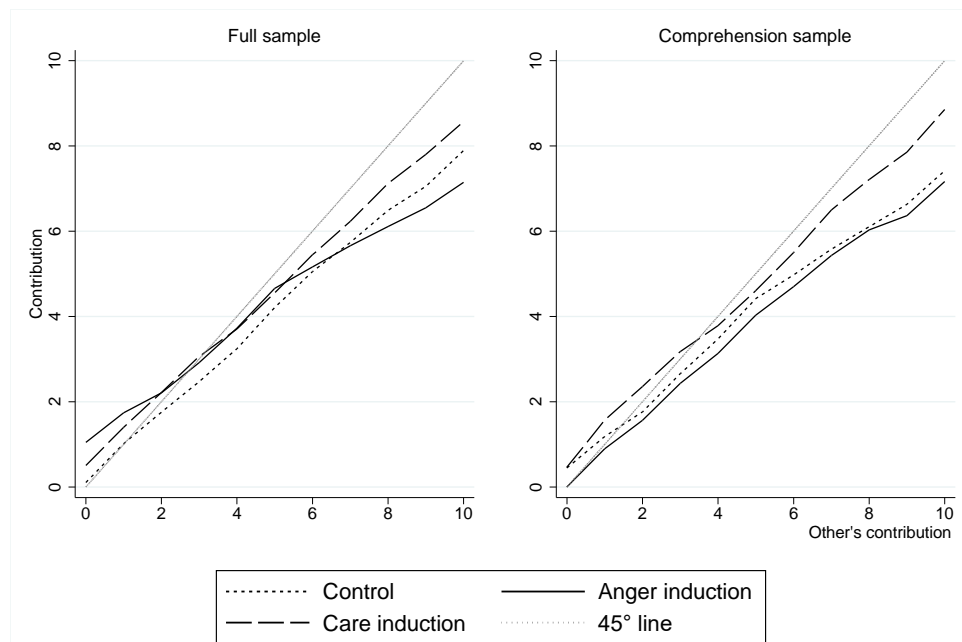
Figure 4 Conditional contribution schedules

We have also regressed conditional contributions on hypothetical partner contributions and estimate that the Care treatment leads to a roughly 92ct. increase[17] in conditional contributions at each hypothesized partner contribution level relative to the Control treatment.

Each subject also was categorized according to the pattern displayed in her contribution schedule. All subjects fit exactly one of five types. The most common type, which we denote "Conditional contributor" is assigned to all subjects whose contribution schedules display a significantly positive (at the 1% level) Spearman rank correlation between own and partner's contribution. "Free riders" give €0 across the range of partner contributions. Similarly, "Pure altruists" give some positive amount that does not vary across the range of hypothesized partner contributions. The second-most common type, "Hump contributors," have a contribution schedule that is increasing up to some hypothesized partner contribution, and then decreasing as contributions go higher. These types are known in the literature (see seminally Fischbacher et al., 2001).
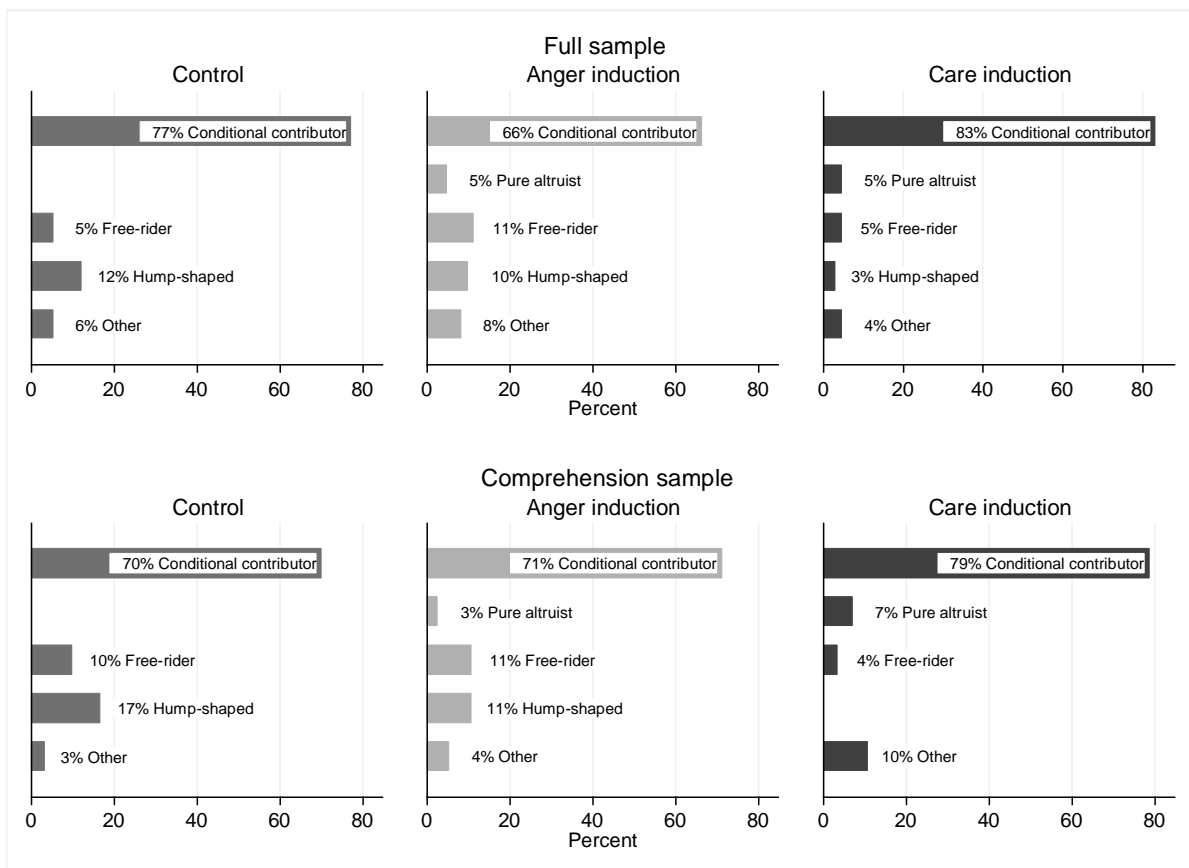
Figure 5 Conditional contribution types across treatments

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[17] This is significantly different from zero at $p=.072$; standard errors were adjusted for clustering by subject.

A small proportion of subjects did not fit into one of these standard types and were classified as "Other".

Figure 5 breaks down the sample by these conditional contribution types. In the full sample, conditional contributors constitute 77% of the *Control* treatment subjects, 66% of the anger-induced subjects and 83% of the care-induced subjects. The difference between the share of conditional contributors in the Care and Anger induction treatments is significant in this sample.

Table 3 Significance of differences in type shares, according to rank-sum tests

	Full sample			Comprehension sample		
	Anger-Control	Care-Control	Care-Anger	Anger-Control	Care-Control	Care-Anger
Cond. Contributors	p=.184	p=.417	p=.029	p=.925	p=.460	p=.493
Pure altruists	p=.094	p=.102	p=.953	p=.374	p=.140	p=.388
Free-riders	p=.238	p=.870	p=.164	p=.944	p=.339	p=.295
Hump-shapes	p=.651	p=.053	p=.127	p=.462	p=.025	p=.079
Others	p=.544	p=.869	p=.426	p=.703	p=.272	p=.412

In the comprehension sample, conditional contributors constitute 70% of the *Control* treatment subjects, 71% of the anger-induced subjects and 79% of the care-induced subjects. Furthermore, we find significant differences when the distribution over all conditional contribution types is compared between the *Care* and the *Control* treatments. These two distributions differ at *p*=.04 according to a Fisher's exact test. Moreover, the joint distribution over all contribution types under the *Anger* and *Control* treatments differs from the distribution under *Care* at *p*=.06, suggesting that subjects under the *Care* treatment have a different set of objectives than those under *Control* and to a lesser extent, *Anger*.

Result 3: Subjects' elicited descriptive beliefs differ only slightly (and not significantly) across induced motives in either the full or comprehension sample.

Figure 6 displays elicited beliefs about the contribution of subjects' partners. Subjects thought that others would contribute around €4.50 to €6.00 on average. Refer to Table 2 for averages by treatment. While beliefs are highest among care-induced subjects and notably so in the comprehension sample, there are no statistically significant pairwise differences in beliefs between treatments according to rank-sum tests.
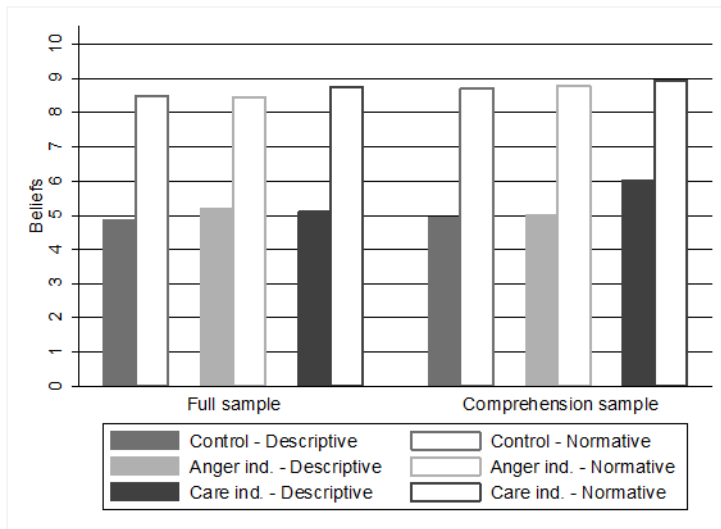
Figure 6 Descriptive and normative beliefs

Result 4: Observed differences in beliefs do not fully mediate the observed differences in contributions. In particular, for subjects under the Care induction in the comprehension sample, contributions are significantly less explained through held beliefs than for comprehensive subjects under the Anger induction. This provides further evidence that differences between treatments observed in the comprehension sample are driven by preference shifts.

Table 4 provides evidence on whether elicited descriptive beliefs might mediate the differences in contributions across treatments. In the first two columns, contributions in the full and comprehension samples respectively are regressed on two indicator variables for the anger induction and care induction treatments (the *Control* treatment is the base category). The estimated coefficients reproduce the mean differences noted above. The difference between the coefficients on the care induction and anger induction dummies is significant at the $p=.02$ level for the comprehension sample. In the next two columns, each subject's elicited belief is added to the regressions of contributions on treatment indicators, with interactions between beliefs and the treatment indicators. Here we see that the difference in contributions between the care induction and anger induction treatments is still significant at the $p=.01$ level. Furthermore, the coefficients on the treatment indicators are not significantly different in the regressions with and without beliefs. By these criteria subjects' beliefs do not satisfy the requirements of a mediating variable (see e.g. MacKinnon et al., 2007). This indicates that different motives are associated with different social preferences and that behavior under different motives is not merely driven by different beliefs under these motives. Another interesting finding to come out of these regressions is that comprehensive subjects under care are significantly less responsive

to beliefs than those under anger at the $p=.01$ level. Table 5 quantifies how much of the observed difference in contributions between the Care and Anger treatments is attributable to differences in beliefs by reporting two-way Oaxaca decompositions[18]. This analysis suggests that €0.76 of the €1.61 difference between the care induction and anger induction contributions is attributable to belief differences and €0.85 is the treatment effect after controlling for beliefs.

Table 4 Regressions of contributions by treatment, controlling for beliefs

Equation	1	2	3	4
Anger	-.371	-.639	-1.23	-1.63
	(.572)	(.801)	(1.08)	(1.43)
Care	-.185	.967	-.995	1.40
	(.576)	(.801)	(.993)	(1.50)
Belief			.612***	.769***
			(.141)	(.182)
Belief x Anger			.124	.183
			(.182)	(.206)
Belief x Care			.129	-.213
			(.163)	(.213)
Constant	6.00	6.03	3.03	2.24
	(.438)	(.638)	(.838)	(1.27)
Full sample	X		X	
Comprehension sample		X		X
N	184	96	184	96
R2	.002	.046	.407	.488

Robust standard errors in parentheses. *** indicates significance at the p=.01 level.

This remains significantly different from zero. We therefore conclude that changes in beliefs are only partially responsible for the observed changes in contributions, and only for the care induction treatment. This corroborates evidence presented above from the conditional contribution schedules.

Result 5: Different induced motives are associated with different patterns of attention. In particular Care-motivated subjects show less self-focus and Anger-motivated subjects show more other-focus. Hypothesis 2 is therefore supported by the data.

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[18] This method explains the difference in mean contributions between treatments by decomposing the difference into 1) that part that is due to a combination of differences in average beliefs between treatments and differences in the impact of beliefs on contributions in the different treatments and 2) the residual difference. We interpret the residual difference as arising from preferences.

Table 5 Two-way Oaxaca decompositions of effect sizes based on beliefs

	Full sample			Comprehension sample		
	Anger-control	Care-control	Care-anger	Anger-control	Care-control	Care-anger
Total	-.371	-.185	.186	-.639	.967	1.61
	(.570)	(.574)	(.524)	(.798)	(.798)	(.682)
Explained diff.	.230	.167	-.075	.079	.735	.764
	(.343)	(.362)	(.352)	(.548)	(.538)	(.532)
Unexplained diff.	-.601	-.352	.262	-.717	.231	.841*
	(.453)	(.447)	(.387)	(.587)	(.563)	(.493)

Robust standard errors in parentheses. * indicates significance at the $p=.10$ level.

Figure 7 displays subject's attention to their own and other's payoffs as displayed on the example calculation screen. Across all treatments subjects pay more attention to their own payoffs. Care-motivated subjects in the full sample view their own payoff significantly less often than those in the *Control* treatment (at $p=.089$ according to a rank-sum test).
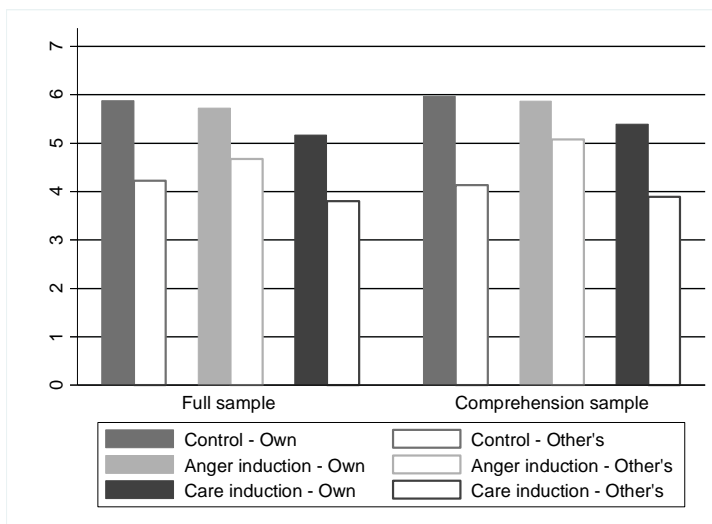
Figure 7 Average views of own and other's example payoffs by treatment

In the comprehension sample a similar pattern emerges. Subjects in the Care induction focused less on their own payoffs ($p<0.1$), while this was not the case for subjects in the Anger induction. Rather, for subjects in the Anger induction only, payoff differences in the example games predicted increased contributions, suggesting that angry participants might have based their contribution decisions on payoff comparisons. This may be seen in Table 6. There is a significant positive correlation between the difference between the subject's own displayed example payoff and the other's displayed example payoff and the subject's subsequent contribution for subjects in the anger induction treatment, but not in either the control or care

induction treatments. This means angry people who see their own payoff higher than another's give more while angry people with displayed payoffs lower than others give less. The direction of the correlation under the *Care* treatment is consistently opposed to the direction under the *Anger* treatment. Since anger-induced subjects are significantly more affected by implied differences in payoffs, it makes some sense that they would pay more attention to their partner's payoffs.

Table 6 Correlations between displayed payoff examples and contributions

	Control	Anger induction	Care induction
Full	-.010	.281**	-.191
Sample	p=.940	p=.027	p=.128
Comprehension	-.155	.331**	-.065
Sample	p=.412	p=.042	p=.741

Result 6: The motive of Anger is associated with weakly greater competitive perceptions of game incentives. Hypothesis 3 is therefore supported by the data.

Figure 8 displays the relative proportions of subjects in each treatment who state that they think the public goods game to be more similar to a purely competitive (matching pennies) rather than a purely cooperative (pure coordination) game. A large majority of subjects in all treatments consider the public good game to be more cooperative than competitive. The biggest majority is in the *Control* treatment. A slightly higher proportion of subjects in the care induction treatment consider the game to be more competitive. Subjects in the anger induction treatment are the most likely to consider the game to be more competitive than cooperative. Indeed anger-induced subjects were nearly twice as likely to consider the game to be more competitive than subjects in the *Control* treatment. Significant differences are detectable only between the control and anger induction treatments for the full sample (at *p*=.02).
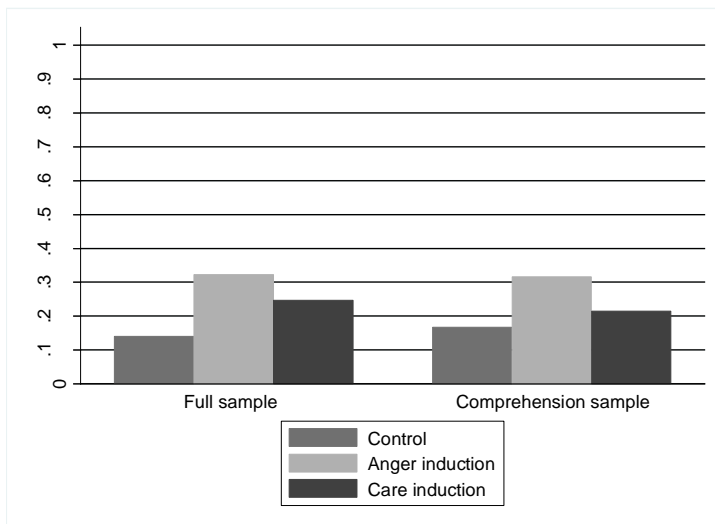
Figure 8 Shares of subjects that perceive the game interaction to contain strategic substitutes

2.5 Concluding Discussion

The aim of this paper is to assess experimentally the influence of psychological motives on economic decisions in a public goods game. In the experiments described above, we induce these motives through autobiographical recall. We present evidence showing that (1) preferences, (2) beliefs and (3) perceptions and attention are affected by two opposing motives, Care and Anger, but that these motives affect the three channels differently. The results of our experiments show that cooperation in public goods games varies significantly depending on whether the social dilemma is encountered under Care or Anger motives. This finding is strongest for subjects that show full comprehension of the game's incentive structure.

We were able to causally investigate how Care and Anger motives changed social preferences through observing a one-shot interaction, eliciting incentivized beliefs about other's contribution, eliciting conditional contribution schedules that control for beliefs, and assessing subject's comprehension of the game's incentives. The Care motive elicits greater willingness to unconditionally contribute to public goods than the Anger motive. This finding is significant for subjects that understand the game's incentives well. Moreover, for these subjects, conditional contribution schedules under *Care* are always higher on average compared to conditional contribution schedules under Control and Anger. The Care schedule becomes significantly higher than the other two when the other group member has contributed high amounts. Subjects under the Anger motive induction demonstrated significantly less often conditional cooperative behavior and had the highest amount of free-riders among them.

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In the comprehension sample, changes in beliefs do not account for differences in contributions between Control and Anger. While the Care treatment increases beliefs slightly relative to Control and Anger, these belief changes explain less than half of the observed difference in contributions. Interestingly, while beliefs generally explain a considerable amount of the variation in contributions, this effect is significantly less pronounced under Care compared to Anger in the comprehension sample. Whereas Anger is focused on retribution, and is therefore conditional in nature, Care is focused on increasing others' well-being and may therefore exhibit weaker conditionality.

Furthermore, subjects motivated by Anger perceive the game to be significantly more competitive than cooperative at more than twice the frequency compared to Control. Subjects under Anger are also most attentive towards hypothetical displayed payoff differences. When example payoffs were displayed to subjects under Anger that resulted in greater disadvantageous inequality or less advantageous inequality, they were less willing to contribute. This is consistent with other research indicating that Anger leads to increased sensitivity towards perceived injustice. In summary, our findings suggest that different motives are associated with different social preferences as well as different perceptual and attentional tendencies and that beliefs influence choices under different motives differently.

The small effects observed for the two induced motivations when compared to the control group separately are somewhat in line with activation theories and the existing research on emotions (e.g., small to moderate effects are typical; Angie et al., 2011). Moreover, compared to the real world, induced motives in the lab are weaker and do not persist as long, which makes observing them vulnerable to specific design choices. In our case, we were likely overly cautious about mitigating the possibility for experimenter demand effects. The two-part design, while clean, induces an abrupt change of context where continuity would be preferable. Nevertheless, we do find significant evidence in the sample that allows for the clearest inference that different motives lead to different social preferences in our experiment.

On the whole, our results suggest that people's willingness to act in the public interest depends on motivational states that may change flexibly in response to changes in social contexts. While this study focused on two specific motives, Care and Anger, these results indicate that the effects that achievement, affiliation and power or fear motives have on social preferences warrants further study. The influence of motives on economic decisions is ignored in mainstream neoclassical microeconomic analysis, where preferences are assumed to be internally consistent, temporally stable (sufficiently for revealed preference experiments to be

performed) and context-independent. The preferences implied by different psychological motives, by contrast, need not be internally consistent with one another; motives can change abruptly through time; and they are highly context-dependent.

We find the strongest evidence for preference changes due to Anger and Care motives in the subsample of those who have fully comprehended the incentives of the public goods game. This stands in stark contrast to the arguments of e.g. Dufwenberg et al. (2011) or Fosgaard et al (2014, 2015) who argue that public goods contributions vary with frames only because the frames influence subject beliefs or misconceptions about the payoff structure. However, our results indicate that motives do not effect comprehension and that mis-comprehension does not explain treatment differences. This suggests that we are observing a change in objectives and not simply heuristic decision making. Given this discussion, it is also interesting to note that by plugging subjects' beliefs about others' contributions into their conditional contribution schedules we observe the most consistent decision-making for subjects in the motive induction conditions. We therefore conclude that objectives themselves differ across environments, and that this may explain differences in cooperation across contexts. Future research should focus on how commonly-studied frames influence behavior by accounting for the psychological affect and motivational state changes they entail.

APPENDIX A

A.1 Instructions

Instructions for Participants

Thank you for participating in today's study. Please take this study seriously and work on the tasks as diligently as possible. During the study, please do not talk to the other participants. If you have a question during the study, please raise your hand. A researcher will come to you and answer it in private. In this part of the study you will work on two tasks. For your work on both these tasks you will receive a fixed amount of 4.50 Euros. In case that you take part in a subsequent session, you will receive your payoff from this session together with possible other payoffs from this subsequent session which will be conducted by a different researcher at the end after approximately 90 minutes. If you do not take part in the subsequent session, you will receive your payoff from working on the two tasks in this session after this session ended. We

will now read out loud the instructions for the first task, which start with the next paragraph. Please also read along by yourself while we read out these instructions to you.

Task A - Essay about compassion and a feeling of warmth for a person

(8 minutes writing time + 2 minutes recollection time)

Please write down a personal memory of a situation in which you felt feelings of compassion and warmth for another person, as well as felt the motivation to improve this person's well-being.

Please note the following points:

- Please write about the situation and how you felt in this situation as vividly as possible.
- Please also feel free to write down any details of your memory that you recall as they come to you; the essay does not have to follow a particular order.
- The data that is collected in this study cannot be linked to your identity; this means that your essay cannot be attributed to you personally. The elicited data are supposed to be analyzed with methods of computational linguistics. Your participation in this study is anonymous and the collected data will be treated as absolutely confidential at all times.
- You can use the front and back of the two included sheets of paper to write down your memory.
- A researcher will announce to you the beginning and the end of the 2 minutes recollection time. During this time, please recall situations in which you felt compassion and warmth for a person, as well as felt the motivation to improve this person's well-being. Please try to imagine these situations accurately and choose one such situation that you would like to write about.
- For completion of this task we ask that you keep writing on this recollection essay for the entire 8 minutes. After 8 minutes you can stop writing. We will check that you write for the entire 8 minutes.

Please wait to start working on this task until the scientific assistant tells you to do so. We will now read out an example essay to you to give you an idea about what kind of essay it is that

you could write. Subsequently, please write about your own personal memory as detailed as possible.

Example Essay Care A:
(This was not distributed to subjects, but only read out loud to them)
- Compassion and warmth for a person -

I just recently became a father at a quite young age. I experienced the childbirth together with my girlfriend Lisa, a midwife, nurses and a doctor in the delivery room. Especially for Lisa the birth was a very strenuous process. I was with her in the room the whole time. When the birth was near, I was standing behind her, behind her head while she was lying and stroked her hair. When our daughter Anna came, we heard the first tender noises from her after a few seconds. She opened her mouth and breathed in the first air she ever breathed into her tiny lungs. Then she started to cry very faintheartedly. When we heard this, tears were rolling over our cheeks and I let sink my head down to Lisa such that our foreheads touched each other slightly. While the medics gave my tiny daughter a quick first examination and some treatments, I gently swept some sweaty strands of hair from the forehead of my girlfriend. The examination ended without difficulties. The little one was healthy and alright. When the medics were done the midwife brought our tiny daughter Anna to us. When I took her into my hands, I had the impression that never in my life I tried to be so careful with something in my hands while being absolutely amazed at the same time. Lisa reached up with her hand to our little daughter and she tried to grasp Lisa's finger with her tiny hand. After this moment of peace, the midwife gave me a blanket and pointed towards a deck chair nearby. The midwife said that it would be good if I let lay Anna down on my belly with the blanket so I could be close to her. I thought this was a great idea. While Anna was slightly moving on my belly I just could not take my eyes off of her and soothed her with my hands. In this moment I thought only that I want to be a good father to her and about how much I enjoy life together with my two girls.

Task B - Essay about an experience in which you helped another person

(8 minutes writing time + 2 minutes recollection time)

Please now write down a second and last essay on a situation in which you thought about how you could help another person or in which you actually did help another person even though this person did not expect to receive help.

- Please follow the same instructions while writing down this memory as in the first essay.
- Please wait to start working on this task until the researcher tells you to do so. We will now read out an example essay to you to give you an idea about what kind of essay it is that you could write. Subsequently, please write about your own personal memory as detailed as possible.

Example Essay Care B:
(This was no distributed to subjects, but only read out loud to them)
- Helping another person -

Last week when I was biking from my lecture hall to the student cafeteria, I noticed another student who was carrying around an extremely big pile of papers and books. It became apparent that this was really cumbersome for him since and that he had to focus really hard on not letting anything drop. The pile reached as high as his chin. From the corner of my eye I noticed how he stumbled over the curb. Because of this, some of the paper and books fell on the ground. I observed how he tried to pick up the material that fell on the ground with one hand. This was very difficult for him, as he had to hold onto the rest of his things and make sure they didn't also land on the ground while he bent over to pick things up. His stuff was strewn all over the street and the wind blew some of the papers even further away. I saw how he grimaced as he tried to quickly pick everything up off the ground. I could well imagine how unpleasant this situation must have been for him. Of course, I had before also dropped things which I then had to collect as the wind blew them away. I decided to help him and quickly rushed to him. I helped him with quickly picking up all of his stuff. He thanked me several times for my help. While I was picking up his belongings, I noticed a physics book that I also saw around the same time on my sister's desk. His book was now completely soaked. My sister is studying physics at the same university as I do a few terms behind me. The idea came to my mind that

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the two might know each other. The guy then said goodbye very quickly because he said that he had to make an important appointment. When I was home, I called my sister and it turned out that she really knew this guy. She told me that his name was Stefan. I asked my sister whether she still needed her copy of that physics book which had landed in the puddle. She said that she no longer needed it. I then asked her if she would perhaps offer Stefan to borrow her copy the next time she saw him and she agreed.

Example Essay Anger A:
(This was no distributed to subjects, but only read out loud to them. This came at the respective part like in the Care instructions depicted above)
- Frustration -

After I graduated from high school, I started a trainee program as a software developer. I had good grades in math and science subjects in school and would have been admitted to an informatics or similar major easily. However, I decided for a trainee program because I wanted to gain direct hands-on experience. I was very motivated and driven. The first months were demanding and interesting. My bosses tried to stimulate and give me interesting tasks. The program was organized such that trainees had to rotate through every unit of the company and work there for a couple of months. The next unit I was supposed to work at was controlling. As my first task there I was supposed to photocopy a file folder. The folder was very thick and it took several hours to completely feeding it through by hand because each sheet had to be removed and put back in independently. Also, the sheets had different sizes and thicknesses. Already after a short time, this task started to annoy me like crazy. When I was done with copying this folder, I went to my boss and asked him about my next task. The boss just looked at me and asked "What you are already done?" Then he walked with me to a small chamber right next to the copy room that contained more than 50 other folders. My boss told me that in the next weeks and months it will be my task to copy every one of these folders. Day in and day out I copied these folders. That was the most stupid and dullest task I ever had to do in my whole life. Because the copy room was in a very remote corner of the building I was mostly alone while on breaks and didn't have anyone to talk to. The co-workers in the controlling unit seemed to feel a certain schadenfreude and soon started to hit me with some nasty lines: "And here comes the copy stud again." In the evening came: "You're already starting to look like a folder yourself: grey and dusty." Also physically this work was not at all pleasant since I had to breathe in the toner fumes every day and my tendons in the arms as well as my back started

to hurt from the repetitive movement. I decided to go to my boss in this unit and ask for another task. He only mocked me during our conversation. He also told me that if I did not like the work that I am paid for I could quit anytime. I told him that there are guidelines for the trainee program and that I was thinking about contacting the HR department about the tasks I was given in controlling. This was when the boss started to massively put me under pressure. He told me that if I went through HR he would make sure that I will not have a career in this company, that he will tell all other unit bosses that I refuse to perform and that he will give me an extremely bad evaluation.

Example Essay Anger B:
(This was no distributed to subjects, but only read out loud to them. This came at the respective part like in the Care instructions depicted above)
- Insult and harassment -

I have to say in advance that my hearing is very bad. During a break on the schoolyard, another girl yelled "deaf slut" and shoved me against a wall such that my head at the place of my damaged ear hit the wall. This girl was known at our school for harassing other pupils. I screamed in pain and was concerned about the rest of hearing ability. I noticed how the blood was pulsating in my ears due to her insult and her attack, especially because my ear hurt. I stepped away from the wall and told her that she should please leave me alone. She really seemed to enjoy harassing other people and with a disgusting grimace on her face, she came closer to me. I then raised my arms in front of me in order to protect myself if she attacked me again. In this very moment, a teacher came around the corner and told me in an aggressive tone that I should come with him immediately. He told me that he could see how I raised my arms to attack the other girl. But it was exactly the reverse! She insulted me first and thn attacked me. He had not noticed anything that happened before. He said that he has zero tolerance for violence in school and that I would face consequences for my behavior. After he ended, I tried to explain to him what had really happened and what he had not noticed, but he was having none of it. He was one of those guys who would not tolerate any opinion other than his own. If anything, my attempts to explain only confirmed his attitude that I had a problem with respecting authority. Then he punished me by telling me that I had to learn a long poem by heart by the end of the week and that I had to clean the schoolyard every day after school for a month. But on top of that he said another sentence that I cannot forget until this day and which turned out to be the worst insult of all. "Especially from you as a disabled child, I would have

expected better behavior." I find this sentence extremely humiliating and inappropriate especially because he was an adult and a teacher. Before that, I was never insulted in such a way in my life. I had to accept the punishment and the demeanor of these two people. I could not do anything about it.

Example Essay Control A:
(This was no distributed to subjects, but only read out loud to them. This came at the respective part like in the Care instructions depicted above)
- Typical day in the life –

A typical day in my life is right now a working day since I work five days out of seven. I wake up at eight in the morning and hit the snooze button at least four times before I get out of bed. I go up and get ready in the bathroom and grab a cup of tea while I am checking messages. I give the fish some food before I bike to work and arrive at about nine. On my way to work I always check the flowers and plants along the biking track to see what's new and how things have grown. At work I first check my mail and maybe answer a few. Then, I go down to the lab and start up the experiments. At ten I take a short coffee-break and talk to my colleagues or check the local paper for interesting articles. Then I go back to the lab to take measurements on my experiments and then I take my results up to my office to think about the results. Are the results what I expected, what are the next steps etc.. I take care of a little paperwork or discuss something with colleagues in the corridor. At twelve then there is lunch. I usually bring my own lunch and eat it in our break room with about 5 – 10 other people who bring their lunch. During lunch we talk about whatever comes up. I go out for half an hour to see the sun and get some fresh air unless it's raining. Then, I go back to the lab and measure some more until coffee break at three. After this there might be a seminar or I prepare for my teaching or correct lab reports. When I'm sick of this and hungry I go home where my boyfriend and I live. He is almost always home before me and we sit down and discuss what has happened today and if there was any interesting articles in the paper the same morning etc.. We also talk about what to have for dinner and cook what we decided on from the things we have in the house. Soup or pancakes, or sometimes spaghetti with tomato sauce, or lentil soup. If we're not too hungry we go to the corner shop and buy some snacks. We chat some more and then we turn on the TV. I might read something also, a book or an article. Sometimes I visit someone else or call someone up. Sometimes my boyfriend and I just talk with each other and watch TV. At

some point each day I call my sister. I drink some more tea and at twelve I go to bed, read some more and then shut my eyes.

Example Essay Control B:
(This was no distributed to subjects, but only read out loud to them. This came at the respective part like in the Care instructions depicted above)
- Yesterday's activities –

I woke up round about seven a.m. After waking up, I made myself a coffee and ate a banana. Then I put on my running gear and went for an hour-long run through the woods. Although the first few meters were very tough, the running fully awakened me. After that I took a shower and had a real breakfast. While I was having breakfast, I sat down at the laptop and checked messages and news. At around 10 a.m., I went to attend my coaching classes for youth handball. I took my bike there. This was actually originally scheduled for noon, but I got a call from the teacher saying that yesterday's unit should already start at 10. I therefore had to hurry to make it on time. Yesterday, the material we covered was very dry and theoretical but I love handball so much that even that interested me. When the training session was over, I ate something for lunch. I decided to go for a Döner since yesterday's morning made me hungry. Then I called my friend and asked him what plans he had for the day. We agreed to meet at a café near university at 2 p.m. We talked and had coffee together for approximately 2 hours. We both have exams to take in a few weeks' time and we started to really feel bad about postponing studying for them. So together we managed to motivate ourselves. We then left the café for the library to study together. In the library I met a teammate from my handball team and we talked for a little while. When the library closed, I asked my friend if he wants to have a beer at my place to relax after our first day of study. He agreed and we relaxed while watching videos online, listening to music and talking. We also discussed plans for the next weekend. My friend went home at around 11 p.m.. After he left, I did a few dishes and afterwards chatted a little bit online with friends. I went to bed at around midnight

Instructions
(Decision making session)

Thank you for participating in today's study. Please now switch on the monitor that is placed in front of you and position the mouse and the keyboard such that you can use them

comfortably. For the time being, please do not type on the keyboard or click around with the mouse.

Now, please focus again on these instructions and read them along while they are read out to you. If you have a question while you are working on one of the tasks, please raise your hand and a research assistant will come over to answer it in private. You will be paid for your work on the tasks at the end of today's study. You will learn about how exactly you will be paid for the work on a specific task in the instructions that come before each task, respectively. We will distribute the instructions for each of the tasks separately and will read them out loud. Please read along while we read the instructions out for the following task.

Task 1

In this task, you form a group with one other participant in this room. The group assignment was randomly determined prior to the beginning of this task. At no point will you learn about the identity of your other group member. You will likewise stay anonymous to this person. Within this group you and your other group member will each make individual decisions which have financial consequences for both of you.

Each of you has an initial endowment of €10. You can either keep any integer amount of Euros between €0 and €10 or you can put it into a *group account*. Your payoff from this task depends on how many Euros you keep, how many Euros you put into the group account and how many Euros your other group member puts into the group account. The Euros that you do not put into the group account in this task are guaranteed to be paid to you as an outcome from this task. Each Euro that you decide to put into the group account yields a payoff for you of €0.75 and also yields a payoff for your other group member of €0.75. Likewise, each Euro that your other group member decides to put into the group account yields her/him €0.75 and also yields €0.75 for you. This means that every Euro that is put into the group account yields 1.5 Euro for the group. Your total earnings from this task comprise the Euros that you did not put in the group account plus €0.75 for every Euro that you have put into the group account plus €0.75 for every Euro that your other group member has put into the group account.

Please now look at your screen. As soon as the program is started you will find two illustrative examples on the screen that are intended to show you how your decision and the decision of

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your other group member jointly influence your payoffs that both of you receive from this task. You can move the mouse cursor over the boxes in order to see the respective payoffs associated with the given examples. After you have left both example payoff screens by means of clicking the "Continue" button, please decide how much of your endowment you want to contribute to the group account by entering an integer number of Euros between 0 and 10 into the box and confirming your selection by clicking "Ok". Once every participant has made a decision, we will hand out the instructions for the next task.

Task 2

In this task, we are going to present you with two "situations:" Situation A and Situation B.

It is your task to decide whether you think that either Situation A or Situation B is more similar to Task 1 (Please recall that in the previous Task 1 you had to decide how many Euros to put into the group account or how many Euros you wanted to keep). Neither answer is right or wrong here – it's about your personal assessment of similarities.

Please read the two short text blocks as soon as they appear onscreen. These describe both situations to you. Then make your decision by clicking either the "Situation A" button or "Situation B" button onscreen. As soon as every participant has made a decision, we will distribute the instructions for the next task to you.

- **The texts that describe the situations were not on the printed instructions, they were readable on the computer screen -**

Situation A
You and another person can each invest in only one of two projects, Project X or Project Y. If you both invest in Project X, then you each earn a 10 percent return. If you both invest in Project Y then you each earn a 3 percent return. If one of you invests in Project X while the other invests in Project Y then you both earn no return.

Situation B
You and another person can invest in only one of two projects, Project X or Project Y. If you both invest in Project X, then you earn a 10 Percent return while the other person earns no

return. If you both invest in Project Y then you earn a 10 percent return while the other person earns no return. If one of you invests in Project X while the other invests in Project Y, you earn no return while the other person earns a 10 percent return.

Task 3

a)

In this task we would like to ask you about two assessments. First, we would like to know from you how many Euros you think your other group member **put into the group account** in task 1. You must state a guess about this in whole Euro increments between 0 and 10 and enter this in the designated box provided onscreen.

If you guess what the other group member has actually put into the group account correctly, you will earn an additional 1 Euro bonus. Otherwise you will not receive a payoff for your assessment.

b)

Second, we would like to know from you how much you feel each of you **should have put into the group account** in task 1. You must enter an integer between 0 and 10 into the designated box provided onscreen. Please write in the amount of Euros that you think each group member should have put into the group account.

If the number you write in exactly matches the one that your other group member writes in, you will earn an additional 1 Euro bonus. Otherwise you will not receive a payoff for your assessment.

Please now look at the screen. As soon as the program is started, please indicate there how many Euros you think your other group member **has put** into the group account and how many Euros you think both of you **should have** put into the group account by entering two integers between 0 and 10 into the respective boxes onscreen and confirming your entries by clicking the "Ok button". As soon as every participant has indicated her or his choices, we will distribute the instructions for the next task to you.

Task 4

In Task 1, you and your other group member have made a decision about how many Euros you each wanted to put into the group account and how many you wanted to keep.

In this task, we would now like to ask how you would change your decision about how much you want to put into the group account if you knew how much your other group member put into the group account.

One member of each group will be selected at random and given the opportunity to make such a change. For this selected person the changed decision will be carried out instead of the original decision from Task 1. You will not learn until the end of the study which group member was selected to change her decision, so both of you must consider how you would react if you knew how much the other put in. Furthermore, we will not reveal how many Euros each group member actually put into the group account in Task 1 until the end of the study. This means that you have to decide how many Euros you would put into the group account for every possible amount that your other group member could have put into the group account. You will enter your decisions into a table on the computer screen which is very similar to the one printed below:

If your other group member put this many Euros into the group account:	then you would put this many Euros in the group account:
€0	
€1	
€2	
€3	
€4	
€5	
€6	
€7	
€8	
€9	
€10	

In the left-hand column you see the possible amounts that your other group member could have put into the group account with his or her previous decision in Task 1. In the right-hand column you can enter how many Euros you want to put into the group account for each amount that your other group member could have put in. Please fill in every cell.

If you are selected to change your decision, your payoff from asks 1 and 4 will be as follows: Your other group member's decision from Task 1 regarding how much to put into the group account will be carried out at the end of today's study, and you will have the amount listed in the corresponding row of the table put into the group account. The final payoff for you will then be calculated just as described in Task 1.

Please now look at the screen and enter your decisions in the respective boxes once the program is started. As soon as every participant has made a choice, we will distribute the instructions for the next task to you.

<div style="text-align: right;">ID:_____</div>

Task 5

In this task we want to check whether you have understood how your decision and the decision of your other group member determine the payoffs that both of you receive from Task 1 and Task 4. For this purpose please answer the questions on this page by filling in the lines below each question in pen. When you have completed your work on these questions, we will collect the sheet you worked on from your place. Together with the instructions for this task, we distributed a payment receipt to you. Shortly after we collected this sheet with your answers, your payoffs from Tasks 1 to 4 will be displayed on the screen. Please enter the amount that you can find in the row "Your payoff from the game" with a pen in the corresponding line on the payment receipt. Please keep this receipt at your place and wait quietly until the session proceeds.

1.) If you put 4 Euros in the group account, how many Euros did you keep for yourself?

_____

2.) If you put 10 Euros in the group account and your other group member put 2 Euros in the group account, how big is your payoff resulting from these two decisions (according to how they are calculated in Tasks 1 and 4)?

_____

3.) If you put 6 Euros in the group account and your other group member put 8 Euros in the group account, how big is the payoff for your other group member resulting from these two decisions (according to how they are calculated in Tasks 1 and 4)?

_____

4.) If your total earnings from Task 1 and Task 4 are 9 Euros and you put 4 Euros into the group account, how many Euros did your other group member put into the group account?

_____

Questionnaire

In this final part, we would like to collect some demographic information about you, as well as ask you some questions regarding your impressions of the separate tasks that you participated in today which were carried out by different researchers. Please fill out this questionnaire. Once you have completed this, please remain seated at your place until your number, which you drew at the beginning of today's study, is called. Please take your payment receipt and the number with you as we call you to go individually to a different room. There you will then receive your total compensation for your participation in all tasks which you have participated in today in lump sum. Please now begin with your work on the questionnaire.

1. What is your gender?
☐ Male   ☐   Female

2. What is your mother tongue?
☐ German   ☐   Turkish
☐ Russian   ☐   Chinese
☐ Arabic   ☐   Other

3. If German is not your mother tongue: Do you assess your knowledge of German as approximately equivalent to your knowledge of your mother tongue?
☐ Yes   ☐   No

4. To what extent were you able to get engaged in the different tasks? Please answer this question for all tasks you have participated in today, even when they were carried out by different researchers. Please tell, on a scale rising from 1 to 10 (1 meaning 'not at all' and '10' meaning 'absolutely'), where you would classify yourself. Please write down the corresponding number. If you had problems getting engaged with a particular task, then please name the task and briefly write down a statement in which you describe the reasons for this.

_____

_____

_____

5. Have you ever, even outside of our laboratory, participated in a study which was similar to this one or partly reminiscent? If so, in which aspects were they similar? Could you please shortly go into detail on this?

_____

_____

_____

6. What do you think are the goals of the studies in which you are participating today?

_____

_____

_____

7. Do you think some task of today's study might have influenced your work on another? If yes, please mention the task which you think has influenced your work on another task. How and why do you think has one task influenced the other if you are of this opinion?

_____

_____

_____

8. Did you adjust the decisions that you have made in this study towards what you thought the experimenters expected you to decide in order to please the experimenters?

_____

_____

9. Have you heard from other students or faculty at Kiel universities that one had participated in more than one experimental session back-to-back on the same day?

_____

_____

_____

A.2 Screenshots of Experimental Procedure

Beispiel 1

alls Sie dem Gruppenkonto 10 Euro hinzufügen und Ihr anderes Gruppenmitglied dem Gruppenkonto 8 Euro hinzufügt.

...dann bekommen Sie
(fahren Sie zum Anzeigen mit dem Mauszeiger über die Box)

enmitglied bekommt
n mit dem Mauszeiger über die Box)

Weiter
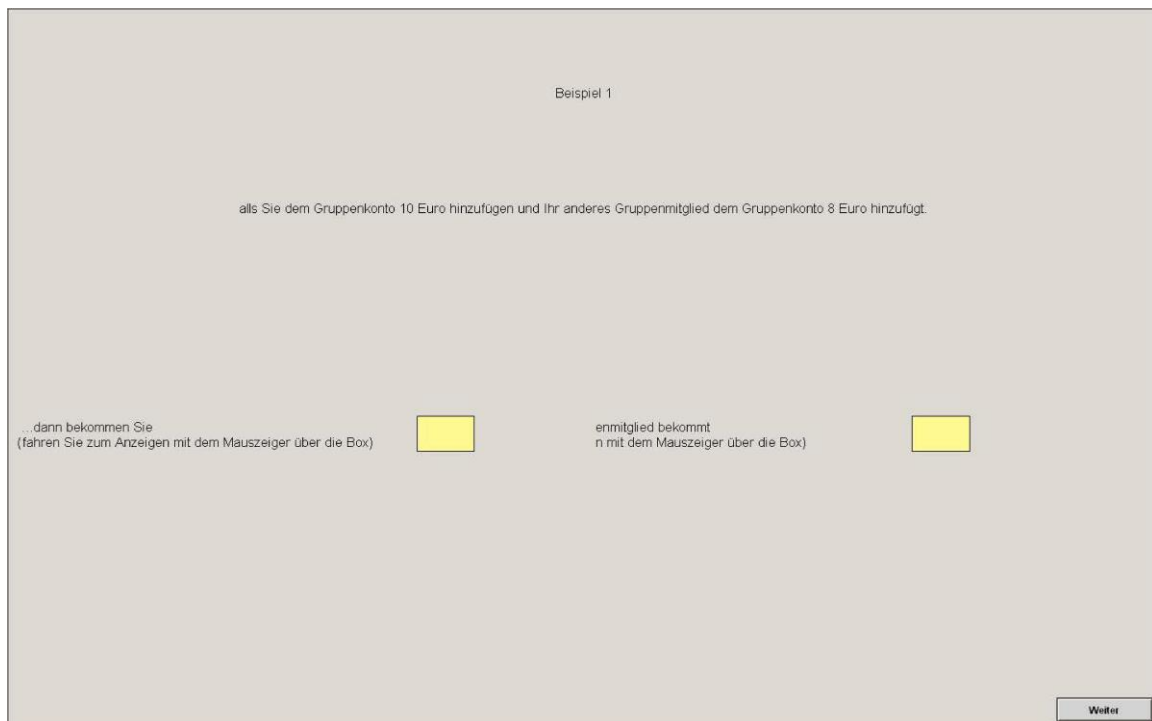
Figure 9 Screenshot "Example payoffs"
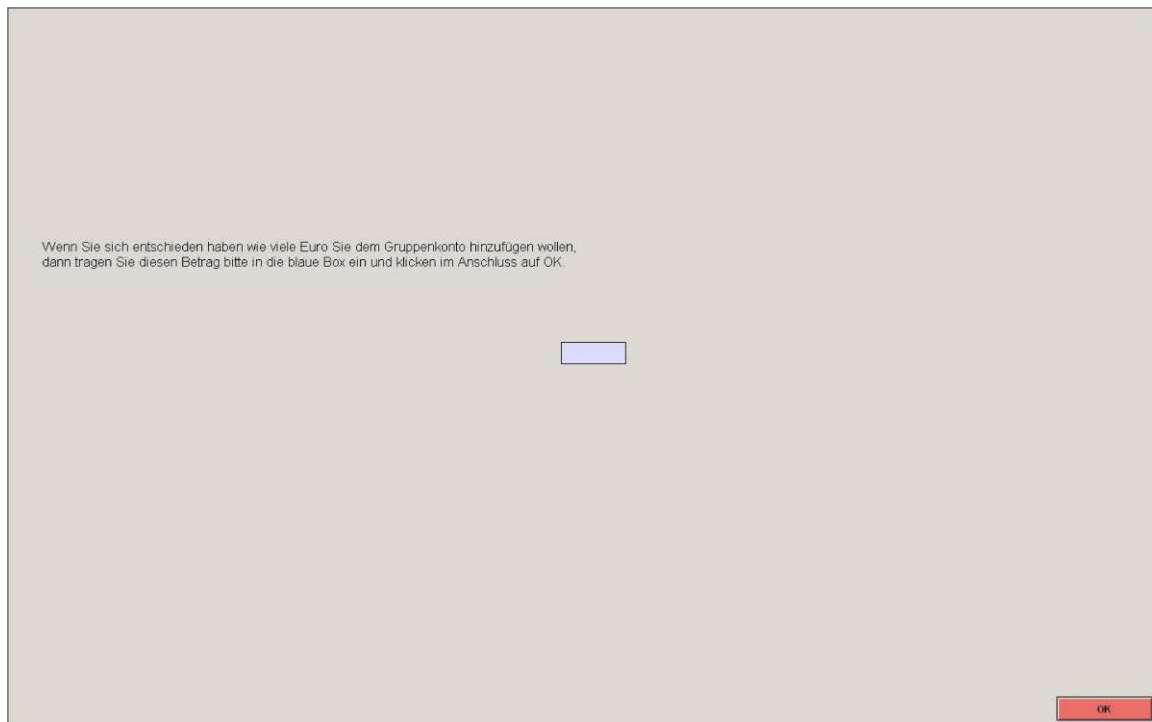
Figure 10 Screenshot "Contribution to public good"
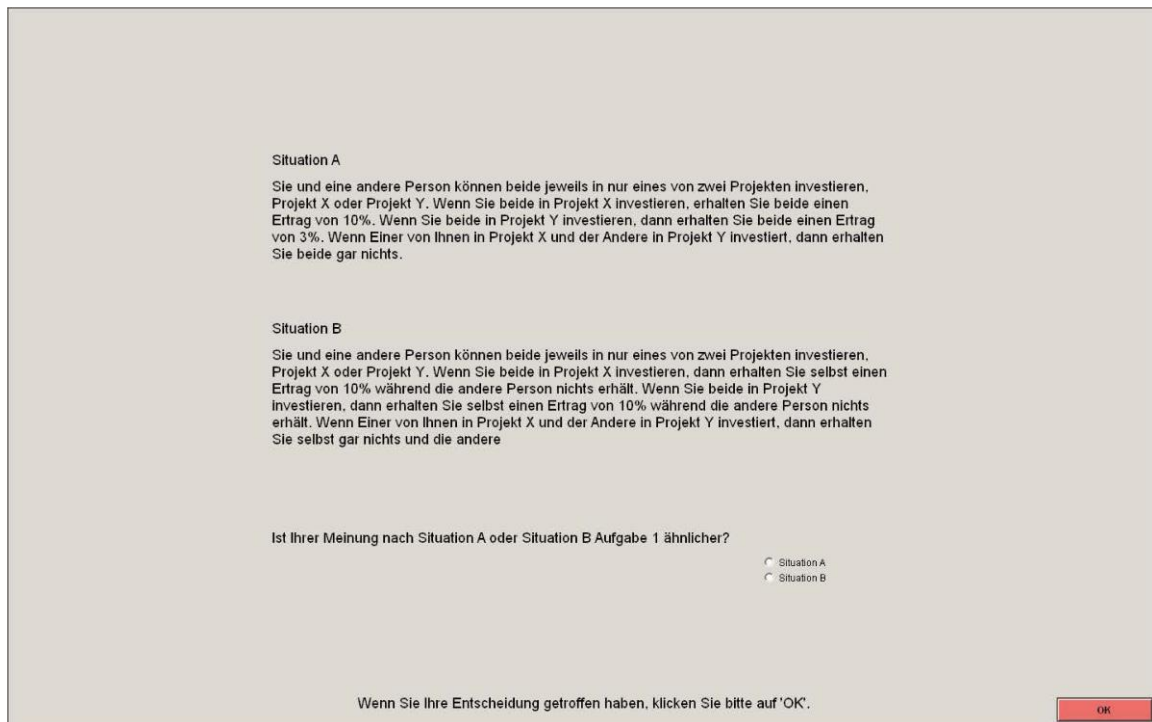
Figure 11 Screenshot "Perception"

Bitte schätzen Sie, wie viele Euro Ihr anderes Gruppenmitglied **tatsächlich** dem Gruppenkonto hinzugefügt hat. Falls Ihr geschätzer Betrag sich genau mit dem Betrag deckt, den Ihr anderes Gruppenmitglied tatsächlich hinzugefügt hat, erhalten Sie zusätzlich 1 Euro.

Klicken Sie bitte auf 'OK', wenn Sie ihre Einschätzung eingetragen haben.

OK

Figure 12 Screenshot "Beliefs / Norms"

Falls Ihr anderes Gruppenmitglied so viele Euro dem Gruppenkonto hinzugefügt hat:	...dann würden Sie dem Gruppenkonto gerne so viele Euro hinzufügen:
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Wenn Sie entschieden haben, wie Sie den Eurobetrag ändern würden wenn Sie gewusst hätten, wie viele Euro das andere Gruppenmitglied hinzugefügt hat, dann tragen Sie diesen Betrag bitte für jede Zeile ein und klicken dann 'OK'.

OK

Figure 13 Screenshot "Conditional contribution schedule"

Figure 14 Screenshot "Final payoff screen"

CHAPTER 3

WHEN DOES TEAM REMUNERATION WORK? AN EXPERIMENTAL STUDY ON INTERACTIONS BETWEEN WORKPLACE CONTEXTS[19]

3.1 Introduction

Traditional economic theory fails to explain why firms use team remuneration to incentivize their workers (Baker et al., 1988). In theory, the free-rider problem leads workers to shirk under such incentives because they bear the full costs of their efforts while receiving only a fraction of their productivity (Alchian and Demsetz, 1972; Holmstrom, 1982).[20] Since individual performance incentives do not contain such a social dilemma, we would expect them to outperform team incentives when available. Team remuneration is, however, a prevalent form of compensation in many organizations (Kruse et al., 2010; Lawler and Mohrman, 2003).

Firm's agency to design workplace context exceeds merely setting incentive structures. Total output may be increased through team remuneration if firms successfully establish a workplace context that leads to cooperation among workers. In order to create a cooperative workplace context, firms could promote a team identity among colleagues. Team identity facilitates communication, coordination, and integration among team members by creating a feeling of membership in a well-defined group (Eckel and Grossman, 2005; Kerr and Slocum Jr., 1987). Team building exercises serve the purpose to help workers to identify with a team (see Riener and Wiederhold, 2016; Tajfel, 1978). They aim to increase communication and common experiences between workers usually unrelated to the firm's trades (Buller and Bell, 1986; Salas et al., 1999). Importantly, these two elements at the firm's discretion, the form of remuneration and actions to promote a team identity, interact with one another (Andersson et al., 2016). We extend the analysis of this interaction by the dimension of complementarities between workers. This study analyzes how the form of remuneration interacts with the contextual factors of team identity and degree of complementarity in the form of synergies in production to influence cooperation at the workplace. By means of a laboratory experiment we

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[19] This chapter is based on the paper "When does Team Remuneration Work? An Experimental Study on Interactions between Workplace Contexts", written jointly by Simon Bartke and Felix Gelhaar. It is currently in preparation for submission.
[20] In what follows, we use the terms team incentive and team remuneration synonymously. These terms describe a classic "sharing rule" a la Holmstrom (1982). A worker receives a compensation that depends on the team's total output irrespective of her exerted effort.

present insights on when team remuneration yields higher effort than individual remuneration and how this result depends on the workplace context. Our insights inform the existing literature on how workers' beliefs and motivations vary across interactions between contextual elements at the workplace.

Complementarities in production in the form of team synergies are present when effort provided by a worker affects a team member's productivity too. Such complementarities can manifest through communication, sharing of knowledge and ideas, increased creativity resulting from more diverse labor inputs as well as enjoying working together towards an ambitious goal with workers with diverse expertise. Complementarities are therefore an important influence on team output in many firms. Team identity and remuneration choice also interact with complementarities in efforts between workers. On the one hand, it is easy to see that the degree to which workers notice and build on complementarities between colleagues varies and can be influenced through team building exercises. Communication and common experiences increase awareness of and exposure to existing complementarities. The reverse is also straightforward: when skills are highly specialized but a common target should be met, specialists need to communicate and coordinate actions with one another which in turn has the potential to lead to a team identity. On the other hand, the form of remuneration interacts with complementarities. Rotemberg (1994) argues that it depends on the remuneration scheme to which degree workers are willing to internalize positive externalities of production that result from existing synergies. In particular, team remuneration enables workers to signal own cooperative behavior to team members. When synergies between workers are high, this signal becomes less noisy under team remuneration.

Recently, the experimental investigation of interactions between elements of workplace context has received increasing attention from economists (Andersson et al., 2016; Riener and Wiederhold, 2016; Weber and Camerer, 2003). The bottom line is that elements like incentivization of effort, the decision to control worker's productivity, organizational values and culture, team feeling, and social preferences of workers should all be aligned to optimally motivate employee performance. We add new insights to this literature since our evidence suggests that team remuneration can lead to higher effort than individual remuneration, but only when complementarities in the form of team synergies are high. Moreover, while previous research has considered the interaction between workplace context and worker-level social preference type, we extend this analysis to the interaction of workplace context and social preference type with motivational states and beliefs. Our results indicate that beliefs and

achievement motivation affect the decision to provide effort differently depending on the workplace context.

Subjects in our study take part in a novel two-person team building exercise. This task serves to induce a team identity by allowing for communication between team members and entertaining joint team achievements. Afterwards, subjects participate in a stylized effort game with the same team member as before. In a 2x2 design, we vary the incentive scheme (team and individual remuneration) and the degree of team synergy (low and high). The effort game consists of 15 rounds in which subjects first decide how much effort they want to put in and subsequently state their belief about the effort decision of their team member for each round. In addition to the beliefs, our experiment also assesses a proxy for a social preference type by means of Social Value Orientation (SVO). Finally, we identify how five distinct motives that are particularly important within organizations react to the team building exercise and how these motives are causally affected by the different remuneration schemes and the degree of synergy in the effort game. To this end, subjects' motivational states are measured before and after the team building exercise as well as after the effort game.

In contrast to Nash equilibrium predictions, we find that under high team synergy team remuneration results in higher effort levels than individual remuneration. The opposite ranking is found under low team synergy. Furthermore, effort is significantly higher than the Nash equilibrium in all treatments. We argue that this is mainly driven by our team building exercise as it significantly affects subjects' motives.

We further find that beliefs about the other team member's effort influence the own effort decision significantly less under team remuneration and high team synergy than under individual remuneration and high team synergy. Furthermore, the influence of achievement motive on effort varies between treatments. Most prominently, under high team synergy the effect of a higher achievement motive on effort is negative under individual remuneration while it is positive under team remuneration. This indicates a change in the influence of achievement motive depending on the workplace context in line with the concept of "we thinking". The concept of "we thinking" describes a mode of reasoning in which an individual is motivated to pursue the goals of the group instead of individual goals (Akerlof, R., 2016; Deutsch, 1949). If workers are motivated to pursue the group's goal as one's own, they will provide high individual effort under team remuneration and hence cooperate despite the possibility to free ride. Whereas the combination of team building, team remuneration and high team synergy induces more achievement oriented subjects to act towards a group goal and cooperate more,

this result does not hold under individual remuneration where achievement motivated subjects seem to be motivated to pursue their individual goals. Finally, more prosocial subjects do not exert more effort under team remuneration compared to individual remuneration in the high team synergy treatments. Higher effort under team incentives and high synergies therefore cannot be entirely attributed to more prosocial team members. We interpret these results as indicative that cooperation is not only belief and trait type dependent, but context-dependent.

The paper is structured as follows. In the next section, we present previous insights about workplace context relevant to our study. Section 3.3 presents literature on the importance of different motives for decision making within organizations. The design of our experiment is shown in section 3.4. Section 3.5 presents our results and section 3.6 concludes.

3.2 Relation to the Literature

3.2.1 Team Remuneration and Team Synergies

Teamwork and team incentives are common in many organizations (see e.g. Kruse et al., 2010, Lazear and Shaw, 2007). For instance, Kruse et al. (2010) report that almost half of American private-sector employees' pay is tied to the team's performance. Team remuneration can have profound advantages for team members and firms since they alter the social distance among team members and the salience of prosocial motives (Meier, 2006; Rob and Zemsky, 2002; Berger et al., 2011).

The problem of free-riding under team incentives arises when the joint output is shared among team members and the marginal product of each team member is not observable. Agents have thus an incentive to shirk. Economic theory suggests that in the absence of effective monitoring, individual remuneration schemes should be preferred over team remuneration schemes (Alchian and Demsetz, 1972; Holmstrom, 1982). Explanations for the use of team remuneration found in the literature include incentives to help others (Itoh, 1991), peer pressure (Kandel and Lazear, 1992), and social preferences (Wambach and Englemaier, 2005).

When comparing the efficiency of team and individual remuneration empirical studies find mixed results. Some studies find that team remuneration schemes underperform compared to individual remuneration schemes as economic theory suggests (Encinosa et al., 2007; Erev et al., 1993; Gaynor and Gertler, 1995; Nalbantian and Schotter, 1997, Thurkow et al., 2000). Other authors find no significant difference in the performance between team and individual

remuneration (Dijk et al., 2001; Farr, 1976; London and Oldham, 1977; McGee et al., 2006; Vandegrift and Yavas, 2011). Finally, several empirical studies find team superior to individual remuneration schemes (Allison et al., 1993; Babcock et al., 2015; Hamilton et al., 2013; Pizzini, 2010). These mixed results indicate that team remuneration alone is insufficient to increase cooperation and motivate workers to exert more effort and that more attention towards the exact circumstances that make team remuneration work is warranted.

Team synergy may explain why team remuneration is used in organizations despite its theoretical underperformance. Under team synergy individual output is a function not only of the worker's own effort, but also of the team members' effort (Alchian and Demsetz, 1972; Chao and Croson, 2013; Lawford, 2003).[21] One of the few exceptions in the economics literature that acknowledges the importance of team synergies as a mechanism that promotes collaboration is by Lasker et al. (2001) on medical partnerships; another study is by Wageman and Baker (1997) in a laboratory experiment. Chao and Croson show in an experiment that team remuneration outperforms individual remuneration when synergies are high enough. Given the parametrization of their experimental setup, the intuition for their result is straightforward. When effort externalities are sufficiently large, this effect outweighs the free-rider problem. However, the degree of complementarity in effort needed for selfish individuals to exert more effort under team than under individual remuneration is so large that it is only reasonable to assume for a small fraction of firms such as highly specialized partnerships (Pizzini, 2010). Team synergies can also be described as a form of positive externality. The economic literature on games with positive externalities suggests that cooperation increases with an increase in the externality (Chauduhri, 2011; Zelmer, 2003). The willingness of workers to internalize positive externalities depends on how easy it is to demonstrate altruistic deeds towards their colleagues (Rotemberg, 1994).

3.2.2 Team Identity

The economic literature mostly neglects that workers are rarely motivated by pure selfishness and that successful teamwork builds on social interactions, norms, and structures among co-workers (Dur and Sol, 2010; Granovetter, 2005; Huck et al., 2012; Riener and Wiederhold, 2016; see also: Bosworth et al., 2016). Social identity theory provides a useful framework to

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[21] Note that team synergies differ from strategic complements. Strategic complements exist when a change of another subject' choice positively affects the marginal payoff of a subject.

explain why team members do not necessarily shirk under team remuneration. It argues that individuals behave primarily as members of well-defined and clearly distinct social groups (Tajfel, 1978). A work team can constitute such a social group and hence shape norms, values, and attitudes that influence workers' interactions (Akerlof, 2000, 2005; Eckel and Grossman, 2005). A social or team identity shared with colleagues, facilitates cooperation among team members by creating a feeling of membership.

Related to team identity and cooperation among work teams is the concept of "we thinking". It describes a mode of reasoning in which an individual is motivated to pursue the team's goals (Akerlof, R., 2016). Once successfully established, team identity promotes "we thinking", in which individuals perceive themselves as part of the "we". This makes it more salient for workers to exert high effort even when free-riding is possible. An example of "we thinking" is found between soldiers who are often motivated to action by thinking about what is best for the group even if it means risking their own lives (Akerlof, R., 2016, Shils and Janowitz, 1948). Social psychologists refer to this concept as "group cohesion". Group pride is put forward by different researcher as a reason for why subjects pursue group ends instead of individualistic ones (e.g. Tyler, 1990). In line with this research, empirical studies have induced team identities and generally found that this suppressed self interest in favor of the team's interests (Bacharach, 1999; Bandiera et al., 2005, 2013; Brewer and Kramer, 1986; Charness, 2012; Chen and Chen, 2011; Chen and Li, 2009; Eckel and Grossman, 2005; Gold and Sugden, 2007; Heap and Zizzo, 2009; Kramer and Brewer, 1984; Lankau et al., 2012; and Weber and Camerer, 2003).

Team identity is created either based on naturally occurring characteristics of group members, like race, sex, and occupation or artificially. The well-known minimal group paradigm (Tajfel, 1970) is often used to induce group or team identities. Here, group membership is assigned randomly based on some superficial criterion like a preference for painters and subsequently labeling the different groups with different names. Goette et al. (2012) suggest, however, that this is an oversimplification that does not capture essential aspects of team identity in the real world. The authors provide evidence that additional motivations which arise when group induction is not minimal are important determinants of individual behavior towards both in-group and out-group team members (see also Pan and Houser, 2013). Eckel and Grossman (2005) explore the extent to which team identity can deter shirking and free-riding behavior in a public good game that resembles a team production setting. Their results provide evidence that random anonymous team assignments are insufficient to overcome self-interests, whereas

actions designed to enhance artificial team identity by letting them solve a task together contribute to higher levels of cooperation (see also Babcock et al., 2015).

Riener and Wiederhold (2016) rely on a team building exercise consisting of a simple coordination game to induce a team identity. Successful team building exercises facilitate positive group experiences and mutual judgement about the team experience among workers and can therefore present a source of pride of the group's achievement (Sundstrom et al., 1990). Their results indicate that practices and contextual elements at the workplace directed towards increasing worker's effort should be aligned. Team building works best to create a team identity when it is complemented by suitable incentives. For example, in a work context characterized by a team identity, imposing strict controls on workers' outputs inhibits cooperation.

The economic literature on interaction effects between several contextual elements at the workplace is scarce. There is a rising interest among economists in studying different dimensions of corporate culture on economic outcomes (Earley, 1993; Kosfeld and von Siemens, 2011; Van den Steen, 2010; Weber and Camerer, 2003). One notable exception is the experimental study by Andersson et al. (2016) which studies how personal preferences, corporate culture, and different incentive schemes interact with each other in a tournament to determine effort provision. They find that the "triple-fit", or alignment, of these three elements is important to optimally motivate workers. However, no study has shown how team synergy, remuneration schemes and team identity align to create a cooperative workplace context.

3.3 Motives and Traits at the Workplace

Research in social psychology differentiates between states and dispositional characteristics, so-called traits. A state is a momentary emotional reaction to internal and/or external triggers which involves physical, motivational, cognitive and psychological reactions and hence drives behavior. Traits are often used to describe subject's personality characteristics that are stable over time. Traits interact with context-dependent factors to activate motivational states. It is this subjective motivational state which in turn drives the psychological, behavioral and emotional reactions once it is activated (Schultheiss and Brunstein, 2001). Decades of psychological, biological, and neuroscientific research suggests that distinct context-sensitive motivational states are associated with distinct action tendencies and decisions (Emmons and McAddams, 1991; Pang, 2010). Motivational states, or motives, are defined as dispositions to experience particular types of incentives as pleasurable and rewarding, to strive for certain

types of goals, and hence to activate particular behavioral tendencies and related decisions (Schultheiss and Strasser, 2012; Heckhausen, 1977; Utz et al., 2004). This notion stands in contrast to classical economic theories, which assume that decisions are determined by stable preferences, which are generally assumed to be context-insensitive, stable over time and exogenously given. Worker's motivation and the underlying motivational states are thus an integral part of their performance equation at the workplace (Chatman, 1989, Grandey et al., 2002).

The seminal research by McClelland (1971 and 1987) based on Murray (1938) focuses on an array of distinct workplace related needs or motives, including, achievement, affiliation, power, and autonomy. By far, most of the attention in McClelland's model focuses on the needs for achievement (defined as behavior directed toward competition with a standard of excellence) and power (defined as a need to have control over one's environment). In a similar vein, Griskevicius et al.'s (2013) research sheds light on motives that can be relevant at the workplace. These motives are affiliation, self-protection, status attainment and caring (see also Kenrick et al., 2010; Schaller et al., 2007). For example, individuals use different exchange rules and behavioral tendencies when interacting at the workplace with friends and allies (affiliation) or competitors and superiors (status attainment). When Griskevicius et al.'s (2013) need for self-protection is active, behavior that pursues selfish wanting or consumption is triggered. This behavior is associated with an increased focus on own needs and behavioral tendencies towards the maximization of individual resources, less cooperative behavior as well as increased preferences towards social distance and solitary activities (Lea and Webley, 2006; Vohs et al., 2006). Finally, it has long been known that the motive to care for your colleagues is an important driver of behavior at the workplace (Hersey, 1932; Roethlisberger and Dickson, 2003). Barsade and O'Neill (2014) have found that a culture of care at the workplace increases well-being and teamwork. Also, social psychologists have found that the care motive leads to helping others and an increasing interest in other's welfare (Goetz et al., 2010; Condon and Feldman Barrett, 2013). A key implication of this framework that different contexts activate different motives is that the same information from the environment may be interpreted and acted upon very differently. The specific behavior depends on the trait characteristics of the individual and how she appraises the context. Depending on which motivational system has been primed to process the contextual stimuli, different behavior can emerge.

Given the context of our study, we focus on five motives that have theoretical and empirical evidence for workplace motivation as outlined above. These five motives are achievement,

affiliation, care, power-status and selfish-wanting/consumption. In the appendix in Table A.1 we present an overview and definitions of our motives and examples for their importance at the workplace. The table also contains words that are specific to these five motives and are used in the experiment. These words are selected based on a semantic categorization task in which subjects are asked to ascribe a number of motive-related words to motivational categories (Chierchia et al., 2018).

In terms of behavioral tendencies related to trait characteristics, more prosocial individual cooperate generally more even when free-riding is possible (e.g. Balliet et al, 2009). Social value orientation (SVO) by Murphy et al. (2011) provides a numeric score which can be used as a proxy to determine the prosociality of individuals.

3.4 Experimental Design

Our experimental design consists of three core building blocks. The first is an exogenous manipulation of team identity by instituting a team building exercise. The team building exercise is supposed to lead to a common experience of having achieved something non-trivial and engaging together. This generates a feeling of collegiality or membership to a group (i.e. "being in the same boat") (see Eckel and Grossman, 2005; Riener and Wiederhold, 2016). The team building is operationalized by using a spot the difference task with the possibility to communicate with the team member. To the best of our knowledge, this team building exercise in its concrete computerized form is novel in the experimental economics literature.

The second block is a two-player effort game, conducted after subjects participated in the team building exercise. Across four treatments we vary either the form of remuneration or the degree of team synergy in production between subjects. The core feature of the game is that higher effort is monetarily more costly, but increases not only one's own production but also the production of the team member (depending on the degree of complementarity in effort). Each subject is matched with its previous team member from the team building exercise.

The third block follows after the effort game and examines a proxy of trait prosociality by social value orientation (SVO, Murphy et al., 2011). The experiment further measures the impact of the team building exercise and the treatments in the effort game on motives that are relevant at the workplace. Motives are measured using a questionnaire of words related to five different motives (see Chierchia et al., 2018). They are measured at three different times in the experiment, at the beginning of the experiment, after the team building exercise, and after the

effort game. All experimental blocks were computerized and conducted in z – Tree (Fischbacher, 2007). At the end of the experiment, subjects completed a short questionnaire on their socio-demographic characteristics. Figure 15 depicts the sequence of the experiment. Screenshots from the different experimental stages can be found in the appendix. All stages of the experiment were incentivized with an experimental currency unit denominated in points. The exchange rate from points to Euro was 250 to 1 and common information to all subjects before the first stage of the experiment.

Figure 15 Sequence of the experiment

3.4.1 Design of Team Building Exercise

The team building exercise consists of a spot the difference task in randomly matched groups of two that includes the possibility to communicate with each other via a computerized chat. Communication not only helps intra-team coordination but has been shown to successfully increase cooperation in social dilemmas and decrease free-riding in public good games (Balliet, 2010; Charness and Kuhn, 2011; Isaac and Walker, 1988).

In this task, each group is presented with picture pairs of three different paintings.[22] Each of the three picture pairs has a number of differences but is otherwise identical. The task is to find as many of the unknown differences as possible within an allotted time of three minutes for each picture pair. After the three minutes elapse, only the left picture of the pair is displayed for an additional minute. When the left picture disappears after 60 seconds, subjects have to enter individually the amount of mistakes they found in a box on the screen. Subjects can communicate by means of a computerized chat during the team building exercise except for those screens on which they individually have to enter the number of differences they found.[23]

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[22] The three picture pairs are the Dancing class by Degas, the Kiss by Klimt and the Wanderer above the Sea of Fog by Friedrich. Two of the picture pairs were provided by pyrosphere. Pyrosphere (pyrosphere.net) is a game developer firm that developed a spot the difference task for classical paintings for mobile devices and who were kind enough to provide some pictures for the team building exercise. One picture pair was retrieved from the internet.

[23] We checked the chat protocols to see whether personal information was exchanged during the two-player interaction. Nearly all subjects limited their discussion only to the game. Since

Subjects are instructed not to reveal any personal information about themselves in the chat and informed that their identities remain anonymous throughout the whole experimental session. The additional minute in which only one picture is displayed and the chat serve the purpose to facilitate coordination on the differences found. The two team members receive each 25 points for each difference found. They do, however, only receive the points if both team members individually enter the same number and the number chosen is not higher than the total number of differences in the picture pair. These conditions ensure that both team members have to coordinate in order to receive any payment. The coordination was sufficiently simple to facilitate the establishment of team identity and pairs who successfully mastered the task have justifiable reason to be proud of their achievement since it takes considerable effort to find a high number of correct differences (Riener and Wiederhold, 2016, Akerlof, R., 2016). In addition, the task is designed to rule out the possibility that subjects learn how cooperative their team member behaves. This is particularly important to avoid any heterogeneous spillover effects onto the effort game.

The subjects did not receive any feedback on how many differences their team member actually entered in the box or the total number of mistakes per picture pair until the end of the experiment. This avoids reciprocal effects, formation of beliefs about ability or type of the team member as well as other motivational responses. At the end of the exercise, subjects are asked how much fun they had doing the task and how successful they perceived the cooperation with the team member. This was done on a 7 point scale, ranging from "not at all" to "very much". On average (standard deviations in parentheses), subjects rated the task as being a 6.31 (1.03) fun and 6.26 (0.75) successful. We take this as evidence that the team building exercise leads to a sense of achievement in subjects and is perceived as engaging and entertaining. The exercise was chosen such that it is unrelated to the tasks to be performed in the next stages, i.e. the coordinative element of our team building exercise played a central role. No information that could potentially alter subjects' beliefs or judgements, for example, by exposing social preferences, is revealed through the coordinative team building exercise.

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dropping the subjects who did reveal their identities or personal information leaves all results virtually unchanged, we kept them in the sample. No team found every difference in the team building exercise. In fact, the average number (standard deviation) of differences found was 8.18 (1.76) out of 15 total differences (Klimt), 7.65 (1.42), out of 10 (Degas), and 6.68 (1.06) out of 10 (Friedrich). This indicates that the spot the difference task inhibited an appropriate amount of difficulty.

3.4.2 Design of Effort Game

The effort game is a modified version of the design developed by Chao and Croson (2013) and involves a 2x2 design: the remuneration scheme (individual and team) and team synergy levels (high and low) are varied. Each subject i is randomly assigned to one of the four treatments. Importantly, teams stay identical between the team building exercise and the effort game which implies a partner matching in the effort game. Both, team synergy level and remuneration scheme are between-subject factors. Teams consist of two subjects who simultaneously choose effort levels e_i from the integers $\{0, 1, …, 105\}$ independently from each other. Effort generates production, y_i according to the following function:

$$y_i = 10e_i + s * e_j \; with \; j = 1,2 \; and \; i \neq j \tag{3.1}$$

with e_j being the effort of the other team member. The marginal product of effort on one's own production is 10 in all treatments. s describes the marginal product on the team member's production. Hence, s is the team synergy level and is set to 1 in the low team synergy treatments and to 9 in the high team synergy treatments. While higher efforts increase production linearly, the costs of effort increase quadratically:

$$C(e_i) = 0.1 \, e_i^2 \; with \; i = 1,2 \tag{3.2}$$

Note that different from the production function, effort costs only depend on subject $i's$ own chosen effort. Under the individual remuneration scheme, each team member receives payoffs depending on their own production. The subjects' payoff under individualized remuneration is then

$$\pi_i^{ind} = y_i - C(e_i) \tag{3.3}$$

Under the team remuneration scheme, team members share the total team production $(y_i + y_j)$ equally. The subjects' payoff under team remuneration is then

$$\pi_i^{team} = \frac{1}{2}(y_i + y_j) - C(e_i) \tag{3.4}$$

The first order conditions yield the following equilibrium efforts for both remuneration schemes:

$$e_i^{* \, ind} = 50 \; and \; e_i^{* \, team} = 25 + 2.5 * s \tag{3.5}$$

The social optima read:

$$e_i^{SO \, ind} = e_i^{SO \, team} = 50 + 5 * s \tag{3.6}$$

The equilibrium predictions generated by our parametrization are depicted in Table 7. Given the positive team synergy, socially optimal effort always exceeds the corresponding Nash equilibrium. Nash equilibrium efforts are predicted to be always larger under individual remuneration than under team remuneration. This holds because the team synergy level is smaller than the marginal product of one's own effort level. This assumption seems realistic for most organizational teams. In this aspect we deviate from Chao and Croson (2013) who focus on partnerships in which the marginal product of the partner can exceed the marginal product of one's own effort on the own production. Raising the team synergy level above one's own marginal product resolves the free-rider problem under team remuneration and thus results in Nash equilibria that are higher under team remuneration than under individual remuneration.

In addition, we elicit subjects' beliefs about team member's effort in every round. After each effort decision, subjects are asked to guess what integer between 0 and 105 the team member chose for her effort in this round. Following Gächter and Renner (2010), we incentivize the guesses with 150 points if the guess does not deviate more than 10 integers from the actual team member's choice.

Subjects play 15 rounds in each session under a single treatment. After choosing an effort level and guessing the team member's effort, subjects are reminded of their own decision, receive feedback about their team member's decision, and their respective earnings for each round in points. Communication is not allowed at this stage of the experiment. Effort decisions from one of the 15 rounds are randomly chosen to be paid out in the end. Likewise, one different round is randomly chosen for the payoff from the stated beliefs. An example of the translated version of instructions can be found in the appendix. The choice set and parameters were chosen such that it is impossible for the subjects to generate negative payments over the course of the experiment. In order to control for income effects, we set the show up fee such that under the Nash equilibria, subjects receive almost identical payments across treatments.

Before the 15 rounds were played, each subject has to complete two comprehension questions about the incentive structure that they subsequently face. Each question consists of choosing an integer from {0, 1, …, 105} for both team members as hypothetical effort decisions. Afterwards, based on their choices, subjects have to calculate their costs, which could be read from a provided cost table, as well as the own or team production, depending on the remuneration scheme of the treatment, and the total payoff that each team member would receive from the hypothetical decisions. To make sure that subjects understood the game, the correct answer is displayed after they finished providing answers for each of the two

comprehension questions. No subject received any information about the entries and performance of their respective team member. Subjects choose their own hypothetical effort levels in this comprehension check to prevent possible anchoring effects (Furnham and Boo, 2011). Completing this comprehension check is incentivized.

Table 7 Equilibrium predictions

$e_i \in \{0,1,\dots,105\}$, 2-subject teams, 15 rounds	Individual remuneration	Team remuneration
Low team synergy ($s = 1$)		
Equilibrium effort (NE)	50	27.5
Socially-optimal effort (SO)	55	55
High team synergy ($s = 9$)		
Equilibrium effort (NE)	50	47.5
Socially-optimal effort (SO)	95	95

3.4.3 Design of Motivation- and Trait-Elicitation Procedure

In order to assess the impact of the team building exercise and the treatments of the effort game on motives, subjects take part in three questionnaires over the course of the experiment probing their motivational states. Each questionnaire consists of the identical 17 items. The order of these items is randomized per subject and for each time the subject encountered the motive questionnaire. Subjects work on them at the beginning of the experiment, after the team building exercise, and after the effort game. All questions ask the subjects how they rate their current motivational state with respect to a certain motivation which was presented as a word. In particular, subjects select on a 7-point scale ranging from "not at all" to "very much", "to which degree they feel like one of the following motivations in this very moment". Each subject provides such ratings for five motives that are relevant at the workplace, achievement (3 words), affiliation (3), care (3), power-status (3), and selfish-wanting/ consumption (3), as well as the affective states of being happy and being sad. These words were selected to be maximally specific indicators for distinct motives (Chierchia et al., 2018). A complete list of words can be obtained upon request. Subjects in this task receive 180 points every time they completely answer the questionnaire.

After the last questionnaire, subjects participate in an implementation of the SVO Slider Measure task (Murphy et al., 2011, Crosetto et al., 2012). The SVO measures a person's

preferences on how to allocate resources between the self and another person. We use this measurement to elicit the prosocial trait of our subjects. Subjects make distribution decisions on the 6 primary items of the SVO measure. For the SVO measurement, subjects are randomly regrouped into groups of two. The regrouping protocol ensured that they are not matched with another subject they had already previously encountered in the team building exercise and effort game. This is common knowledge to the subjects. The subjects are told that one of the six rounds and their role in it would be chosen randomly to be paid out.[24] Similar to Riener and Wiederhold (2016) and Fehr and Williams (2013) our prosocial trait measurement is conducted at the end of the experiment.

3.5 Hypotheses

The hypotheses in this subsection follow from the previously presented empirical findings. We hypothesize that a cooperative workplace context consisting of team remuneration and high team synergy after a team building exercise results in higher effort compared to any other treatment.

Hypothesis 1: Efforts under *TR high* are the highest across all treatments.

This implies that effort under *TR high* is higher than under *IR high*. Although team remuneration aligns team's goals with the team identity, the free rider problem under low team synergy is expected to be prevalent enough for individual remuneration to yield higher effort. Hence, the degree of synergy is decisive for team remuneration to lead to higher effort than individual remuneration which follows from Rotemberg (1994).

We further hypothesize that effort in the effort game is significantly higher than Nash equilibrium in all treatments.

Hypothesis 2: All treatments yield effort levels that are significantly higher than Nash predictions due to subjects' participations in the previous team building exercise.

Whereas Chao and Croson (2013) find in a similar effort game without a team building exercise that effort converges towards the respective Nash equilibrium, the economic literature on team identity and team building suggests that cooperation above Nash equilibrium can be maintained during the entire game. We expect that effort deviates from Nash equilibria towards the social

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[24] The items are parametrized such that subjects could earn between 113 and 750 points.

optima since the team building exercise leads to a shared team identity and team feeling (Eckel and Grossman, 2005; Riener and Wiederhold, 2016; Chen and Li, 2009). The continuation of the partner matching between team building exercise and effort game should further strengthen cooperative bonds within work teams independent of the team synergy and the remuneration choice.

Effort decisions above Nash equilibrium, can be rationalized by social preferences of the form

$$U_i = (1 - x_i)\pi_i + x_i\pi_j \tag{3.7}$$

Where i's utility from the payoffs in the effort game, U_i, depends on $i's$ own payoff from the effort game, π_i, the team member's payoff from the effort game, π_j, and x_i, the degree of how much i's utility positively depends on j's payoff. For effort decisions that lie above the Nash equilibrium but are at most as high as the social optimum it follows that $0 < x_i \leq 0.5$. In addition, the hypothesis that effort under *TR high* is higher than under *IR high* implies under such social preferences that $x_i^{TR\ high} > x_i^{IR\ high}$; which is indicative of context-dependent social preferences.

Since motives are affected by the context in which an individual takes a decision, we hypothesize that the team building exercise as well as the effort game affect motives scores. In particular, the team building exercise will increases scores on more prosocial motives, i.e. affiliation and care and those that are outcome related, i.e. achievement and power-status due to their team accomplishments.

Hypothesis 3: The team building exercise will increase prosocial (care and affiliation) and outcome related (achievement and power-status) motives. *TR high* will lead to the highest states of care and affiliation as well as achievement motives.

In the effort game, the different treatments will affect motives differently. We hypothesize that the cooperative context of team building exercise, team remuneration and high team synergy results in the highest prosocial motive states, i.e. care and affiliation, and that the hypothesized high cooperation levels result in the highest states of (team-)achievement compared to others.

3.6 Results

3.6.1 Effort and the Workplace Context

The data collection took place between April and June 2017. The experiment was organized and administered with the software hroot (Bock et al., 2014) and programmed with the software z-Tree (Fischbacher, 2007). In total, 230 subjects participated in the experiment. Of these, 52 (26 pairs) took part in in the individual remuneration - low team synergy treatment (*IR low*), 60 in individual remuneration - high team synergy (*IR high)*, 60 in team remuneration – low team synergy (*TR low)* and 58 in team remuneration – high team synergy (*TR high)*. Subjects came from the University of a WEIRD city subject pool and study diverse subjects, with 31% of the subjects having an economics related background. The share of females in the experiment was 47%. According to Boschloo tests, we find neither significant gender differences nor significant differences in the share of economics students across the four treatments. Subjects earned on average €11.21 for participating in a session, which lasted around 90 minutes.

Result 1: Average effort under TR high is significantly the highest across all treatments.

Average effort decisions over 15 rounds in the effort game by treatment are as follows; *IR low*: 54.76 [51.78, 57.74][25], *IR high*: 67.17 [57.55, 76.79], *TR low*: 44.58 [37.68, 51.48], *TR high*: 82.51 [75.81, 89.21]. Our main result is expressed in Figure 16, which depicts average effort decisions over 15 rounds for all four treatments. As can be seen, *TR high* displays the highest average efforts over all rounds, followed by *IR high*, *IR low*, and *TR low*. Figure 16 also shows that the end-game effects occurs in the team remuneration treatments, which is common in finitely repeated social dilemma games (see, e.g. Ledyard et al., 1995). This can be interpreted as evidence that subjects are aware of the free-rider strategy as being individually rational in the *TR* treatments.

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[25] 95% confidence interval calculated with standard errors clustered at the team level.
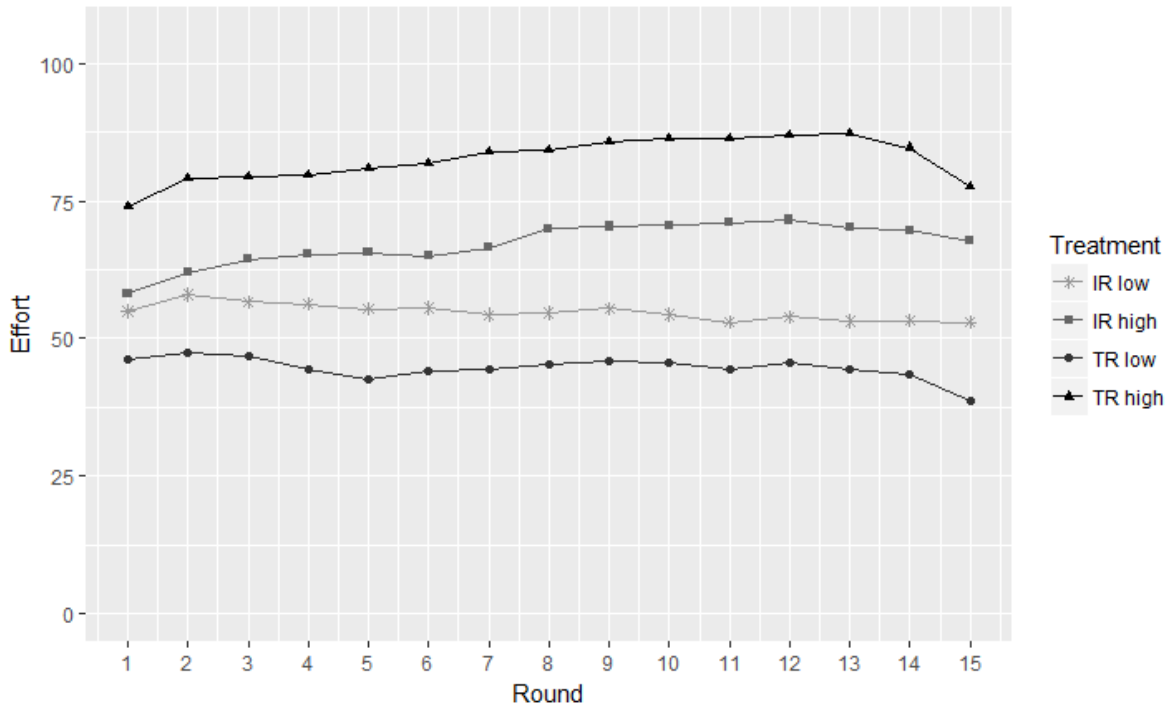
IR low: Nash equilibrium, social optimum: 50, 55; *IR high*: Nash equilibrium, social optimum: 50, 95; *TR low*: Nash equilibrium, social optimum: 27.5, 55; *TR high*: Nash equilibrium, social optimum: 47.5, 95

Figure 16 Average effort decisions over 15 rounds across treatments

As for the low synergy treatments, we see little variation in average effort levels over the 15 rounds with *IR low* effort decisions slowly converging towards the Nash equilibrium. Independent of the team synergy, selfish rational optimization implies that effort under *IR* is always higher than under *TR* as seen in Table 7.

When one compares average effort decisions over 15 rounds at the group level between treatments, we find that average effort decisions of *TR low* are indeed lower than under *IR low* (Wilcoxon rank sum test, p = 0.005).[26] However, effort under *TR high* is significantly higher than effort under *IR high* (p = 0.016). This evidence suggests that the degree of team synergy is important to explain situations where *TR* leads to higher effort than *IR* in the presence of team identity. Note also that effort levels between *IR high* and *IR low* do not differ significantly

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[26] All subsequent tests for differences in mean effort levels over 15 rounds across treatments were done with the Wilcoxon rank sum test. Before these tests were conducted, a Kruskal-Wallis test was performed that investigated whether the four treatment means differ significantly. The test indicated that pairwise tests for treatment differences are permissible (H = 40.27, df = 3, p < 0.01).

(p = 0.113)[27]. Result 1 is also supported by regression analysis. Table 8 presents GLS random – effects regression models with standard errors clustered at the team level. The dependent variable is the effort decision over all 15 rounds.

Model 1 confirms the results from Figure 16: Chosen effort differs significantly across treatments. In addition to the treatment dummies, model 2 includes the control variables Female, Age and Economics background. Including these controls does neither change the size of the coefficient estimates nor decrease their significance considerably. Females put in significantly less effort into the effort game and having an economics background also has a negative influence on effort decisions that is marginally significant.

Result 2: Average effort is significantly higher than its respective Nash equilibrium prediction for all treatments.

It becomes apparent from Figure 16 that average effort exceeds Nash equilibrium predictions in all four treatments. We find that effort averages over 15 rounds at the team level differ from their respective Nash equilibrium prediction at the below 1% significance level for all treatments using the Wilcoxon signed-rank test. We interpret result 2 as evidence that the common team experience, the repeated interaction, and communication with the identical team member in the team building exercise leads to more cooperative behavior between team members across all treatments.

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[27] Moreover, *TR high* has significantly higher average efforts over 15 rounds than both *IR low* and *TR low* at both p < 0.001. Also, *IR high* leads to significantly higher efforts than *TR low* at p = 0.002.

Table 8 Effort regression

Dependent variable: Effort decisions in the effort game over 15 rounds		
Model	1	2
IR high	12.42**	13.16***
	(5.07)	(4.89)
TR low	-10.18***	-10.48***
	(3.75)	(3.72)
TR high	27.75***	28.31***
	(3.63)	(3.45)
Female	-	-12.92***
		(2.78)
Age	-	-0.39
		(0.39)
Econ	-	-4.65*
		(2.51)
Constant	54.76***	72.57***
	(1.39)	(10.05)
Observations	3450	3450
N	230	230
Overall R^2	0.28	0.33

$** = p < 0.05; *** = p < 0.01$

Random – effects regressions estimated with the GLS method;

Standard errors clustered at the team level in parentheses

Result 3: Workplace context influences motives significantly.

Figure 17 depicts average motive scores at the baseline measurement from the beginning of the experiment and average motive scores measured directly after the team building exercise. We find that the team building exercise increases states of achievement, affiliation, care and power motives significantly, while it decreases states of the selfish-wanting /consumption motive significantly. All of these differences are significant below the 1% significance level. The

nonparametric test used for these results evaluates the Somers' D statistic.[28] We see this as evidence that the first component of our workplace context, the team building exercise, varies the degree to which motives are perceived.

Treatment specific differences in motivational states can arise after subjects have participated in the effort game. Figure 18 shows average motive scores of achievement, affiliation and care motives after the effort game by treatment. Figure 18 focuses on these three motives because a Kruskal-Wallis test finds that the distribution between treatments differs significantly only for achievement motive scores (p-value < 0.01), care motive scores (p-value < 0.01), and marginally significant for affiliation motive scores (p-value = 0.09). The treatment with the highest effort decisions, *TR high*, is also the treatment with the highest ratings on achievement, affiliation and care motives. Figure 18 also presents results from nonparametric tests (Wilcoxon rank sum) for treatment differences in motive scores after the effort game. The most pronounced differences become apparent between *TR high* and *TR low*. We find that reported achievement, care, and affiliation motive score under *TR high* are significantly higher than under *TR low*. Moreover, *TR high* leads to higher achievement motivation compared to *IR high* and *IR low* at marginally significant levels. Finally, we find that *IR low* leads to significantly higher ratings on the care motive than *TR low*. We conclude from this analysis that the degree of team synergy that is present when subjects are incentivized by team remuneration has a significant influence on the degree of achievement, affiliation and care motives of the subjects.

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[28] The paired test clusters at the subject level and accounts for repeated ratings that subjects make within a motive category. The test uses a generalization of the confidence interval of the Wilcoxon sign rank test.
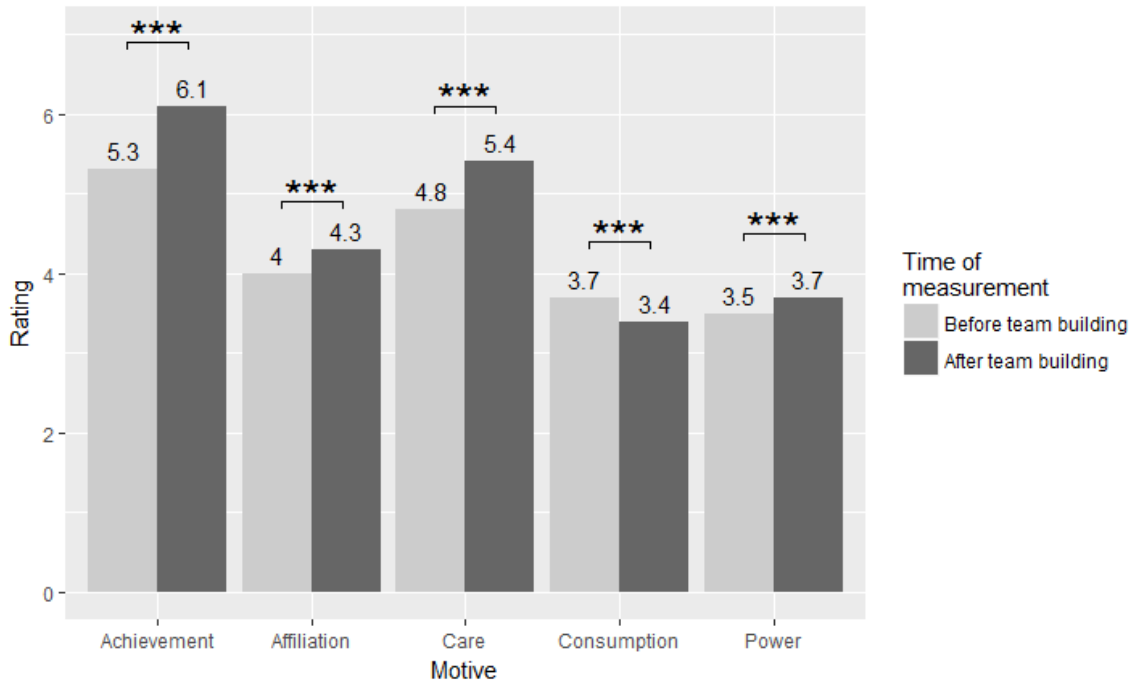
Figure 17 Motive ratings before and after the team building exercise
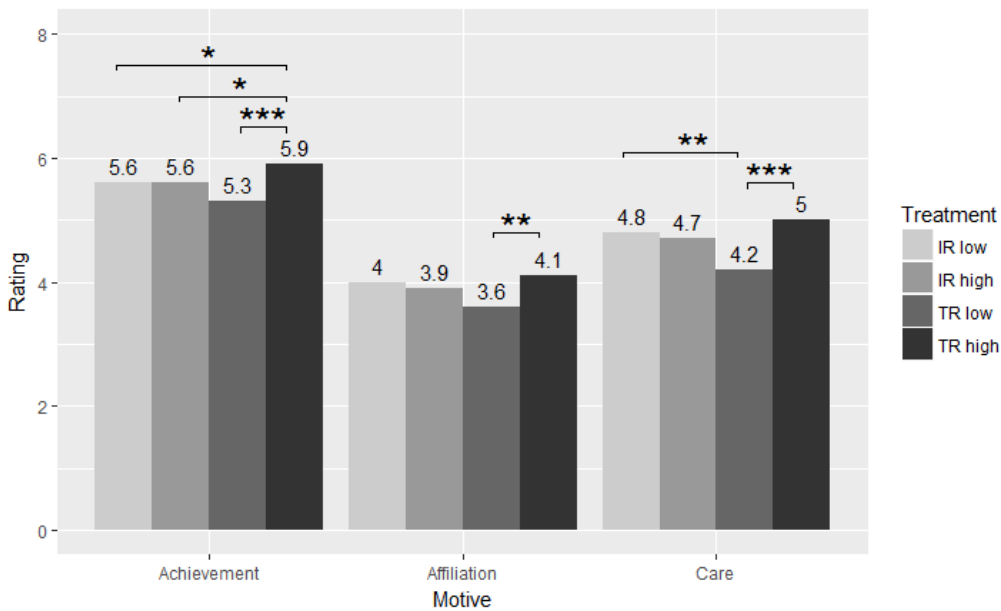
Figure 18 Motive ratings after the effort game

3.6.2 The Role of Beliefs, Motives and Social Values for Effort Decisions

In this subsection, we examine different channels that influence effort decisions with a particular emphasis on our main result: Efforts under *TR high* are higher than efforts under *IR high*. The goal of this analysis is to assess the influence of beliefs, motives and a proxy for

social preferences (SVO) on our main result and to present insights into how these measures influence effort decisions differently between treatments.

3.6.2.1 Beliefs

Table 9 provides an insight into how effort decisions depend on beliefs. Apart from the belief variable, model 3 is identical to model 1 in Table 8. Beliefs are normalized by subtracting average beliefs over all treatments. We find that while incorporating beliefs diminishes the significance of the *IR high* and *TR low* treatment dummies slightly, significant treatment differences in effort provision persist. This might be driven by heterogeneous belief formation across treatments (see Table 13 in the appendix B 1.1).[29] How beliefs affect efforts heterogeneously across treatments is presented in models 4 and 5. The two regression models divide the sample into high and low team synergy subsamples. Model 4 regresses a team remuneration dummy, beliefs normalized for the average beliefs of the high team synergy treatments, and the interaction variable between the team remuneration dummy and beliefs on effort decisions over 15 rounds for the high team synergy subsample.

Model 5 uses the identical list of explanatory variables, but is estimated based on the low synergy treatments subsample with beliefs normalized for the average beliefs in the low team synergy treatments. Since effort decisions in these two samples were made under different strategic incentives, it is not straightforward to compare differences in the sizes of the coefficient estimates between these two models. What is noteworthy, however, is the sign change for the coefficient estimates for the interaction terms of "TR x Belief" in the two models. Under high team synergy, an increase in beliefs about the team member's effort decision increases effort under *TR* significantly less than under *IR*. We interpret this as suggestive evidence that effort decisions under *TR high* are not as strongly driven by changes in beliefs compared to *IR high*. A different picture emerges for the low team synergy subsample in model 6. The interaction variable of "TR x Belief" shows a positive sign in this model and is also highly significant. Therefore, under low team synergy, subjects under *TR* significantly increase effort more when beliefs increase. Hence, we find that the degree of team synergy influences whether beliefs under *TR* or *IR* correlate stronger with effort decisions. Overall,

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[29] Table 13 Belief formation regression in the appendix B 1.1 presents an analysis of the belief formation process similar to Fischbacher and Gächter (2010).

beliefs vary across workplace context but cannot fully account for why *TR high* leads to higher effort than *IR high*.

3.6.2.2 Motives

Next, we investigate whether motives influence effort decisions in general and how it relates to our main result in particular. We focus this analysis on the influence that motive scores measured after the team building exercise have on effort in the first round of the effort game. We restrict the analysis to effort decisions in round 1 to avoid any reciprocity or preference learning effects and thus allow for a direct link between motives and effort decisions. We find that only achievement has a significantly negative influence on effort decisions in round 1 (see Table 14 in the appendix B 1.2). The two regression models in Table 10 investigate the influence of achievement motive on effort decision in round 1 for the high and low team synergy subsample, respectively. Model 6 and 7 contain a *TR* treatment dummy, motive scores after the team building exercise for all five motives and interaction terms between the treatment dummy and the five motive scores. In order to facilitate readability all motives and their corresponding interaction term except for achievement are omitted in the table.[30] In the high team synergy treatments, achievement motive correlates significantly positively under *TR high*, but significantly negatively under *IR high* with effort in round 1.[31] In model 7, the low team synergy subsample, we do not find any significant effect of achievement motive on effort decision in round 1 independent of the remuneration scheme.

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[30] None of the motive scores or their interaction term correlate significantly with effort in round 1, except for the Affiliation motive which correlates positively with effort decision in round 1 under low team synergy treatments and the Selfish-Wanting motive which correlates negatively with effort decision in round 1 under the high team synergy treatments.

[31] This finding is robust to extending average effort in round 1 to round 1-5. Under this specification, the interaction effect remains weakly statistically significant and the achievement motive has a negative influence.

Table 9 The influence of beliefs on efforts

Dependent variable: Effort decision over 15 rounds			
Model	3	4	5
IR high	2.06** (0.91)	-	-
TR low	-1.28** (0.60)	-	-
TR high	4.66*** (1.03)	-	-
TR	-	2.37** (1.16)	-3.27*** (0.96)
Belief	0.87*** (0.02)	0.97*** (0.02)	0.49*** (0.12)
TR x Belief	-	-0.16*** (0.05)	0.40*** (0.12)
Constant	60.96*** (0.30)	74.11*** (3.23)	52.07*** (0.84)
High synergy sample		X	
Low synergy sample			X
Observations	3450	1770	1680
N	230	118	112
Overall R²	0.86	0.86	0.77

$* = p < 0.1$; $** = p < 0.05$; $*** = p < 0.01$

Random – effects regressions; estimated with the GLS method

Standard errors clustered at the team level in parentheses

The overall negative influence of achievement on effort provision in round 1 is mainly driven by *IR high*. In contrast to this, under *TR high*, an increase in achievement motive increases effort decisions in round 1. Thus, under high team synergies the influence in the form of a significant sign change of achievement motive on effort depends on the remuneration scheme. This finding is complemented by the previous motive analysis in Figure 17. The team building exercise significantly increases self-reported ratings of achievement motive. As previously discussed, subjects that experience the achievement motive pursue their set goal. We interpret our results as suggestive evidence that the team building exercise and *TR high* align subjects' achievement goal to perform well as a team and thus cooperate more because it increases the team's performance. On the other hand, increases in achievement motivation decreases cooperation under *IR high*. This is evidence for a different influence of achievement motivation between contexts that could result from different goals that subjects pursue across contexts.

3.6.2.3 Social Value Orientation

Social Value Orientation (SVO) examines individual traits that influence behavior in social dilemmas (Messick and McClintock, 1968; Van Lange, 1999). After the effort game, we elicited subjects' SVOs with a newly matched stranger as either the receiver or proposer. The Kruskal-Wallis test on the mean SVO angles does not reject the null hypothesis that the distribution across treatments is identical.[32] Except for the SVO angle variable, model 8 in Table 11 is identical to model 2 above.

We find strong evidence that an increase in trait prosociality leads to higher effort. At the same time, the coefficient estimates and estimated standard errors for the treatment dummies of *IR high*, *TR low* and *TR high* remain virtually unchanged between models 2 and 8. This indicates that prosociality alone cannot explain cooperation across contexts and that other aspect of workplace context have an influence on effort provision. Model 9 and 10 in Table 11 present a more nuanced analysis of prosociality on effort by dividing the sample in low and high team synergy treatments. Both models regress effort over all 15 rounds on a TR treatment dummy, SVO angle, and an interaction between TR treatment and SVO angle.

In the high team synergy sample, SVO angle is positively correlated with effort decisions. The positive effect of prosociality on effort is significantly less pronounced for *TR high* compared to *IR high*, as indicated by the interaction effect. In other words, whereas under *IR high* more prosocial subjects cooperate significantly more, under *TR high,* the high degree of cooperation is not driven significantly by more prosocial individuals. This suggests that a cooperative workplace context with team remuneration and high team synergy after a team building exercise increases cooperation even for individuals that are less prosocial. Under *IR high* however, subjects that have a high trait prosociality cooperate significantly more, which is in line with previous findings (Andersson et al., 2016). While the influence of trait prosociality on effort remains positive under *TR high*, it is not significant. This suggests that contextual elements can be aligned in such a way that cooperation under this context does not depend significantly on one's social trait. These findings stand in contrast to the results obtained under

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[32] Following Murphy et al. (2011) the SVO angle was calculated for each subject according to the following formula: $\tan^{-1}\left(\frac{mean\ amount\ allocated\ to\ self\ -375}{mean\ amount\ allocated\ to\ other\ -375}\right) * \frac{180}{3.142}$. With a mean SVO angle at around 27 across all treatments, the average subject is of the prosocial SVO type. Murphy et al. categorize SVO types according to their SVO angle according to the following: SVO angle $<$ -12.04: competitive; -12.04 $\leq$ SVO angle $\leq$ 22.45: individualist; 22.45 $<$ SVO angle $\leq$ 57.15: prosocial; 57.15 $<$ SVO angle: altruist.

low team synergies shown in model 10. The effect of prosociality on effort is much weaker for both *TR* and *IR*. Moreover, we do not find any significant difference between *TR* and *IR* for the effect of prosociality on effort provision in this subsample. Our main result that effort under *TR high* is higher than under *IR high* is not driven by more prosocial individuals increasing their efforts more under team incentives. However, both, remuneration scheme and degree of team synergy are important for the extent to which prosociality influences effort which means that traits interact with contexts to influence behavior.

Table 10 The influence of motive scores on effort by degree of team synergy

Dependent variable: Effort decision in round 1 of the effort game		
Model	6	7
TR	-78.14 (56.05)	22.44 (33.77)
Achievement	-9.18** (3.59)	-3.13 (2.42)
TR x Achievement	15.68** (5.86)	-0.33 (4.99)
Constant	110.5*** (31.66)	57.17** (23.57)
Additional motives	X	X
High synergy sample	X	
Low synergy sample		X
N	118	112
Overall R²	0.22	0.11

$** = p < 0.05$; $*** = p < 0.01$

OLS regression; Standard errors clustered at the team level in parentheses

So far, the effects of beliefs, trait prosociality and achievement motive on effort decisions have been considered in isolation. Table 12 presents a regression that regresses these three variables as controls alongside the treatment dummies on effort. We find that all three variables as well as all treatment dummies remain significant to explain effort provision. This suggests that besides the three channels that we have considered in this paper, context – dependent preferences that adapt to the workplace condition are relevant drivers for the degree of cooperation we observe between treatments. Our results indicate that workplace context can facilitate more cooperation by increasing the salience of cooperative team goals and aligning individual contextual elements.

Table 11 The influence of Social Value Orientation (SVO) on efforts

Dependent variable: Effort decision over 15 rounds			
Model	8	9	10
IR high	12.71*** (4.59)	-	-
TR low	-9.98*** (3.54)	-	-
TR high	28.05*** (3.61)	-	-
TR	-	42.00*** (11.49)	-16.11*** (5.44)
SVO Angle	0.48*** (0.11)	1.13*** (0.26)	0.20** (0.09)
TR x SVO Angle	-	-0.99*** (0.35)	0.22 (0.21)
Constant	41.64*** (3.10)	37.01*** (8.90)	49.31*** (1.42)
High synergy sample		X	
Low synergy sample			X
Observations	3450	1770	1680
N	230	118	112
Overall R2	0.32	0.28	0.12

** = $p < 0.05$; *** = $p < 0.01$

Random – effects regressions; estimated with the GLS method

Standard errors clustered at the team level in parentheses

Table 12 The influence of relevant channels and treatment dummies on effort decisions

Dependent variable: Effort decision over 15 rounds	
Model	11
IR high	2.30***
	(0.85)
TR low	-1.26**
	(0.56)
TR high	5.26***
	(1.13)
Belief	0.86***
	(0.02)
SVO Angle	0.10***
	(0.03)
Achievement	-0.88***
	(0.30)
Constant	63.28***
	(1.84)
Observations	3450
N	230
Overall R^2	0.86

** = $p < 0.05$; *** = $p < 0.01$
Random – effects regressions; estimated with the GLS method
Standard errors clustered at the team level in parentheses

3.7 Conclusion

Many aspects of workplace contexts have been neglected for the most part in economics. Economists have primarily been focused on rational behavior which do not allow for other-regarding motives or contextual factors other than monetary incentives. However, empirical evidence suggests that non-pecuniary incentives and other contextual elements significantly influence how workers behave within organizations. In particular, social relations fostered through a common team identity, achievements and communication as well as team synergies (i.e. a complementarity in production between workers) shape the context and influence workers' effort decisions. As a result, workplace context shapes beliefs, motivations as well as how prosocial traits affect decisions.

Our experiment is designed to test how a workplace context with different remuneration schemes and team synergies influence effort after a team building exercise that promotes a common team identity. We find that on average team remuneration, despite the free-rider

problem, results in higher effort than individual remuneration when team synergy is high. We further find that effort in all treatments is significantly higher than Nash equilibrium predictions. We interpret this finding that our team building exercise increases team identity independent of the degree of team synergy or remuneration scheme.

Our results suggest that preferences at the workplace are context sensitive. Most importantly, a cooperative workplace context includes not only reward interdependencies but also social and task interdependencies. Our results further suggest that when workplace context elements are unambiguously aligned towards a cooperative end, subjects do not have to rely as much on belief-based inferences. Similarly for prosocial preferences, when contextual elements are cooperatively aligned, it is unambiguous that own behavior should be directed towards group ends irrespective of one's own trait-based behavioral tendencies towards strangers. One possible explanation is given by the influence of the achievement motive. More achievement motivated subjects cooperate more under cooperative contexts but less under individual contexts. Achievement motivated subjects may pursue different goals depending on context. For example, under team remuneration the team's performance is more salient whereas under individual remuneration the individual performance is more salient. This interpretation should be seen in the light of team identity. Team identity enables subjects to think more in terms of team goals than under individual remuneration in certain contexts. In this sense, the concept of "we thinking" (Akerlof, 2016) can be interpreted through the lens of motives. Once subjects focus on team goals it is straightforward to assume that the need to achieve an individual goal diminishes.

Different contextual elements at the workplace interact to influence the effort provision decision of workers. These interaction effects at the workplace determine how a specific situation is perceived by the worker and change objective goals and motivations. Hence, contextual elements should be carefully designed within organization, taking into account potential interactions. The workplace culture should be as clear as possible and point towards a common direction, leaving no room for ambiguities due to contextual misalignment.

B.1 Additional Regression Results

B.1.1 Belief formation

Table 13 Belief formation regression

Dependent variable: Belief about team member's effort decisions	
Model	B1
IR high	1.18***
	(0.44)
TR low	-0.66*
	(0.40)
TR high	1.38***
	(0.45)
Round	-0.12**
	(0.05)
Effort team member (t-1)	0.53***
	(0.02)
Belief (t-1)	0.42***
	(0.03)
Constant	3.63***
	(0.66)
Observations	3220
N	230
Overall R^2	0.91

$* = p < 0.1$; $** = p < 0.05$; $*** = p < 0.01$
Random – effects regressions on the individual subject over 14 rounds (round 2
Round 15) of the effort game; estimated with the GLS method
Standard errors clustered at the team level in parentheses

By means of a GLS random effects regression model we find that the guess about the team members' effort choice over the course of the effort game is significantly influenced by the treatments in the effort game. TR high and IR high increase held beliefs significantly at the below 1% significance level while TR low decreases beliefs marginally significantly at the below 10% level, all relative to the IR low treatment. These findings are robust to integrating a count variable for the round of the game, the effort decision of the team member in the previous round and the own belief in the previous round. We conclude from this that the context

of the effort game determined by the treatments affects belief formation significantly, or: beliefs are context dependent.

B 1.2 Motive Scores on Effort

Model B2 in Table 14 regresses the five motives measured after the team building exercise and treatment dummies on effort decisions in round 1. Note that the treatment dummy coefficients differ in size and significance compared to model 1 and 2 in Table 8. However, observation sample and estimation method differ between tables. Therefore, to conclude that motive scores after the team building exercise explain treatment differences on effort over all rounds is not possible. Achievement motive has a significant negative effect on effort. This holds true even when we leave out any motive besides achievement (model B3). We want to point out, however, that absence of further evidence of the influence of (other) motives on effort does not prove that it does not exist. Our motive elicitation method by means of motive specific word clusters may be an imprecise measure for motives. Moreover, we find highly significant correlations between our different motive measures[33]. Achievement motive measures after the team building and after the effort game are highly significantly positive correlated with every other motive category. The presentation of both models – B2 and B3 – can therefore be seen as a robustness check of the achievement influence despite this collinearity between motives.

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[33] Correlation coefficients between achievement motive and other motives after the team building exercise (significance of correlation coefficient in parentheses): $\rho_{achievement,\ affiliation} = 0.18\ (p < 0.01)$; $\rho_{achievement,\ care} = 0.24\ (p < 0.01)$; $\rho_{achievement,\ power} = 0.27\ (p < 0.01)$; $\rho_{achievement,\ wanting} = 0.17\ (p < 0.05)$. Correlation coefficients between achievement motive and other motives after effort game (significance of correlation coefficient in parentheses): $\rho_{achievement,\ affiliation} = 0.33\ (p < 0.01)$; $\rho_{achievement,\ care} = 0.27\ (p < 0.01)$; $\rho_{achievement,\ power} = 0.33\ (p < 0.01)$; $\rho_{achievement,\ wanting} = 0.27\ (p < 0.01)$.

Table 14 The influence of motive scores on effort

Dependent variable: Effort decision in round 1 of effort game		
Model	B2	B3
IR high	3.77 (4.91)	3.50 (4.89)
TR low	-7.80* (4.68)	-8.30* (4.38)
TR high	20.55*** (4.23)	20.10*** (4.26)
Achievement	-3.76** (1.69)	-3.81** (1.53)
Affiliation	1.40 (2.15)	-
Care	-1.26 (2.55)	-
Power	0.97 (1.88)	-
Selfish-Wanting	-1.17 (1.25)	-
Constant	78.11*** (14.53)	77.58*** (12.70)
N	230	230
Overall R2	0.16	0.16

* = p < 0.1; ** = p < 0.05; *** = p < 0.01
OLS regressions on individual effort decisions in round 1of the effort game
Standard errors clustered at the team level in parentheses

B.2 Overview of workplace relevant motives

Table 15 Overview of workplace relevant motives

Motive & Definition	Associated goal & behavioral tendencies	Words associated with motive (questionnaire words)	Importance for the workplace
Achievement			
Achieve something better or more efficient than previously	Compete with a standard of excellence, ambitious, persistent or dominant actions	Hard-working, productive, success-driven	Aspiration levels, pursuing subjective goals and targets
Affiliation			
Need to be liked or belong to a group	Form and maintain cooperative alliances, norm-adherence and norm compliance	Attached, affable, popular	Productive teams of friends and allies, conform to norms within teams
Care			
Wanting to be accepted and to accept and nourish others, behave altruistically	Helping, generosity, and cooperation	Helpful, supportive, unselfish	Caring for well-being of one's team.
Power-Status			
Desire to have an impact, to be strong, and to influence others, be better than others	Gain and maintain social status; control over environment, competitive, reputation concerns	Officious, firm, stifling	Increased reward sensitivity, and risk taking, performance dependent on others
Selfish-wanting/consumption			
Maximization of own self-interests and consumption, protect and focus on own well-being	Pursue subjectively-defined ends optimally, wanting and desire goods and services	Consumerist, materialistic[34]	Selfish behavior without considering others

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[34] Two of the three German consumption motive related words have the same English translation.

B.3 Instructions

Welcome to today's study. During this study you will work on different tasks in different parts. Within these parts, you will make decisions which have financial consequences for you and other participants. Your decisions in the single parts result in points. These points are converted to Euros at the end of the study. You receive €1 for 250 points. In addition to your payoffs from the single parts, you receive a fixed amount for your participation in today's study (show-up fee) of 600 points. The show-up fee as well as these parts of the study, for which you earn a flat and fixed amount if you complete the part properly ensure, that in any case, you will receive a positive amount at the end of the study. You are informed about how exactly your decisions are remunerated with points in the instructions for the single parts. We will distribute the instructions for the single parts separately and read them out loud. Please read along while the instructions are being read out to you. Please do not talk to other participants. If you have a question, please raise your hand quietly. A scientific assistant will come to you and answer your question in private. The identities of the individual participants will not be revealed during today's study.

Motives

In this part you indicate, how much you feel yourself driven by different feelings and motivations just now or rather how strong you currently perceive them. These motivations will be displayed to you as a word on the screen and you have to indicate for every word on a 7-point scale how much you feel yourself driven by this feeling or motivation. You receive 180 points for your work on this part when you have carefully indicated your perception for every word on the scale at the end of the study. Please look at the screen now and start with this part as soon as it is displayed to you.

Picture puzzle within Teams

In this part you build a team with another participant in this room. The teams have been randomly assigned before the beginning of this part. Within your team you will jointly work on three picture puzzles. In doing so you have to find differences in two almost identical pictures for every picture puzzle within your team. During this task you can communicate with your team member via a chat window and exchange about found mistakes or organize your work.

Initially, one picture pair will be displayed to you on the screen per picture puzzle. At first, you have 3 minutes to count the differences between the two pictures. As soon as you see a picture pair, your time is running. Meanwhile you have the possibility to communicate with your team member by chat. After the three minutes, only the left picture of the picture pair will be displayed to you for additional 60 seconds. In this time, you can still communicate with your team member by chat and compare the amount of mistakes found. Subsequently, you and your team member each separately enter into a box on the screen how many differences you have found. For every mistake found, you get 25 points. However, you only get points for found differences in a picture pair if:

- You and your team member enter an identical amount into the box. Should you and your team member not enter an identical amount of differences, you and your team member receive nothing; irrespective of how many differences you have entered individually.

- You and your team member state a number which is smaller or equal the amount of differences that the respective picture puzzle actually contains. Thus, you receive no points if a number is stated that is higher than the actual amount of differences.

An overview about your decisions and those of your team member, as well as the resulting payoffs from the picture puzzle part takes place at the end of the study.

Example:

- You state that you have found 5 differences in the first picture pair. Your team member states that she found 6 differences. Both of you do not receive any points for this first picture pair.

- You state that you have found x differences in the second picture pair. Here, your team member also states that she found x differences. In fact, the second picture puzzle only has x-1 differences. Both of you receive no points for this second picture pair.

- You state that you have found 10 differences in the third picture pair. You team member also states that she has found 10 differences. In fact, there are 10 or more differences between the two pictures in the third picture puzzle. You and your team member respectively receive 250 points for the third picture puzzle.

- In this example you would receive 250 points for the entire picture puzzle part at the end of the study. These result from the sum of the scored points from the three picture

puzzles. Puzzle 1 = 0 points; puzzle 2 = 0 points; puzzle 3 = 250 points; puzzle 1 + 2 + 3 = 250 points.

Instruction for the Chat Feature:

The chat is situated in the left part of the screen. In the bottom-left, blue-highlighted window you can write your message to your team member and send it by pushing "Enter". The written messages of both team members appear in the window above. Messages from you are marked with the adding "You". Messages from your team member are marked with the adding "Your team member". The chat is thought of as a tool, which shall support you in your joint work on the picture puzzles. For instance, you can write down and send notes about found differences here. The history of all sent messages is visible in the chat window at all times.

Decision Situation

In this part of the study, you collaborate with the identical team member, you have already collaborated with in the picture puzzle part. You work together with this identical team member in this part over 15 rounds. Per round, you will make one **decision** and will state one **belief** about the behavior of your team member. How many points you get in this part depends on your decisions and beliefs as well as the decisions of your team member.

The **decision** you make each round:

In each of the 15 rounds, you and your team member respectively choose an integer between 0 and 105. The chosen integer is **your decision** in this round. Enter this decision into the box on the screen. Your payoff will depend on the number you chose and the one which your team member chose.

(IR low; IR high with larger synergy parameter of 9 analogously)

Production:

The decisions that you and your team member make, determine your respective **production**. This is composed as follows:

Your production = $10 \times$ (**Your decision**) + $1 \times$ (decision of team member)

Production of your team member = $10 \times$ (decision of team member) + $1 \times$ (**your decision**)

However, also costs are connected to the number that you selected as **your decision**.

Costs:

Your costs and the costs of your team member for possible decisions are:

Your costs $= 0.1 \times$ (**Your decision**)^2

Costs of your team member $= 0.1 \times$ (decision of team member)^2

You alone bear the costs of **your decision**. Note, that costs are increasing quadratically if you decide for higher numbers. This means that if you choose a smaller number, you only bear little cost. However, if you decide for a large number, costs grow disproportionately and you bear very high costs.

Example: (Full particulars in cost table)

If you decide to select **10** as **your decision**, you bear costs to the amount of **10**.

However, if you decide to select **100** as **your decision**, you bear costs to the amount of **1000**. Hence, it is possible to make losses resulting from high costs, and accordingly receive a suboptimal amount of points because of a decision that was too high.

Points:

The points from your decision result from the difference between your production and your costs. Your points are:

Your points = Your production – your costs

This can be depicted as follows:

Your points $= 10 \times$ (**Your decision**) $+ 1 \times$ (decision of team member) $- 0.1 \times$ (**Your decision**)^2

(TR low; TR high with larger synergy parameter of 9 analogously)

Production:

The decisions that you and your team member make, determine your **production**. This is composed as follows:

Your production $= 10 \times$ (**Your decision**) $+ 1 \times$ (decision of team member)

Production of your team member $= 10 \times$ (decision of team member) $+ 1 \times$ (**your decision**)

Your joint **team production** is the sum of your production and the production of your team member. This can be expressed in a simplified way:

Team production = 11 × (**your decision** + decision of team member)

However, also costs are connected to the number that you selected as **your decision**.

Costs:

Your costs and the costs of your team member for possible decisions are:

Your costs = 0.1 × (**Your decision**)^2

Costs of your team member = 0.1 × (decision of team member)^2

You alone bear the costs of **your decision**. Note, that costs are increasing quadratically if you decide for higher numbers. This means that if you choose a smaller number, you only bear little cost. However, if you decide for a large number, costs grow disproportionately and you bear very high costs.

Example: (Full particulars in cost table)

If you decide to select **10** as **your decision**, you bear costs to the amount of **10**.

However, if you decide to select **100** as **your decision**, you bear costs to the amount of **1000**. Hence, it is possible to make losses resulting from high costs, and accordingly receive a suboptimal amount of points because of a decision that was too high.

Points:

The points from your decision result from the difference between your share of the joint team production and your own costs. Your points are:

Your points = $^1/_2$ × (**team production**) – your costs

This can be depicted as follows:

Your points = 5.5 × (**Your decision** + decision of team member) – 0.1 × (**Your decision**)^2

Directly after you made your decision in every round, you state a belief about the decision that your team member made in this round. For that purpose, you enter your belief as an integer between 0 and 105 in the box on the screen. If the belief about the previous decision of your team member does not deviate more than 10 units from her actual decision, you receive in this part an additional bonus of 150 points. Otherwise, you receive no bonus for your belief.

One round and therefore one decision as well as the decision of your team member in this round will be randomly chosen at the end of the study to determine your points from this part. In addition, **a different round** is randomly selected for the possible bonus payment from the belief statement about the decision of the team member.

Comprehension Check

Before you begin to make decisions in the decision situation described above, we would like to probe your comprehension of it. For this purpose, please answer the two practice questions on the screen. The instructions to this will be displayed to you on the screen. After your answered the comprehension questions, you will make your decisions within the decision situation described above.

Distribution Task

In this part of the study you work on six distribution decisions. For this purpose, you build a group of two with another participant in this room. The group assignment was carried out randomly before the beginning of this part of the study. The identities will stay anonymous for the two of you respectively. The random group assignment in this part ensures, that **in no case** you will be matched with a participant into the group of two who was your team member in previous parts of the study.

In the six short tasks you will make decisions how you distribute certain amounts of points between yourself and the other person. To this end you choose for every task the one of nine given distributions that you prefer. One of these six tasks will be randomly selected to determine your as well as the payoff of the other person in the group from this part. In this randomly selected task it will also be randomly determined, if your preferred distribution or the preferred distribution of the other participant in the group is selected to specify your payoffs from this part.

Select the distribution you prefer the most:

You get	750	703	656	609	562	515	468	422	375
	○	○	○	○	○	○	○	○	○
Someone gets	375	422	468	515	562	609	656	703	750

Please look at the screen now. As soon as the program was started, please indicate your decisions which payoff alternative you prefer for each task.

Cost Table

Your decision	Costs of this decision	Your decision	Costs of this decision
0	0,0	53	280,9
1	0,1	54	291,6
2	0,4	55	302,5
3	0,9	56	313,6
4	1,6	57	324,9
5	2,5	58	336,4
6	3,6	59	348,1
7	4,9	60	360
8	6,4	61	372,1
9	8,1	62	384,4
10	10	63	396,9
11	12,1	64	409,6
12	14,4	65	422,5
13	16,9	66	435,6
14	19,6	67	448,9
15	22,5	68	462,4
16	25,6	69	476,1
17	28,9	70	490
18	32,4	71	504,1
19	36,1	72	518,4
20	40	73	532,9
21	44,1	74	547,6
22	48,4	75	562,5
23	52,9	76	577,6
24	57,6	77	592,9
25	62,5	78	608,4
26	67,6	79	624,1
27	72,9	80	640
28	78,4	81	656,1
29	84,1	82	672,4
30	90	83	688,9
31	96,1	84	705,6
32	102,4	85	722,5
33	108,9	86	739,6
34	115,6	87	756,9
35	122,5	88	774,4
36	129,6	89	792,1
37	136,9	90	810
38	144,4	91	828,1
39	152,1	92	846,4
40	160	93	864,9
41	168,1	94	883,6
42	176,4	95	902,5
43	184,9	96	921,6
44	193,6	97	940,9
45	202,5	98	960,4
46	211,6	99	980,1
47	220,9	100	1000
48	230,4	101	1020,1
49	240,1	102	1040,4
50	250	103	1060,9
51	260,1	104	1081,6
52	270,4	105	1102,5

B.4 Screenshots of Experimental Procedure
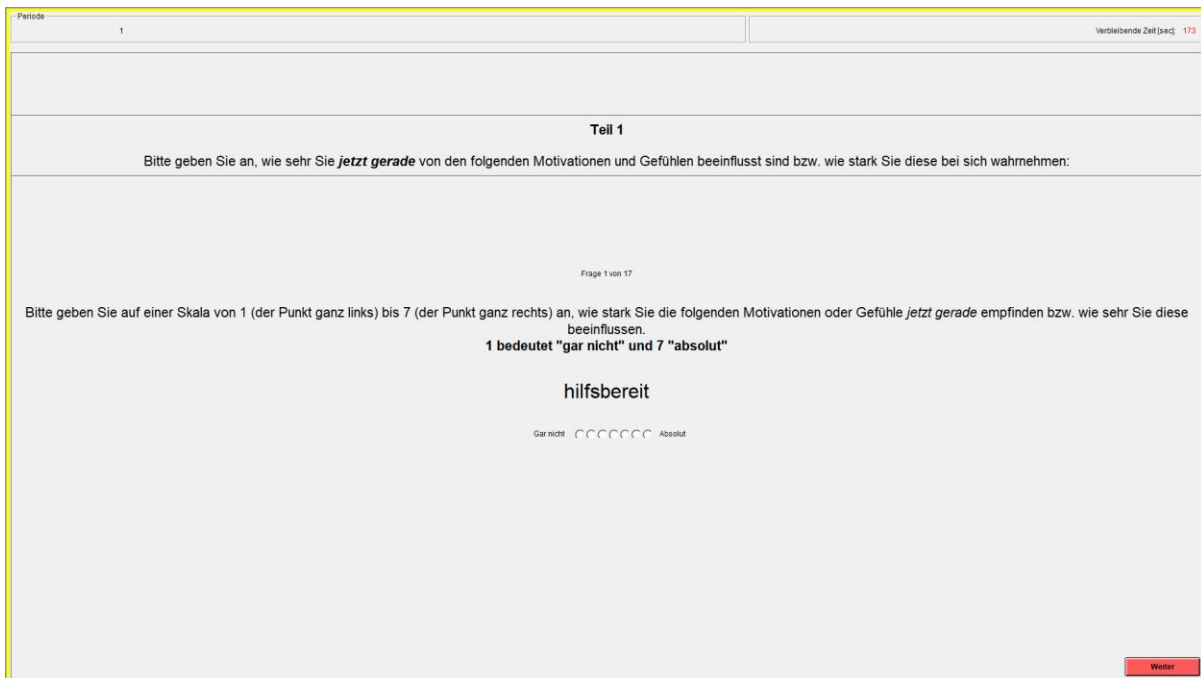
Figure 19 Motive elicitation screens
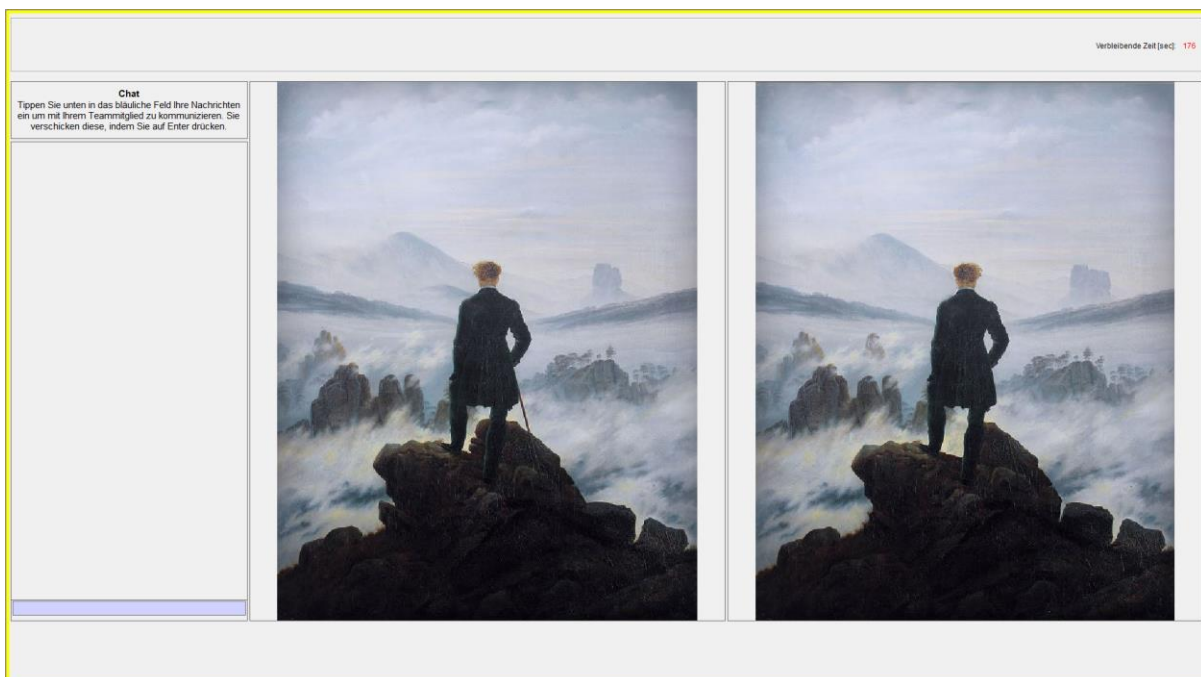
Figure 20 Team building screen 1 (one of three picture pairs)

Chat
Tippen Sie unten in das bläuliche Feld Ihre Nachrichten ein um mit Ihrem Teammitglied zu kommunizieren. Sie verschicken diese, indem Sie auf Enter drücken.
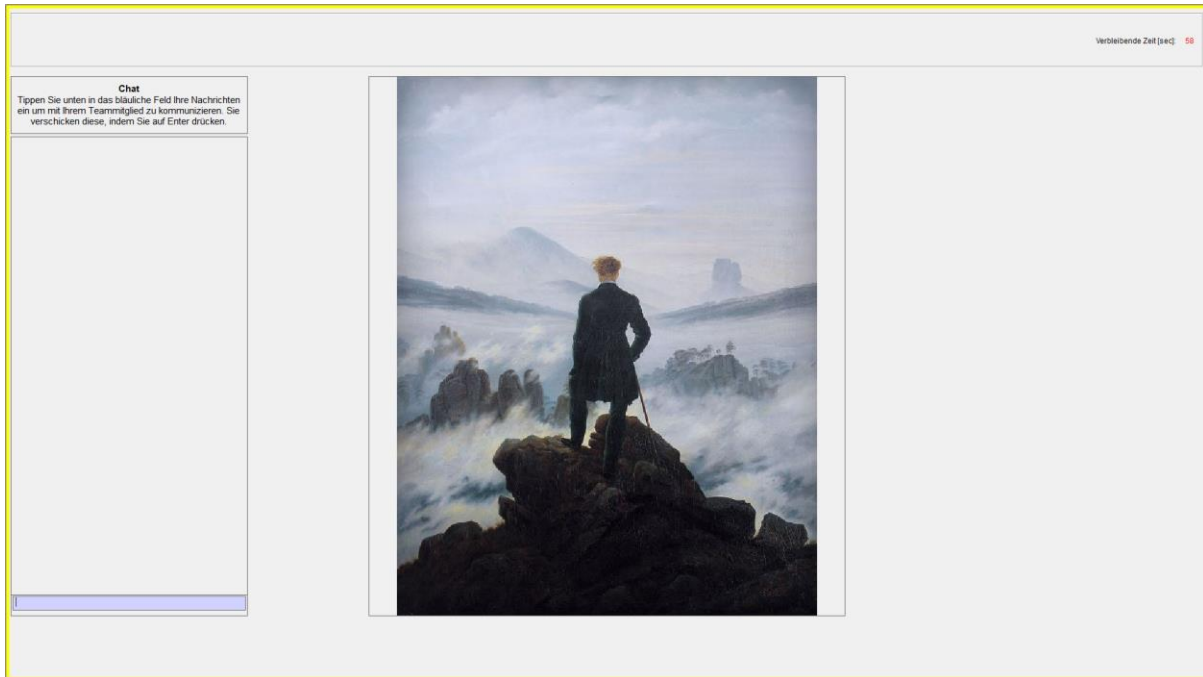
Figure 21 Team building screen 2 (one of three picture pairs)

Wie viele Unterschiede haben Sie zwischen den beiden Bildern gefunden?

Bitte beachten Sie, dass Sie Entscheidungen innerhalb eines Teams treffen. Sie bekommen nur dann eine Auszahlung für diese Aufgabe, wenn Sie und Ihr Teammitglied dieselbe Zahl eingeben. Bitte geben Sie nun Ihre Entscheidung darüber ein, wie viele Unterschiede Sie gefunden haben.

Wie viele Unterschiede haben Sie gefunden?

Weiter

Figure 22 Team building screen 3 (one of three picture pairs)

Figure 23 Question after team building: Was team building fun / successful?

Figure 24 Comprehension and exercises 1

Bitte beachten Sie, dass es sich hierbei um Beispielaufgaben handelt, welche Ihr Verständnis der Entscheidungssituation im Anschluss vertiefen sollen. Die Werte die Sie wählen, sind unverbindlich für Ihre späteren Entscheidungen und die Ihres Teammitglieds und werden Ihrem Teammitglied **nicht** mitgeteilt. Bitte beachten Sie, dass in der späteren Aufgabe Ihr Teammitglied alle Entscheidungen selbstständig trifft. Bitte nutzen Sie den . als Dezimalstelle.

Wählen Sie eine eine ganze Zahl zwischen 0 und 105 als Beispiel für **Ihre Entscheidung:**

Wählen Sie eine eine ganze Zahl zwischen 0 und 105 als Beispiel für die Entscheidung Ihres Teammitglieds:

Bestimmen Sie mit diesen Beispielentscheidungen und den Instruktionen nun die folgenden Antworten. Dazu können Sie den Taschenrechner benutzen, wenn Sie auf den Taschenrechnerknopf in der Ecke rechts unten klicken.

Bestimmen Sie die Produktion, die sich aus den Beispielentscheidungen oben ergibt:

Bestimmen Sie die Beispielkosten für Ihre gewählte Beispielentscheidung anhand der beigefügten Kostentabelle:

Bestimmen Sie Ihre Punkte für die von Ihnen gewählten Entscheidungen:

OK

Figure 25 Comprehension with exercises 2

In diesem Beispiel haben Sie sich für folgende Zahl als **Ihre Entscheidung** entschieden: 6

In diesem Beispiel haben Sie sich für folgende Zahl als die Entscheidung Ihres Teammitglieds entschieden: 6

Als Ihre Produktion haben Sie angegeben: 6

Die richtige Antwort ist: 114
Die Produktion berechnet sich wie folgt:
10 × (**Ihre Entscheidung**) + 9 × (Entscheidung des Teammitglieds)

Als Kosten für **Ihre Entscheidung** haben Sie angegeben: 6.0

Die richtige Antwort ist: 3.6
Die Kosten berechnen sich wie folgt:
0.1 × (**Ihre Entscheidung**) × (**Ihre Entscheidung**)

Sie haben angegeben, dass Sie so viele Punkte aus den Beispielentscheidungen erhalten: 6.0

Die richtige Antwort lautet: 110.4
Die Punkte berechnen sich aus:
Ihre Produktion - Ihre Kosten

OK

Figure 26 Comprehension and exercises 3: Feedback

111

Figure 27 Effort game 1: Effort decision

Figure 28 Effort game 2: Belief elicitation

Dieser Bildschirm informiert Sie über die Ergebnisse aus den Entscheidungen, die Sie und ihr Teammitglied in dieser Runde getroffen haben.

Sie und Ihr Teammitglied haben folgende Entscheidungen in dieser Runde getroffen, aus denen diese Ergebnisse resultieren:

Diese Zahl haben Sie als Entscheidung eingesetzt:	4.0
Diese Zahl hat Ihr Teammitglied als Entscheidung eingesetzt:	2.0
Sie haben geschätzt, dass dies die Entscheidung Ihres Teammitglieds ist:	4
So viele Punkte resultieren aus den Entscheidungen Ihres Teams für Sie:	56.40
So viele Punkte erhalten Sie zusätzlich aus Ihrer Einschätzung:	150
So viele Punkte resultieren aus den Entscheidungen Ihres Teams für Ihr Teammitglied:	55.60

Weiter

Figure 29 Effort game 3: Information about previous round

Für jede der folgenden Fragen, geben Sie bitte jeweils diejenige Verteilung an, welche Sie am meisten bevorzugen.

1 von 6

Sie erhalten	638	652	666	680	694	708	722	736	750
	○	○	○	○	○	○	○	○	○
Jemand erhält	113	146	179	211	244	277	310	342	375

Sie erhalten	**0**
Jemand erhält	**0**

OK

Figure 30 SVO screen 1

113

Figure 31 SVO screen 2: SVO payoffs

Figure 32 Final payoff screen 1

114

Ihre Auszahlung aus der heutigen Studie

Auszahlung aus der Entscheidungssituation	
Der Zufallsmechanismus hat folgende Runde zur Auszahlung ausgewählt:	15
Ihre Punkte in der ausgewählten Runde:	36.90
Ihre Auszahlung aus der ausgewählten Runde in Euro:	0.15
Die Punkte Ihres Teammitglieds in der ausgewählten Runde:	38.10
Die Auszahlung Ihres Teammitglieds aus der ausgewählten Runde in Euro:	0.15
Für Ihre Teilnahme an dieser Aufgabe erhalten Sie zusätzlich diesen pauschalen Betrag in Euro:	0.50
Auszahlung aus der Entscheidungssituation: Einschätzungen	
Der Zufallsmechanismus hat folgende Runde zur Auszahlung der Einschätzungen ausgewählt:	8
Die Entscheidung Ihres Teammitglieds in der ausgewählten Aufgabe:	3
Ihre Schätzung in der ausgewählten Runde:	2.00
Ihre Punkte aus der Einschätzung:	150.00
Ihre Auszahlung aus der Einschätzung in Euro:	0.60
Auszahlung aus der Team-Bilderrätselaufgabe	
Ihre Auszahlung aus dem ersten Bilderpaar:	0.00
Ihre Auszahlung aus dem zweiten Bilderpaar:	0.20
Ihre Auszahlung aus dem dritten Bilderpaar:	0.10
Ihre Gesamtauszahlung aus der Bilderrätselaufgabe:	0.30
Auszahlung aus der Aufteilungsaufgabe	
Ihre Punkte aus der ausgewählten Runde:	638.00
Ihre Auszahlung aus der Aufteilungsaufgabe in Euro:	2.55
Auszahlung aus den Angaben zu Motiven und Gefühlen	
Punkte für die Angaben über die Intensitäten der Motive:	450.00
Ihre Auszahlung aus den Angaben über Motive in Euro:	1.80
Auszahlung aus den Verständnisfragen	
Punkte für die Arbeit an den Verständnisfragen:	200.00
Ihre Auszahlung aus der Arbeit an den Verständnisfragen in Euro:	0.80
Ihre Gesamtauszahlung aus der heutigen Studie (gerundet auf die erste Dezimalstelle):	6.80

Figure 33 Final payoff screen 2

Die Studie ist nun beendet. Vielen Dank für Ihre Teilnahme!

Ihre Gesamtauszahlung aus der heutigen Studie beträgt **6.80 Euro**.
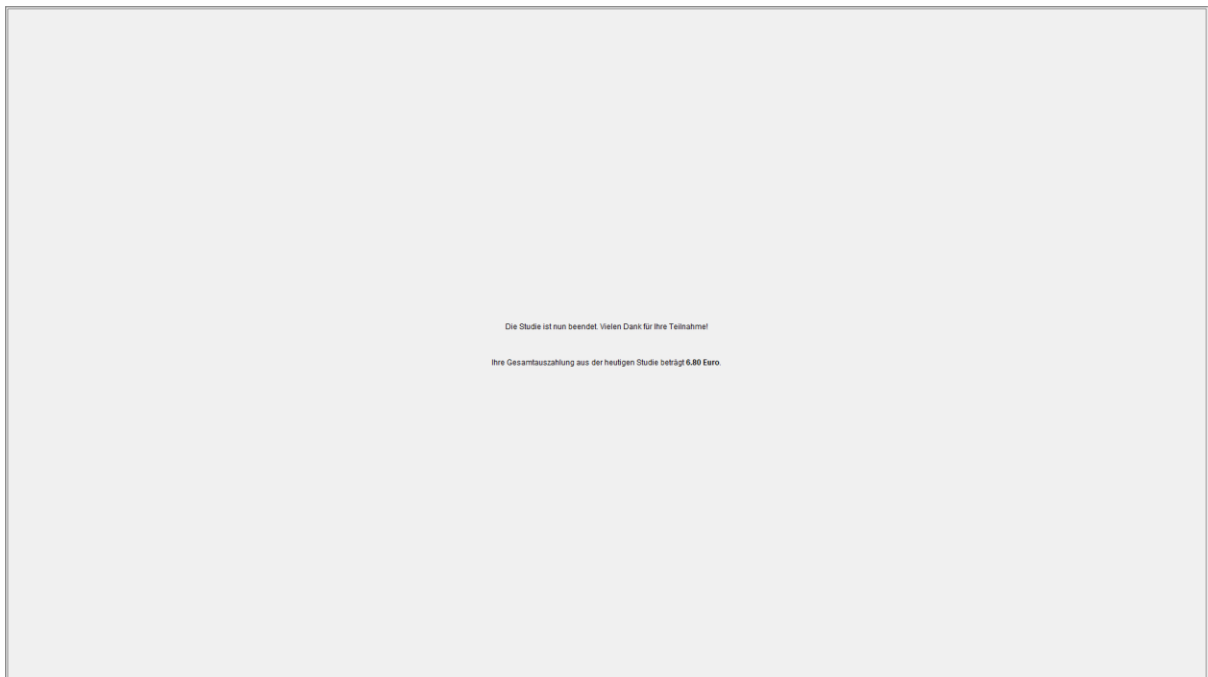
Figure 34 Final screen

SOCIAL COMPARISON NUDGES – GUESSING THE NORM INCREASES CHARITABLE GIVING[35]

4.1 Introduction

Modern societies are based to a great deal on implicit rules and norms. Information on the behavior of others, i.e. descriptive norms, can influence our own behavior (Festinger, 1954). Organizations that rely on donations increasingly take advantage of this by giving descriptive norm cues in their solicitation. They use so-called social comparison nudges (SCNs) that provide individuals with information about the behavior of relevant peers. Several studies find that descriptive norms positively impact donations (see e.g. Agerström et al., 2016; Alpízar and Martinsson, 2013; Frey and Meier, 2004; Martin and Randal, 2008; Shang and Croson, 2009).

The literature in social psychology finds that an increase in attention to a descriptive norm strengthens its influence on behavior (Chaiken and Eagly, 1989; Cialdini et al., 1990; Fazio, 1990; Harvey and Enzle, 1981; Melnyk et al., 2011; Petty and Wegener, 1999). Krupka and Weber (2009) find that even without being provided a descriptive norm, giving a guess about peer behavior increases pro-sociality in a binary dictator game by increasing the attention to the norm. Following Krupka and Weber we argue that asking for a guess of the norm would also increase the attention to the provided descriptive norm.

The novelty of this paper is therefore to provide subjects with the descriptive norm directly after they guessed it. This way, subjects' beliefs about the norm, as expressed by their guess, are directly updated. This belief update is hypothesized to further increase the effectiveness of the provided descriptive norm. This hypothesis is informed by social and motivation psychology and rests on status motives and the motivation to obtain high social esteem (Wigfield and Eccles, 2000; Festinger, 1954). We test this hypothesis in a field experiment by comparing donation rates to a local charity. As descriptive norm we use the donation rate of the general public from a study of the German Ministry of Family Affairs. We find that asking for a guess of the descriptive norm before providing it significantly increases donations over merely providing it. We further find suggestive evidence that it matters for the donation

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decision whether subjects receive a belief update which lies below or above their previously stated guess about the descriptive norm.

4.2 Methods

The field experiment was conducted at the main train station in the city of Kiel, Germany, in September 2015. Our sample consists of 263 observations (131 females) in three treatments. The participants were recruited from the general public waiting for public transport, mainly on their way to or from work. We conducted our experiment on work days, both in the morning between 7 and 9 a.m. and in the evening between 4 and 6 p.m. One solicitor that was unaware of the study's hypotheses carried out all treatments of the experiment. Following a written protocol, the solicitor approached subjects by asking whether they would be willing to participate in a two minute survey. Only individuals that made the impression of commuting alone were approached and the solicitor continued with individuals out of earshot in order to minimize potential social image effects. Participants were reimbursed with a scratch lottery ticket. The tickets are well known in Germany, cost €1, and we explicitly mentioned the jackpot prize of €60,000. This facilitated the approach of subjects and is likely to have increased participation. It further provides an easy, non-strategic decision environment with a binary choice to either donate the (unscratched) ticket or not.

Participants faced one of three treatments; *Control*, *Descriptive Norm* or *Guess Norm*. In the *Control* treatment participants were asked whether they wanted to donate their ticket to a local child relief organization. In the *Descriptive Norm* treatment participants were told the following prior to the donation decision: "According to a survey of the Ministry of Family Affairs about 2/3 of the population in Germany make charitable donations each year." In the *Guess Norm* treatment participants first had to give a guess on the question: "What percentage of the population in Germany do you think makes charitable donations each year?" Only after they stated their guess the solicitor provided the same statement as in *Descriptive Norm*. All donated tickets were put into a non-transparent donation box to avoid social cues. After the donation decision a short follow-up questionnaire was conducted (see appendix C.2 for translations of the experimental questionnaire).

4.3 Results

We are interested in how the decision to either donate or keep the scratch ticket is affected by the different treatments. We use the Boschloo test (Boschloo, 1970) to test for the difference in proportions of donations between treatments. Following Schlag (2008), the Boschloo test is uniformly more powerful than Fisher's exact test. We report p-values from two sided testing throughout, except mentioned otherwise. Our main results are summarized in Figure 35.

In line with previous results in the literature investigating SCNs, we find that subjects who are merely informed about the donation behavior of others (*Descriptive Norm*: mean = 61% sd = 5%) donate the scratch ticket more often than subjects in the control group (*Control*: mean = 48%, sd = 5%) who received no descriptive norm. This difference in donation behavior of 13 percentage points is marginally statistically significant (p = 0.089).
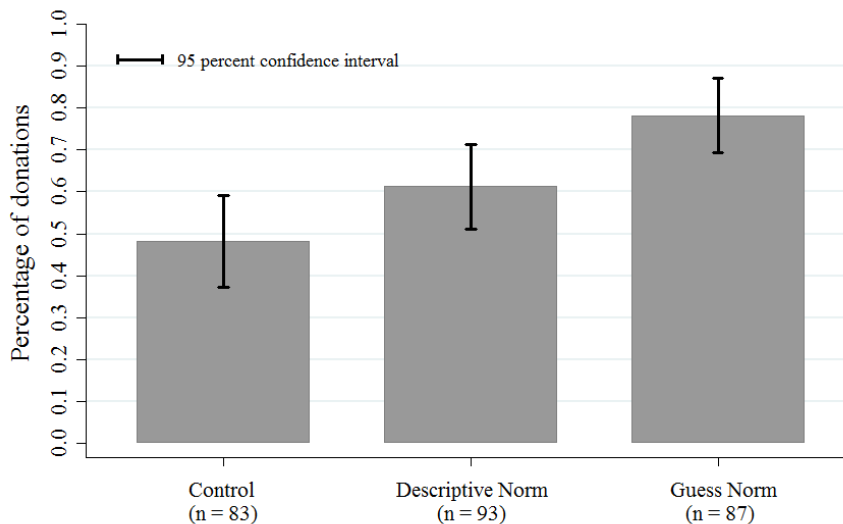
Figure 35 Percentage of lottery ticket donations for three treatments

The most pronounced effect on the share of donations is observed in *Guess Norm*. We find clear evidence that making subjects state a guess about the descriptive norm before receiving it leads to a higher share of donations compared to both *Control* and *Descriptive Norm*. In particular, while *Descriptive Norm* increases donations only marginally compared to providing no descriptive norm, subjects under *Guess Norm* donate in 78% of the cases. This share is significantly higher (*Guess Norm*: mean = 78%, sd = 4%) than under *Descriptive Norm* (p = 0.014). The difference in donations between *Guess Norm* and *Control* therefore is 30 percentage points and statistical significant (p = 0.001).

Table 16 depicts the marginal effects at the mean that incremental changes in certain independent variables have on the dependent variable "donation" as estimated by logistic

regression. Model (1) examines the effects of the *Guess Norm* and *Descriptive Norm* treatments relative to the *Control* treatment and presents White robust standard errors in parentheses. The model additionally includes the control variables time of day, gender, age, time of the week, weather condition, type of occupation, and solicitor experience. While these variables are not of substantial interest to our research question, they might be of interest to some readers. A detailed description of these covariates and their coefficient estimates can be found in the appendix. Model (2) estimates the impact of the *Guess Norm* and *Descriptive Norm* treatments relative to the *Control* treatment but leaves out the control covariates. The estimated marginal effect of the *Guess Norm* and *Descriptive Norm* treatment in Model (1) are robust to analyzing the model with standard errors clustered at the session level as can be seen in the appendix. We see that the marginal effects of the *Descriptive Norm* and *Guess Norm* variables in these two models are consistent with the treatment effects described above.

Previous work that investigated how descriptive norms affect behavior suggests that heterogeneous treatment effects can occur when social norm information is used to influence behavior. It was found that subjects who learned that their behavior deviates from the behavior of the peer group are likely to adjust their behavior towards the norm. When this adjustment occurs in the direction that is not intended by the nudge, this is coined "boomerang effect" (Clee and Wicklund, 1980). This effect was found in different applications in the field (Schultz et al., 2007; Costa and Kahn, 2011). From this, we hypothesize that subjects with a belief update from guessing below the descriptive norm are more likely to donate than subjects with a belief update from guessing above.

Table 16 Logit regressions; marginal effects models

VARIABLES	Model (1) Full marginal effects model	Model (2) Marginal effects model without Controls
Guess Norm	0.315**	0.312***
	(0.127)	(0.078)
Descriptive Norm	0.143*	0.123*
	(0.073)	(0.071)
Controls	Yes	No
Observations	263	263

Note: White robust standard errors are in parentheses. Control variables are: time of day, gender, age, time of the week, weather condition, type of occupation and solicitor experience.
*** p<0.01, ** p<0.05, * p<0.1

Overall, we observe a negative correlation between the stated guess and the donation decision of -0.158 (p = 0.143). Analyzing the guesses in more detail, we find that 14% of participants in *Guess Norm* guessed higher than the descriptive norm (mean = 74.25, sd = 5.48), while 86% guessed lower (mean = 29.33, sd = 15.09). When we compare donation decisions of participants that guessed below the norm (mean = 81%, sd = 4%) with donation decisions of participants that guessed above the norm (mean = 58%, sd = 14%) we find participants that guessed above are marginal significantly less likely to donate (p = 0.052, one-sided). Our finding suggests that descriptive norms not only interact with previous behavior in shaping decision making, but also with previous beliefs about the norm.

4.4 Conclusion

This paper reports the results of a field experiment testing the influence of a descriptive norm on donation behavior. We contribute to the literature by studying how increasing attention to the descriptive norm affects donations. We find that asking for a guess of the descriptive norm before providing it significantly increases donations over merely providing it.

We additionally find tentative evidence that subjects with guesses above the norm donate less than those with guesses below the norm. Explanations for this include the boomerang effect or moral licensing. The idea behind moral licensing as an alternative explanation could be that participants that have previously donated to another cause may have higher guesses and also feel entitled to not donate again (see Merrit et al., 2010 in general and Tiefenbeck et al., 2013 for moral licensing in SCNs). Our results extend both explanations by suggesting that the effectiveness of SCNs depends on how the descriptive norm updates the a priori beliefs that individuals hold about the descriptive norm.

To ask for a guess is an easy and low-cost practice that is applicable not only to charitable giving but other policy areas in which SCNs have been applied. These include promoting energy (Allcott, 2011; Nolan, et al., 2008) and water conservation (Ferraro and Price, 2013), retirement savings (Beshears et al., 2015), and increasing voting participation (Green and Gerber, 2008; Margetts et al., 2011). For a better understanding on why and how norms shape behavior more research is needed on the interaction between beliefs about and the degree of attention to norms.

APPENDIX C

C.1 Additional Regression Analysis

We examine the treatment effects of the *Descriptive Norm* and *Guess Norm* treatments by means of marginal effects estimated from a logistic regression model. The model investigates the predictive power on donation decisions of the two treatment dummies and several other potentially relevant controls. There is evidence suggesting that charitable giving is influenced by gender, age, educational attainment and household income (Andreoni, 2000; Andreoni and Versterlund, 2001; Mesch et al., 2011).

The variable "type of occupation" is categorized by using the "Current Employment Status" classification system in its <u>hierarchically</u> summarized version on page 11 from the Socio-Economic Panel (SOEP) (2015). This led to the following categories (with respective subject counts in parentheses): pensioner (6), currently in education (22), apprentice (10), self-employed (6), manual laborer (19), employee in services (148), and civil service (49). Three subjects were unwilling to report their occupation. Moreover, we cannot report any observations in our sample for the SOEP occupational position categories of "unemployed" and "military / social service". The weather condition was categorized into one of four categories (as categorized by our solicitor): sunny (79) partly cloudy (62), cloudy (100) and rainy (22). The "rainy" category serves as the baseline category in the regression analysis below. In order to control for weekday effects, we categorized weekdays into three categories of roughly equal size: The "beginning of the week" category contains the days Monday and Tuesday (92), the "middle of the week" category contains the days Wednesday and Thursday (99) and the "end of week" category contains Fridays (72). The "end of week dummy" serves as the baseline category in the models below. Solicitor experience could bias our results if increased solicitation experience over time leads a change in solicitation success. To control for time trends in our data, we add the session number as a regressor to the models. In total, 22 sessions were conducted in chronological order with session number 1 being the first session that was conducted.

Model (C1) is identical to Model (1) in the main text of chapter 4 and presents coefficient estimates and standard errors in parentheses for the controls. Model (C1) therefore describes the marginal effects of a logistic regression analysis with White robust standard errors. The

dependent variable "donation" is regressed on the two treatment variables *Descriptive Norm* and *Guess Norm* as well as the list of controls described above. Compared to Model (C1), Model (C2) presents robust standard errors clustered at the session level, while keeping the identical list of regressors of Model (C1). We chose the session level for clustering in order to control for whether certain session specific events have an influence on our analysis. By means of a specification link test we find no evidence that adding complexity to Models (1) and (2) in the main text of chapter 4 as well as Models (C1) and (C2) in the appendix through squaring the prediction leads to a significant increase in predictive power. Furthermore, we find no evidence for critical multicollinearity. Testing our regressors for correlation with one another, no regressor shows a variance inflation factor (VIF) above 5. The mean VIF over all regressors of Models (C1) and (C2) is 2.42.

Table 17 Additional regression results

VARIABLES	Model (C1) Full marginal effects model; White standard errors	Model (C2) Full marginal effects model; Standard errors clustered at session level
Guess Norm	0.315**	0.315***
	(0.127)	(0.089)
Descriptive Norm	0.143*	0.143*
	(0.073)	(0.08)
Evening	0.02	0.02
	(0.067)	(0.051)
Female	0.016	0.016
	(0.065)	(0.049)
Age	-0.007***	-0.007***
	(0.003)	(0.002)
Beginning of week	0.139	0.139**
	(0.110)	(0.07)
Middle of week	0.019	0.019
	(0.085)	(0.043)
Sunny	0.197	0.197***
	(0.123)	(0.075)
Partly cloudy	0.168	0.168
	(0.149)	(0.115)
Cloudy	0.177	0.177*
	(0.117)	(0.107)
Pensioner	0.466	0.466*
	(0.272)	(0.267)
In education	0.024	0.024
	(0.173)	(0.228)
Apprentice	-0.064	-0.065
	(0.201)	(0.261)
Self-employed	0.138	0.138
	(0.297)	(0.226)
Employee (services)	0.039	0.039
	(0.130)	(0.180)
Public service job	0.061	0.061
	(0.140)	(0.186)
Session	0.007	0.007
	(0.008)	(0.005)
Observations	263	263

Note: Standard errors are in parentheses; Model (C1): White robust standard errors; Model (C2): Standard errors clustered at the session level. Treatments, time of day, gender, time of week, weather condition, type of occupation are categorical variables. Age and solicitor experience are at their mean values.
*** p<0.01, ** p<0.05, * p<0.1

In Model (C1) the coefficient estimate for *Guess Norm* is significant (p = 0.013). The coefficient estimate for the *Descriptive Norm* treatment is also significant, but with a higher p-value of 0.052. The estimated marginal effects associated with the *Guess Norm* and *Descriptive Norm* of Models (C1) and (C2) mirror almost perfectly those estimated in the marginal effects models (1) and (2) from the main text of chapter 4. We take this as evidence that especially *Guess Norm* increases the likelihood of a donation significantly and that this effect persists in the face of the robustness checks of adding a list of potentially relevant covariates to the analysis and checking for the possibility that observations might have been affected by session specific events. Likewise, the treatment effect of *Descriptive Norm* is robust across different model specifications, yet considerably smaller than the effect of *Guess Norm.*

In terms of significant influences of covariates other than the two treatment dummies on the donation decision, Models (C1) and (C2) lead to the following insights: Throughout all model specifications we find a stable and significant negative effect of age on the decision to donate.[36] However, as can be seen by the arguments in the previous paragraph, this effect of age affects the size and significance of our treatment effects only marginally. When comparing the two models, we find a positive effect of "beginning of the week" on donation decisions in Model (C2) but not in (C1). However, the positive effect of "beginning of the week" does not alter the size of the significance of our treatment variables and the decrease in the size of the standard error of the coefficient estimate is small compared to the White robust standard error. Throughout all models there is a negative influence of rainy weather condition on donation behavior as can be seen by the positive signs on the coefficient estimates of sunny, partly cloudy and cloudy weather. As expected, when standard errors are clustered at the session level, some of the "good" weather coefficient estimates become significant. In particular, sunny weather has a significant positive influence on donation likelihood compared to rainy weather (p = 0.009). However, one can see that the negative influence of bad weather does not affect these estimates significantly in Model (C2). We can only speculate that a negative psychological concept like bad mood is induced through worse weather conditions which affect donations negatively. Further research could try to confirm this insight and to identify the causal mechanism behind it if it persists. In terms of how affiliations with different types of occupation affect the likelihood to donate we find in Model (C2) that identifying as a pensioner increases the likelihood to donate. Importantly, we want to point out that across both models

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[36] Incorporating non-linear age regressors does not lead to an improved model fit.

in the appendix, the variable "session" does not show a significant influence on donation decision. Given that our solicitor was blind to the study's hypotheses, we therefore conclude that our solicitor has not learned a systematic behavior over time which influenced subjects' decisions. To conclude, Models (C1) and (C2) demonstrate in detail that the marginal effects we present in the main text of chapter 4 are (a) robust to the inclusion of controls and (b) robust to calculating standard errors at the session level.

C.2 Experimental Questionnaire

(Questionnaire only visible to researcher)

ID: xx

Date: xx.09.2015

Weather: Sun   Sun/Clouds   Clouds   Rain

Time of day	Morning	Evening	
Nudge	Control	Treatment 1	Treatment 2 & Guess:
Donation	Yes	No	

> All things considered, how satisfied are you with your life as a whole at the moment on a 0 to 10 scale?

Morning > Are you on your way to work right now or will you go to work later today?

Evening > Are you coming from work or will you go to work later today?

Yes	No

Yes, Morning> You said, you are on your way to work. How tiring do you expect today's workday to be compared to other days? <Less, just as or more tiring than usual?

Yes, Evening> You said, you are coming from work. How tiring was your workday compared to other days? <Less, just as or more tiring than usual?

<less	= just as	> more

> How old are you? (+Gender!)

> What is your occupation?

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┌─────────────────┐
│                 │
└─────────────────┘
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Yes> In what industry do you work?

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┌─────────────────┐
│                 │
└─────────────────┘
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> How much do you want to know whether the lottery ticket won?
 <Very much, pretty much, I do not care, rather not, by no means>

Very much	Pretty much	I do not care	Rather not	By no means

CHAPTER 5

TEXTUAL ANALYSIS OF NARRATIVES IN THE CONTEXT OF A PUBLIC GOODS EXPERIMENT[37]

5.1 Introduction

Narratives shape individual thinking and motivate action. Individuals understand themselves, others and their environment through narratives about events they experienced (Conway and Holmes, 2004; McAdams, 2001, 2006, see Holland and Kensinger, 2010 for a review). Narratives motivate behavior by offering cues that are based on social norms and provided identities for solving problems, offering heuristics derived from past experiences about dealing with new situations and presenting goals for future behavior (Pillemer, 2003). Therefore, narratives activate motives which in turn affect behavior.

By means of a laboratory experiment, this study analyzes the impact of narratives on motives as well as how motives that were activated by narratives affect behavior. To this end, narratives are investigated within two contexts: *i)* a public goods game context and *ii)* within the context of subjects' self-reported motivational states after having been exposed to their recalled narratives. I focus on narratives in the sense of stories that subjects wrote down from autobiographic memory. In particular, subjects were assigned to one of three conditions that determined what narratives they should recall. They either had to narrate memories focusing on compassionate motivation (*Care*), or narratives focusing on angry motivation (*Anger)* or write down a narrative about a motivationally unspecific experience *(Control)*. Based on motivation psychology, the concrete topics of the treatments have clear predictions in terms of how subjects exposed to them should behave in a subsequent public goods game. Motivation psychology delivers hypotheses how recalling the narratives in the different treatments impacts subjects' motivational states that were measured by means of subjects' ratings on motivational scales. Therefore, this experiment provides a causal investigation of how narratives and which aspects of them affect behavior and motivation.

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[37] This chapter is in preparation for submission. It makes use of the data and initial results that were presented in chapter 2. This chapter uses fundamentally different methods on this data to answer different research questions.

A lot of decisive social problems challenging the global community (such as carbon emissions abatement and reduction of systemic financial risks) have a public good character. Public goods are a social dilemma: groups of individuals face a conflict between the maximization of individual gains and the collective interest. To the extent that beneficiaries of such global public goods do not contribute enough for their provision, a free-rider problem exists. It is therefore evident that different interest groups use and construct narratives to influence attitudes and actions towards global public goods. Hence, narratives are part of the context that influences whether provision of public goods does or does not occur. Exemplarily, some narratives regarding climate change (Pancost, 2017) seek to stress that climate change is not-existent, not man-made and that researchers themselves contradict each other when they discuss causes and consequences of climate change. A different narrative on the same topic might stress that research on causes and consequences of climate change is clear on the point that a reduction in CO_2 emissions is warranted. This other narrative might further argue that rise in atmospheric CO_2 and temperature correlates almost perfectly with the industrial age and is increasing ever since and outline horror scenarios such as biodiversity loss, melting of ice and flooding of whole nations to make their point. Such narratives are often strategically developed with great care, seen as an instrument of "soft power" in international relations and repeated by respective spokespersons at various venues and outlets (Ganz, 2011; Lowe et al., 2006; Nye Jr., 2013; Nye Jr., 2008; Roselle et al., 2014).

In order to analyze narratives within a controlled laboratory setting, three approaches are compared. I investigate whether the presence of specific words (single marker words) by means of the dictionary method within narratives have a significant impact on motivational and behavioral reactions. In addition, I analyze the relation between motivational content rating / assessment of motivational intensity within narratives by human assistants and subsequent behavioral and motivational responses. Finally, the results from the previous two approaches are compared with those from an unsupervised statistical learning algorithm, Latent Dirichlet Allocation (LDA, Blet et al., 2003) which synthesizes underlying topics in narratives.

This study therefore adds to the literature in two domains: First of all, I demonstrate how the effect of narratives on motives and the subsequent effect of motives on behavior can be analyzed in a quantitative way within a controlled setting. Second, I make a methodological contribution by showcasing the potential of LDA for the purpose of analyzing narratives within experimental economics compared to other textual analysis methods. To the best of my knowledge, this paper is the first to apply text analysis by means of LDA to language analysis

in experimental economics. These two contributions look into the black box of the effects that narratives have.

This study uses response variables from an experiment that consisted of two parts: one part in which subjects wrote narratives and subsequently indicated their motivational states and another part in which subjects also initially wrote down narratives and then made decisions in a public goods game. The first part serves to answer the question which dimensions of narratives affect the motivational state of subjects in a hypothesized direction. The second part yields insights which aspects of narratives are responsible for the impact of narratives on decisions. Furthermore, I can observe how different means of analyzing narratives compare based on different response variables. Specifically, I can compare human narrative analysis capabilities with the automated approaches of the dictionary method and LDA.

In the context of a text corpus of narratives, LDA posits that every single narrative from within the corpus is composed of K topics. A topic is defined as a distribution over the unique words of the population of all words that were used in the text corpus of all narratives. Individual words appear in different topics with different probabilities. Therefore, LDA yields quantitative variables that express how much of topic x was written in narrative y for every narrative in the corpus. Exemplarily, narratives investigated in this study may all consist to some degree of the motivationally unspecific topic of doing routine day-to-day activities, but the shares that this topic covers vary by narrative. In this example, words about taking a shower have high probability under the everyday activities topic and lower probability under a *Care-* or *Anger-* related topic.

Narratives are naturally linked to text as data. Recent developments within economics use quantitative representation of text as data in their studies. Working with text as data has become feasible due to novel technological developments and received considerable interest by social scientists lately (Gentzkow et al., 2017; Einav and Levin, 2014). Within experimental economics, the focus of analyzing texts has treated mostly communication data and relied largely on coding schemes that human assistants were trained on to code communication content (exemplarily, Brandts and Cooper, 2007). While this approach seeks to analyze communication and narratives in a systematic way and uses the unique human ability of interpretation, it is subjective and often not blind to the hypotheses of the study, prone to errors due to human processing as well as resource intensive since assistants need to get paid and need a fair amount of time to rate texts.

Overall, I find that topics within narratives as well as words used in them have a decisive impact on later motivational states as well as behavior, beliefs and perceptions in the public goods game. I find that both automated approaches, LDA and dictionary method, outperform human coding of motivation in revealing connections between narratives and behavior in public goods games. LDA topics are systematically associated with both behavior in the public goods game as well as self-reported motivational states. In particular, I find that the identical LDA topics that are associated with increases in motivational states also predict behavior in the public goods game according to predictions from motivation psychology which indicates the presence of convergent validity. In line with predictions from motivation psychology I find that one topic in particular, "helping others in public", has a significant and positive influence on subsequently self-reported states of compassion motivation and at the same time a positive effect on contributions and beliefs in the public goods game. I do not find this degree of convergent validity for the dictionary method. The only word category that indicates convergent validity between motivation and behavior given the experimental treatments is the anger words category. The use of anger words increases anger motivation and decreases attention that subjects pay to the payoff of the other group member in the public goods game. Several other word categories have an isolated impact on subsequent behavior which I discuss in the results below. For the dictionary method, I can only partly confirm the marker word hypothesis which states that one can infer the presence of motivation from the presence of single groups of words within texts. On this regard, I find that anger words do predict self-reported anger motivation but that no word category related to compassion is meaningfully associated with compassion motivation. The only reasonable result I find for human coding of motivations in narratives is that the higher the human assessment of anger within a narrative, the less likely subjects are to be a conditional cooperator in the public goods game. My results indicate that insights from motivation psychology are essential for interpreting the results from the dictionary method and LDA methods and therefore to a quantitative analysis of the impact of narratives in general.

Section 5.2 defines the concept of narrative used within this paper and introduces some relevant literature that most economists should not be acquainted to. Section 5.3 presents the design, experimental data and behavioral as well as motivational results of the experiment. Section 5.4 proposes three approaches to analyze narratives within the texts and presents hypotheses as well as results for each approach. Section 5.5 investigates the robustness of the results and relates them to one another. Section 5.6 provides a concluding discussion.

5.2 Definition of Narrative Concept and its Application

5.2.1 Narratives and Autobiographic Memory

For this study, narratives are defined as formulations of stories about personal episodic memories that are interpreted and created by the current self (Larsen, 1992).[38] In this sense, narratives comprise of a number of events that are linked up causally and guide the interpretation of current experience which in turn motivates behavior in the current situation (Bluck et al., 2005). Akerlof and Snower (2016) identify the following function as being essential to narratives: Narratives are a simplified account of events which yield a motivational framework for action since narratives are tied to social norms, values and guidelines how norms and values should be enacted (see also Rai and Fiske, 2011). Likewise, social contexts are linked to narratives as societies are socially constructed orders that were built with the help of narratives. Within these socially constructed orders, narratives motivate people to interact with others in specific ways to reach common goals. However, narratives not only prescribe certain types of behavior to actors, they also define social roles and relationships for people which shape their identities. Since the narratives with their encompassing behavioral norms and defined identities are common knowledge, narratives on the one hand facilitate coordination (Feldman et al., 1990) among people and establish hierarchies on the other (Asch, 1955; Milgram, 1964). The coordinating function has also been referred to as "shared intentionality" which describes a state in which tasks share an identical mental representation between people (Tomasello and Carpenter, 2007). This human ability enables narratives to be internalized and spread across many people.

Narratives and memories are clearly interlinked due to their interdependent influence on each other (Pasupathi and Hoyt, 2009). It was found that narratives transform memories about situations that one experienced due to two reasons: Memories need to be narrated such that they fit into a coherent self-image and therefore the narrated memories have to follow a narrative format. Moreover, narrating memories occurs in a communication context. In order to make memories comprehensible for other persons, the representations of memories are

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[38] It should be noted that psychologists consider narratives of this kind under the theory of „narrative identity" (McAdams, 2001). Evidence has accumulated that the presence and organization of memories is essential such that an identity represented by a narrative can be formed (Habermas and Bluck, 2000).

changed such that others can understand them (Smorti and Fioretti, 2016). It was found that when humans are offered to tell personal stories, they implicitly convey details about their reasoning and choice process (O'Conner, 2000) which is of particular interest to this study. Narratives further allow us to better understand and empathize with others (Cohen, 1998). Furthermore, narratives serve a social purpose since they help engage and preserve social bonds by providing material for conversation. Ultimately, every known narrative, be it about the own identity, a political ideology or a scientific school of thought, once originated in the mind of one or a few individuals (Mokyr, 2016).

Many agents such as politicians, think tanks, historians or the media use narratives in order to influence opinions and debates (Turowski and Mikfeld, 2013; Berger, 1997; Alexander, 2017). Examples of such narratives are the "rags to riches", "American Dream" or "Space Race" narratives. Narratives are a powerful way of fixing and communicating ideas like the "market for lemons" narrative that George Akerlof used to illustrate the consequences of information asymmetries (Akerlof, 1970). Other disciplines in the social sciences such as history, sociology, anthropology and psychology have already put a bigger focus on studying narratives than the discipline of economics has; a situation which, as some economists argue, should change (Shiller, 2017; Wydick, 2015).

Within economics, few studies exist that study the ability of narratives to influence and initiate changes in economic conditions (Shiller, 2017; Akerlof and Snower, 2016; Akerlof and Shiller, 2015). Rodrick et al. (2003) use growth theory and combine it with country experiences to shed light on unsolved riddles in the economic growth literature through the lens of country narratives. Falk and Tirole (2016) model narratives to be held up as justifications for immoral behavior. Agents that behave unethically use narratives to exaggerate the cost of behaving ethically or downplay the externalities of behaving unethically or showing themselves as not pivotal in the context of morally questionable decisions. Glaeser (2005) models political actors as agents that propagate stories that are advantageous to themselves. These stories do not gain credibility from being true but from mere repetition. Pöder (2010) provides an innovative example of how analytical narratives can be constructed from historical studies to explain the provision of lighthouses in Estonia over time and changing incentives of public good provision. However, the quantitative study of the impact of narratives is still underrepresented. Generally, it is hard to determine how and when narratives impact decisions. Shiller (2017) suggests that textual analysis studies have great potential in studying effects of narratives quantitatively.

Recently, this approach became more feasible due to the onset of big data and the availability of better methods of automated natural language processing like LDA.

5.2.2 Textual Analysis Studies in (Experimental) Economics

Given recent methodological developments in the area of studying text as data in a quantitative way, textual analysis has been increasingly applied to economics research questions lately. Exemplarily, Kuziemko and Washington (2015) perform a quantitative analysis featuring text data from newspapers, to investigate how racial views of whites in the southern USA are responsible for a dramatic change in voting behavior of this group since the 1960s. Through the analysis of Congressional speeches from 1873 to 2009 with machine learning methods focusing on classification, Gentzkow et al. (2016) show that political partisanship increased immensely since the 1990s. Boudoukh et al. (2013) use textual analysis to infer the type and tone of news. They show that once this information is accounted for, changes in news that reveal changes in fundamentals show a significant association with stock price movements (see also Nyman et al. (2018)). Based on the computational analysis of economic and financial newspaper articles, Shapiro et al. (2018) create time series of sentiments from 1980 to 2015 and analyze their correlations with the business cycle. They find that their sentiment indices improve forecasting performance and are significantly related to consumer sentiments.[39]

Within experimental economics, the object of textual analysis was almost exclusively communication data. For this purpose, the experimenter typically hires assistants who code or categorize the communication that occurred between participants in an experiment. The coding scheme / a priori categories are usually previously developed by the experimenter for the study (Xiao and Houser, 2005; Brandts and Cooper, 2007; Cooper and Kagel, 2005). Xiao and Houser (2011) compare different methods of classifying communication methods in the context of a coordination game. These authors compare a coordination-game message classification procedure with classification according to a coding scheme developed by the investigators and author's self-classification. They find that the coordination game for communication classification to be superior to the other two forms, but also note that it is resource intensive in terms of money and time and is likely to reach capacity limits when the amount of messages

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[39] There are a few other recent studies that employ a similar strategy to a similar application: Tetlock (2007), Tetlock et al., 2008, Loughran and McDonald (2011), Heston and Sinha (2015), Fraiberger (2016) and Young and Soroka (2012).

becomes too large. Moellers et al. (2017) analyze how profit shares and efficiency varies in interactions between a monopolist and an oligopoly of downstream firms that compete when the possibility to communicate is altered. In this research, the authors let coders categorize the communication similar to Houser and Xiao (2011) and also mine the communication for keywords.

So far, studies in economics that used textual analysis have focused mostly on keyword retrieval or developed own content coding schemes. However, there is a further approach in quantitative textual analysis that is widely used in social sciences: counting words in texts from pre-specified lists (*dictionary method*). Within this method, the LIWC dictionary (Pennebaker et al., 2001) has received considerable attention. The LIWC dictionary stems from the field of psychology and was among other things previously used to detect motivations within texts (Schultheiss, 2013). Also, several studies within experimental economics have recently used the LIWC dictionary for quantitative textual analysis (Abatayo et al., 2018; Chen and Chen, 2011; Babin, 2016). Penczynski (2016) employs machine learning methods to show that human classification of experimental communication can be reliably replicated by machine learning methods. He points out that the adoption of his automated classification approach enables a fast and more objective classification of especially large-scale communication data at low costs.

5.2.3 LDA as a Textual Analysis Method in Economics

LDA is able to reveal underlying (latent) topics in unlabeled text data without receiving any structural information or evaluation criteria about the respective text data beforehand. LDA as a method should therefore enable many research endeavors that are of interest to economists. As an example, Hansen et al. (2017) study how transparency of central bank communication affects deliberation of monetary economists. The authors exploit data from a natural experiment and show that the release of minutes from meetings of central bankers has two effects: it disciplines the discussion but also leads to more conformity, with the latter effect dominating the former and hence an advantageous overall effect (in a similar vein, see Arango et al. (2017)). Thorsrud (2016) uses LDA for a nowcasting purpose. He uses LDA to infer latent topics from a business newspaper in order to nowcast quarterly GDP with these topics. Another application of LDA can be found in Budak et al. (2014) who study the effects of do-not-track policies on the Internet economy. They use LDA to tie retailers to specific market segments that they operate in and to link content providers into categories such as games, news,

automotive and many more. Nimark and Pitschner (2016) make use of LDA to categorize news articles into overarching topics. They find that in general, heterogeneity exists in the topics that different newspapers choose to report on, but that the topic selection becomes more homogeneous after major events and link this observation to a theoretical model. Finally, Bandiera et al. (2017) make use of LDA to map typical behaviors to distinct CEO management styles. They show that especially in low/middle income countries there exists a discrepancy between the management style of the CEO and the necessities of the firm she manages that leads to a productivity loss accounting for 13% of the productivity gap between low- and high-income countries. At present, I am not aware of any other study within experimental economics that previously used LDA.

5.3 Experimental Data and previous Results

This section follows from sections 2.3 and 2.4 of chapter 2 of this dissertation text. Its purpose is to introduce the data and previous results that the analysis of narratives in this chapter is based on. Below, it is provided in a shorter exposition such that readers only interested in this study can comprehend the exposition below.

The recollection of narratives was intended to activate different motivations depending on the treatment. It was argued in chapter 2 of this dissertation that the activation of different motivation systems is associated with clear hypothesized behavioral patterns in the public goods game. In particular, the *Care* (*Anger*) treatment was supposed to lead to increases in self-reported compassion (anger) motivation as well as behavior, beliefs, attentional foci and perceptions in the public goods game that were significantly more prosocial (antisocial) than under *Control*. Based on the data that was collected with this experiment, I can analyze first, which parts of narratives are related to subsequent motivational state changes that subjects report. Second, I can link behavior, beliefs, attention and perceptions from the public goods game to previously written narratives in the context of a controlled experimental setting. Since subjects wrote narratives under the identical set of treatments in both parts of the experiment, the "motivational states part" and the "public goods game part", this allows to compare whether components of narratives that predict motivational state changes also have predictive power for the dependent variables in the public goods game. This increases the robustness in terms of external validity of the insights about the role of narratives in influencing motivations and behavior. Furthermore, I can compare how different methods of analyzing narrative content compare in the context of these two parts.

5.3.1 The "Motivational States Part"

The experiment consists of two parts. In the „motivational states part" (henceforth ms-p), subjects first wrote down narratives based on own memories depending on their randomly assigned treatment. Subsequently, they rated the degree to which they felt a number of affect- and motivation-related adjectives described their current state.[40] Within each treatment, subjects had to write down with pen and paper two narratives whose ordering was random for each session. In the *Care* treatment, subjects wrote about memories when they helped someone and when they felt feelings of compassion and warmth for another person. Under *Anger*, subjects wrote about memories when they were frustrated and when they were insulted or harassed. In the *Control* condition, subjects wrote about what they did yesterday and about the course of a typical day in their lives. Subjects received a fixed compensation of €4.50 for writing down the narratives and indicating their motivational states afterwards which together took around 30 minutes. Subjects indicated how much they felt different motivational and affective states with pen and paper. In particular, subjects made marks on a continuous scale ranging from "not at all" on the one side to "very much" on the other, "to which degree they feel like one of the following motivations and emotions in this very moment".[41] Each subject rated themselves in this way for 22 adjectives. These adjectives comprised words related to anger motives (5 words), compassion motives (5), fear motives (5), achievement motives (5), as well as the two feelings happy and sad. A complete list of words can be obtained upon request and was developed to be maximally representative of the indicated motivations (Chierchia et al., 2018).[42] In order to mitigate experimenter demand effects that would lead to tautologous argumentation, several measures were employed. Apart from anger and compassion motive words, subjects also had to rate their affective states for fear and achievement words as well as words that express the concepts of happiness and sadness. This is a standard procedure in economics and psychology and obfuscates what the researchers is actually interested in. Moreover, the specific care and anger words were selected such that they are maximally representative of the target motivations but do not contain explicitly concepts that were used in the instructions like "helpful", "compassionate", or "angry". Finally, the

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[40] Please refer to chapter 2.3.2 of this manuscript for a detailed discussion of the hypotheses for the "motivational states" part.
[41] The rationale for choosing exactly these narrative topics is motivated by insights from motivation psychology and laid down in chapters 2.2.2.1, 2.2.2.2 and 2.3.1 of this manuscript.
[42] The procedure thus follows chapter 2.3.2 of this manuscript.

induction method in the ms-p needed to be validated in order to be justified to claim that the narrative recollection method successfully induces motives. I preferred to validate the method aside from the part in which economically relevant decisions were collected: the public goods game part. Therefore the word rating scales were only part of the ms-p.[43]

In total, 133 subjects[44] from Kiel University subject pool participated in the ms-p. Of these, 45 participated in *Control*, 41 in *Anger*, and 44 in the *Care* treatment. We compare the mean ratings of words that belong to either the compassion or anger motivational category between treatments. The *Care* treatment increases self-reported ratings of compassion words compared to *Control* at p = .005. The *Anger* treatment increases self-reported ratings on anger words compared to *Control* at p < .001.[45] We find that writing down narratives targeted at compassion (anger) increases self-reported motivational states of compassion (anger) significantly compared to the control condition.[46]

5.3.2 The „Public Goods Game Part"

The second part of this experiment is the „Public Goods Game Part" (henceforth pgg-p), which was carried out in different sessions and with different subjects than the ms-p. The pgg-p consisted of two sessions that were run back-to-back. A first session, in which subjects wrote down narratives which was identical to the respective task in the ms-p and a second, in which we collected response variables from the public goods game context. We recruited subjects separately for each session. See chapter A.1 for the procedure and instructions used for the experiment.

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[43] The colleague Chierchia who produced the lists of motivation specific words experimented with more implicit validation procedures that make use of these words based on Price et al., (1996). However, he could not replicate their findings. Therefore, I used the more explicit version of validating the narrative memory method by means of rating scales for different words.

[44] Three subjects were excluded due to a lack of proficiency in the German language.

[45] We used Somers' D, which is a variant of the ranksum test accounting for clustering at the subject level

[46] Please refer to chapter 2.3.2 and Table 1 for a more detailed exposure.
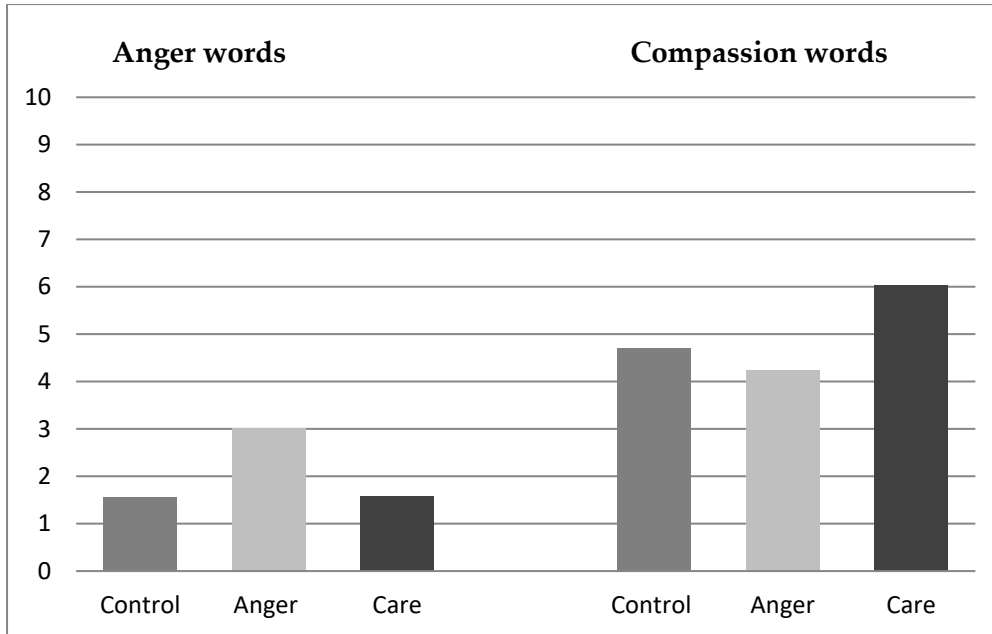
Figure 36 Results of "motivational states part"

The group size per public good was two subjects. During the experimental procedure, subjects learned at no point the identity of their other group member. The marginal per capita return (MPCR) was 0.75 for both subjects in a group. The initial private account (endowment) of each subject i was €10. From this endowment, they had to decide how much $x_i \in \{0, \dots, 10\}$ in whole Euro amounts to contribute to the public good. The monetary payoff for subject i was

$$\pi_i = 10 - x_i + 0.75 \times (x_i + x_j) \tag{5.1}$$

Where x_j is the contribution of $i's$ other group member j to the public good.

Subjects were exposed to example calculations and their comprehension of the public goods game was checked by means of comprehension questions to ensure that they understood the strategic incentives of the game. During this comprehension check, we report how much attention subjects devote to their own relative to their other group member's hypothetical payoff. Subsequently, the public good contribution decision was collected, followed by the statement what subjects believed was contributed by their other group member. After that, subjects stated their perception of whether the game exhibits strategic substitutes or

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complements and finally decided how much to contribute to the public good in a conditional way[47] which was elicited by means of the strategy method (Selten, 1967).[48]

The 184 subjects for this part came from the University of Kiel subject pool but it was made sure that they had not participated in the ms-p. 57 subjects participated in *Control*, 62 in the *Anger* treatment, and 65 in the *Care* treatment. The recruiting was carried out with the software hroot (Bock et al., 2014) and the experimental interface was programmed with z-Tree (Fischbacher, 2007). On average, subjects were paid €18.20 for their work in this part which took around 90 minutes.

The comprehension check revealed that 97 of the 184 subjects answered all comprehension questions correctly ("comprehension sample"). Strategies that subjects seek to realize are observable with least noise for those subjects that have a perfect understanding of the game's incentives. In the following, we will therefore report results for the full and the comprehension sample.[49]
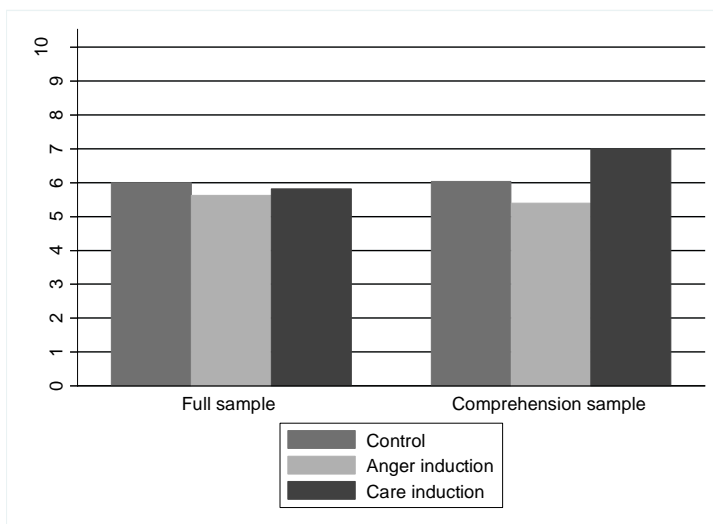
Figure 37 Average contributions

Figure 37 displays the mean contribution levels across the three treatments. In the full sample there are no significant differences. In the comprehension sample by contrast, average contributions are €6.03, €5.39, and €7.00 under *Control*, *Anger* and *Care* treatments, respectively. Contributions in the care induction treatment are significantly higher than in the

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[47] Please refer to chapter 2.3.3 of this manuscript for a detailed discussion of the hypotheses for the pgg-p.
[48] Details can be found in Appendix D.1.
[49] Please refer to chapter 2.4 of this manuscript for a more detailed exposure.

anger induction treatment at the p=.039 level according to a rank sum test. We find that for comprehending subjects, subjects under *Care* contribute significantly more than subjects under *Anger*, while *Control* subjects contribute between the two.

Figure 38 displays subject's attention to their own and other's hypothetical payoffs from the pre-game comprehension stage. The solid bars show the average number of views for subjects' own payoffs, while the outlined bars show the corresponding number of views for the other's payoff. In all treatments subjects pay more attention to their own payoffs. *Care* treatment subjects in the full sample view their own payoff significantly less often than those in the *Control* treatment (at $p=.089$ according to a rank sum test). No other differences are significant according to rank sum tests. Subjects under *Anger* pay the most attention to their partner's payoff, but there is a significant positive correlation ($\rho=.28$ in the full and $\rho=.33$ in the comprehension sample, both significant at 5%) between the difference in displayed payoffs for subjects in the anger induction treatment and subject's subsequent contributions, but not in either the control or care induction treatments. This indicates that different narrative topics lead to different attentional foci: Under Care, subjects show less self-focus, while subjects under Anger show more other-focus.
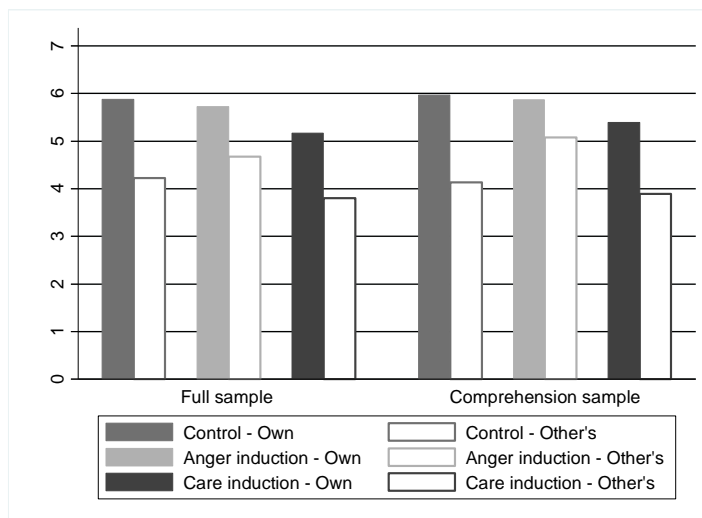
Figure 38 Average views of own and other's payoffs by treatment

Figure 39 displays the shares of subjects by treatment who think that the public goods game is more similar to a purely competitive (matching pennies) rather than a purely cooperative (pure coordination) game. The Anger treatment leads subjects the most often to consider the game to be more competitive than cooperative: 32% percent consider it to be more competitive in the full sample and also 32% in the comprehension sample. For the full sample, this difference is

significant (at $p=.02$) compared to *Control*. Writing narratives about Anger is associated with more competitive perceptions of game incentives.
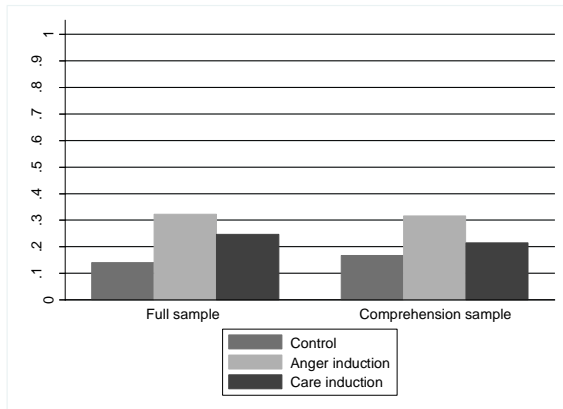
Figure 39 Percent of subjects perceiving the public goods game as a competitive setting
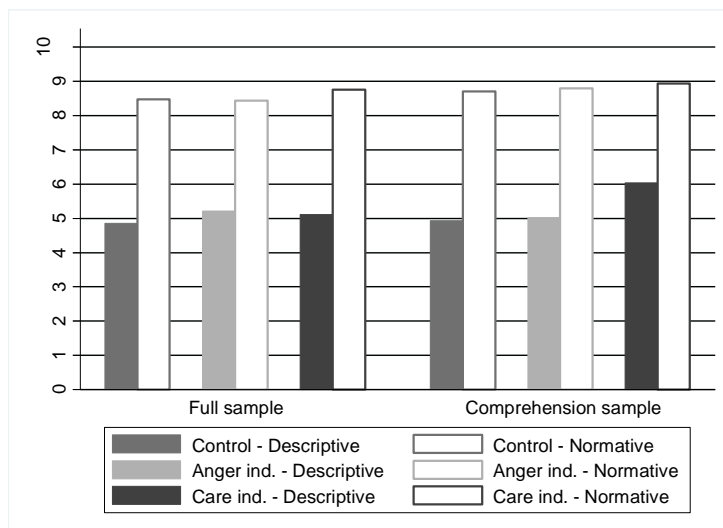
Figure 40 Beliefs about the actual contribution of subjects' partners (descriptive expectations, solid bars) and subject's perceptions of the normative contribution levels

Subjects' elicited descriptive and normative beliefs (Figure 40) do not significantly differ across treatments, irrespective of the considered sample. We find a trend that subjects under Care have higher beliefs and slightly higher normative expectations than other subjects especially in the comprehension sample.

Figure 41 presents subjects' contribution schedules as averages over all subjects within each treatment for all treatments. In the full sample on the left, contributions are slightly higher in the *Care* than in the *Control* treatment at all hypothesized partner contributions, while both lines show a similar slope. Subjects under *Anger* give slightly more than those in the other treatments when the other group member contributes little. At the same time, they give less at

higher contributions of their group member (i.e. the slope is shallower). In the comprehension sample, *Care* subjects give the most for all possible contributions of a partner, followed by *Control* subjects and then by *Anger* subjects. There are significant pairwise differences (at the 10% level) between *Care* and *Control* subjects at hypothetical partner contributions of €0, €6, €7, €8, €9 and €10 in the comprehension sample according to ranksum tests. Also, there is a significant difference between *Care* and *Anger* subjects in the full sample for a hypothetical partner contribution of €10 (at $p=.05$) and between the *Anger* and *Control* subjects in the full sample for a hypothetical partner contribution of €0 ($p=.09$). Subjects' conditional contribution schedules – a proxy for their preferences - differ significantly across treatments with *Care* schedules being higher than those from *Control* and *Anger*.
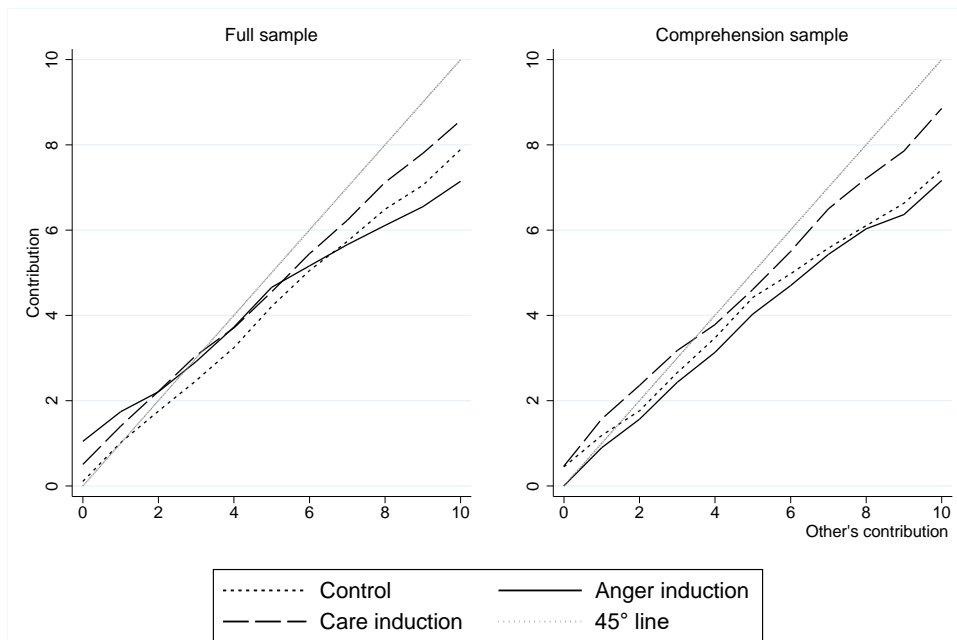
Figure 41 Conditional contribution schedules

Especially when we focus at the results for the full sample we only find partial evidence for the hypotheses of the study in chapter 2. This suggest that a deeper look into the narrative texts that subjects wrote is warranted. Which I will turn to for the remainder of this study.

5.4 Narrative analysis

5.4.1 Description of the Text Corpus

The narrative texts corpus consists of two narratives that each subject from the ms-p (133) and the pgg-p (184) wrote down.[50] The size of this corpus can be inferred from Table 18.

Table 18 Size of the narratives text corpus

	Total words	Average words per subject per narrative (2 per subject; standard deviation in parentheses)
Motivational states part (N = 133)	47274	177.7 (37.4)
Public goods game part (N = 184)	66135	179.7 (36.1)

5.4.2 Text Pre-processing

Before applying the dictionary and LDA methods to the corpus of narrative texts, the texts are pre-processed. This step increases the retrieval of meaningful information from both methods and ensures comparability between methods. In particular, all tokens in the corpus are converted to lower case. Subsequently, high-frequency words that are occurring regularly in any type of text, so called stop-words, are removed from the text[51] which is a standard procedure in natural language processing. Examples are "the", "to", "also", which bear little meaningful content and whose presence are not helpful in distinguishing different types of narratives based on their content. After this step, the corpus is tokenized[52] which means that any token that is not an alphabetical letter is removed from the texts. Finally, the words are reduced to their linguistic root, a process known as "stemming".[53] Exemplarily, the words "running" and "runs" both become "run" through stemming. Table 19 presents how these pre-processing steps have reduced the dimensionality in the data.

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[50] In contrast to chapter 2 of this document whose results are summarized under section 3.2.2 above, the results from the dictionary method, LDA and human rating analyses will be shown for the full sample of the pgg-p only.

[51] The German stopwords corpus from Python's Natural Language Toolkit (NLTK) is used for this step.

[52] NLTK's tokenize package was used for this.

[53] The SnowballStemmer from Python's NLTK package was used for this.

Table 19 Dimensionality reduction of data through pre-processing

Size of corpus before pre-processing (both parts)	Size of corpus after pre-processing (stop-word removal, tokenization)	Unique tokens after pre-processing (stemming)
113409 words	51880 tokens	22666 stems

5.4.3 Latent Dirichlet Allocation (LDA)

LDA (Blei et al., 2003) is a probabilistic, unsupervised statistical learning algorithm. Unsupervised means that neither is the information which narrative was written under which treatment fed to the algorithm, nor are other dependent variables from the experiment, pre-defined lists of words that supposedly belong to a topic, or some kind of training set used to give the algorithm prior information. LDA works on a quantitative representation of text data and uses the insight that the meaning of a document can be assessed by the words that the document uses. It is supposed to produce K meaningful topics from a collection of documents (corpus) and to represent each document in the corpus in terms of these topics. In the context of this study, a document is one narrative text and the corpus is the collection of all 634 narratives ((133 subjects + 184 subjects) × 2 narrartives per subject). A topic will be a set of words directed towards an identical underlying matter which needs to be interpreted by a human after it was found. In this study, the estimated topics can be interpreted in the light of the topics that subjects were supposed to write about according to the experimental instructions. Due to the specific experimental setting, this reduces the degrees of freedom researchers have in topic interpretation which makes my results more scientifically robust. LDA topics can be conceptualized as latent variables that give values how intensely a subject wrote about the LDA-estimated topics in her narratives. Words will be part of one topic with a certain probability. Single words can be parts of many topics with different probabilities. Therefore, LDA is a tool that can reduce the dimensionality of sparsely distributed variables such as count data of words that appear in a document considerably. The main motivation why LDA is used in the context of this experiment is that it results in a quantitative representation of the share of single topics within a narrative. These additional quantitative variables were originally absent, since we could only observe in which treatment a subject participated in the experiment. Therefore, the topic shares allow to infer how much a subject complied with the motive treatment induction in an approximative way which gives an additional perspective on

treatment effects of induced motives that manifest in the narratives. At the same time, this quantified topic content is based on topics that are identical between narratives from both parts of the experiment: ms-p and pgg-p which allows to investigate identical LDA topics stemming from identical instructions in the context of different outcome variables.

5.4.3.1 LDA Statistical Model and Statistical Learning Algorithm

The following introduces the LDA algorithm in a detailed, yet non-technical way.[54] LDA makes the following assumptions about the generative process behind each word / document. For each document, a vector with the dimensionality of the amount of topics that should be found is drawn from the Dirichlet distribution. This means that for each document m, a vector θ_m of dimension K (the amount of topics to be found) is drawn. For each document, θ_m gives the shares of each topic that a document comprises of. Initially, topics were drawn from the corpus, where a topic is itself a probability vector over all the unique words in the corpus (denoted β_{k_i}). Following this step, LDA generates each word in every document by assigning every word a topic according to θ_m. Once a topic was assigned to a word, this word is generated by this topic probability vector β_{k_i}.

Concrete example:

In order to fix ideas let's assume that I want the algorithm to find two latent topics (k_1 and k_2) for a document m_1. Initially, let's assume that topic k_1 contains word x with 50% and word y with 50%. Likewise, assume that topic k_2 contains x with 90% and y with 10%.

- θ_1 is assigned to m_1. Initially, θ_1 assigns m_1 to be 40% about topic 1 and 60% about topic 2; meaning that every word in the document is assigned with 40% probability topic 1 and with 60% probability topic 2.
- Word 1 in m_1 gets assigned k_1 according to θ_1.
- Word 1 is generated by k_1 to be y.

LDA assumes this generative model for the production of the corpus. Based on this, the algorithm finds topics that are likely to have produced the realization of the documents in the corpus. For this purpose, a statistical learning method is used that is called collapsed Gibbs sampling. This learning method first randomly assigns a topic to every word in the corpus.

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[54] Please refer to appendix section D.1 for a more technical description.

Note that this random assignment gives you an initial, topic representation of the documents in the corpus as well as word distributions that define the topics. However, they are a random first shot and need to be improved, which is what collapsed Gibbs sampling does. After the initial random assignment, it goes over each document and computes for every word in each document:

- The proportion of words in a document that are currently assigned to a certain topic: $p(topic = k|document = m)$.

- The proportion how often a certain word is assigned to k in the whole corpus: $p(word = w|topic = k)$.

- Word w is assigned a new topic where the probability that w is assigned to k is computed by $p(topic = k|document = m) * p(word = w|topic = k)$.

The last step is repeated often for every word in every document. After a cut-off value of repetitions that is set by the user, the word – topic assignments should have converged to a stationary state. Based on this outcome, the topic mixture of every document and the words associated to each topic is inferred. This informs about the share each topic occupies within a narrative. Moreover, one can infer the assignment of each word to a topic and its relative weight in this topic.

5.4.3.2 LDA Parameter Selection

Given the experimental design and the resulting corpus of narratives, the parameter calibration for K, the number of topics to be estimated, is straightforward. Across the treatments, subjects were specifically asked to write about six different narrative themes (*Control*: course of a typical day / what they did yesterday; *Anger*: situations that frustrated them / situations in which they were insulted; *Care*: situations in which they helped another person / situations in which they felt compassion for someone). The LDA algorithm was therefore instructed to estimate six topics in the corpus. This facilitates the subjective interpretation of the topics that LDA produced against the context of the experimental treatments. Furthermore, the latent topics that were found have a real representation and should actually be present in the text. The hyperparameter α gives a prior tuning possibility about the amount of topics you expect to be present in the documents of your corpus. If you expect that each document contains most of the topics, α should be set relatively higher. Similarly, a high β value expresses that most of the words from the whole corpus are likely to be a part of every topic. Expecting that only a

limited list of words is relevant for the different topics informs you to set β to a relatively lower value. As hyperparameter values, α was chosen to be $\frac{5}{K}$, K was set to 6 and β was 0.01. The chosen hyperparameter calibration is the default setting within the applied LDA model that was used to estimate topics[55]. These algorithm parameters can be seen to be rather large which allows for convergence of the word topic assignment with a high likelihood and is feasible given the present corpus as it is rather small. A burn-in period of the Gibbs sampling of 5000 iterations was carried out. Following this, a sample of the topic assignment for each of the words in the corpus is drawn every 50 iterations until a total of 5000 iterations have passed which results in a sample of 100 draws. Putting the hyperparameter calibration into the perspective of the underlying narrative text corpus, one can say that α has a relatively large value and β a moderately small value (compare for instance Griffiths and Steyvers, 2004), despite being the Mallet-LDA default settings. However, this serves the underlying corpus and a priori expectations well: Roughly one third of the narratives corpus consists of *Control* narratives. It is likely that all narratives to some degree will contain elements that could be assigned to the description of yesterday's or typical daily activities. On the other side, the relatively low β value attempts to increase the specificity of the estimated topics which supports the insight that certain words are associated with specific motives (Chierchia et al., 2017, mimeo).

5.4.3.3 LDA Empirical Design and Hypotheses

LDA and the statistical learning algorithm with collapsed Gibbs sampling was applied to all narratives from the ms-p and pgg-p using the calibration discussed above. For every narrative from both samples, this resulted in six figures, how much of topic k_i is present in narrative m_j. What constitutes a topic is however identical between narratives from both parts. Moreover, the six topics are each represented by a weighted list of words, where the respective weight that is mapped onto a word within a topic can be interpreted as the importance of this word within this topic. The topic share distributions of the two narratives that every subject wrote were averaged at the subject level.[56] For every subject, this gives six new variables that indicate

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[55] Mallet, the LDA implementation that was used comes from http://mallet.cs.umass.edu/index.php.
It is a statistical package that can estimate topics by means of LDA implemented in Java.
[56] Like in the dictionary method this is feasible since the treatment specific narrative themes were designed such that they activate the identical motivation system within a treatment.

how much he wrote in her narratives about the six LDA topics. This enables to use topic shares per subject within regression models which investigate outcome variables from both experimental parts. In particular, this allows to assess whether a topic has predictive power in explaining motivational state changes from the ms-p, but at the same time, whether this identical topic is relevant for explaining behavior, beliefs or perceptions in the pgg-p. The idea is that LDA finds topics that can be associated with either the *Care*, *Anger* or *Control* treatment. Therefore, a topic share at the individual level represents how much a subject complied with the typical narrative content[57] of a given treatment. If the narrative of a subject is relatively congruent with a single LDA topic then this means that her narrative contains the words of this one LDA topic to a large extent.

Hypothesis 1 – Topics that can be related to representing the *Care* treatment predict motivational state ratings of compassion motivation.

Hypothesis 1 expects that there are LDA topics that can credibly be associated with the *Care* treatment and that the closer a subject's narrative resembles this LDA topic, the higher compassion motivation he subsequently reports.

Hypothesis 2 – Topics that can be related to representing the *Anger* treatment predict motivational state ratings of anger motivation.

Analogous to the previous discussion, I hypothesize that the closer a subject's narrative represents LDA topics that are clearly attributable to the *Anger* treatment, the higher anger motivation he subsequently reveals.

In addition, I hypothesize that LDA topics are significantly associated with outcomes from the pgg-p. Given the mediocre full sample results of the treatment dummies on predicting behavior in the public goods game depicted in Table 20, this sheds light on whether a quantifiable (vs. dichotomous) treatment dimension by means of topic shares predicts behavior, beliefs, attention and perception in the public goods game. The reason for this is that only accounting for the treatment assignment ignores potentially important dimensions how narratives and which components of them influence behavior.

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[57] As measured by LDA.

Table 20 Full sample results of public goods game part

Dependent variable:	Public good contrib.	Belief about other's contrib.	Perception of the game (1 = competit.)	Attention to own payoff	Attention to other's payoff	Probability to be cond. con.
Model	F1	F2	F3	F4	F5	F6
Care treatment dummy	-0.18 (0.56)	0.25 (0.51)	0.69 (0.48)	-0.71 (0.53)	-0.43 (0.45)	0.37 (0.46)
Anger treatment dummy	-0.37 (0.56)	0.35 (0.52)	1.07** (0.47)	-0.15 (0.53)	0.45 (0.45)	-0.55 (0.41)
Constant	6.00*** (0.41)	4.86*** (0.37)	-1.81*** (0.38)	5.88*** (0.38)	4.23*** (0.33)	1.23* (0.32)
N	184	184	184	184	184	184
Regression	OLS	OLS	logit	OLS	OLS	Logit
R^2/ AIC	<0.01	<0.01	AIC: 202.76	0.01	0.02	AIC: 205.7

*** = $p < 0.01$; ** = $p < 0.05$; * = $p < 0.1$

By means of the weighted list of words that comprises a topic, this also helps to assess which concepts in particular are associated with changes in outcome variables. Based on insights from motivation psychology (Goetz et al., 2010; Lerner and Tiedens, 2006) I hypothesize the following.

Hypothesis 3 – Topics that can be related to the *Care* (*Anger*) treatment lead to more prosocial (antisocial) behavior, beliefs, perceptions and attentional patters in the public goods game.

5.4.3.4 LDA: Results and Discussion

Table 28 in the appendix gives an account of the top 25 words for each of the six LDA topics. Based on this list of words, the topics can be interpreted. To illustrate the LDA topics and their key words, I provide a visualization with word clouds. Here, the size of a word is approximately proportional to its probability in the topic. In order to increase accessibility of the word clouds, only the 20 - 25 words with the highest probability within each topic are shown. Figure 42 presents the word clouds.

- *Topic 1* prominently contain words about university examination situations, frustration, as well as work and money related terms. This topic fits well the narrative theme that subjects were instructed to write about situations in which they were frustrated. Apparently, it was common to associate frustration with examination situations at university which makes sense given the nature of the subject pool.

- *Topic 2* puts emphasis on words like insult and bad-mouth, angry, class, teacher and football. I interpret this topic to be about narratives that recall situations in which subjects were insulted and harassed. It appears that these situations occurred in school or while playing football and were emotionally loaded as the world "feels" indicates.

- *Topics 3 and 5* describe the activities that subjects did yesterday / their everyday routine, respectively. For differentiating these two topics, note that topic 3 ("yesterday") circles around activities with friends but is otherwise unspecific and sparse which mirrors that there is considerable heterogeneity in yesterday's activities. Topic 5 on the other side is clearly focused on university and additionally contains the words "morning", "noon" and "afternoon" as well as activities that are probably associated with these activities like "breakfast", "lecture" and "sports", terms that are absent in such prominence in topic 3.

- *Topic 4* can be interpreted to contain narratives that describe how the subject noticed someone that needed help and subsequently helped this person. It appears that these situations frequently occurred in the public like on the street or in public transport, involved elderly citizens and was followed by gratitude and feelings of joy.

- *Topic 6* centers around terms such as "friends", "child", "parents", "father" and "mother". It further contains words of closeness, tenderness and deep emotions such as "feeling", "conversation", "notice", "eye", "love", "fear", "sadness" and "happiness" [58]. I therefore interpret this topic to describe situations in which subjects narrated experiences of compassionate and empathic states directed towards family and friends.

In what follows, I associate topics 1 and 2 with the *Anger* treatment, topics 3 and 5 with the *Control* treatment and topics 4 and 6 with the *Care* treatment. Furthermore, I omit topics 3 and 5 in the following regression models for the reason that they represent the hold out category of the *Control* treatment.

Result 1: Topics that can be related to representing the Care treatment predict motivational state ratings of compassion motivation which gives support for hypothesis 1.

Model 21.1 in Table 21 confirms the significantly positive influence that the *Care* treatment has on subsequent ratings of compassion motivation. Model 21.2 shows that topics 4 and 6

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[58] The precise narrative theme that we associate with this LDA topic asked the subjects: "Please write down a personal memory of a situation in which you felt feelings of compassion and warmth for another person, as well as felt the motivation to improve this person's well-being."

have a significantly positive relationship with reported compassion motivation, albeit the estimated regression coefficient for topic 4 is larger. Note that this result holds for the whole sample of narratives from the ms-p and not only for narratives stemming from *Care*, which confirms expectations derived from motivation psychology. In Model 21.3, neither the coefficient estimates on the *Care* treatment dummy nor those for topics 4 and 6 indicate a significant relationship, while all three show a positive relationship with the compassionate motivational state.[59]

Table 21 Regression of compassionate motivational states on LDA topics

Dependent variable: Self-reported compassion motivation rating in ms-p			
Model	21.1	21.2	21.3
Care treatment dummy	1.22*** (0.44)	- (-)	0.04 (1.09)
Anger treatment dummy	-0.50 (0.45)	- (-)	-0.83 (1.12)
Topic 1: Frustration at uni / job	- (-)	-1.73 (1.49)	-0.46 (2.22)
Topic 2: Anger at school	- (-)	-1.59 (1.36)	0.27 (2.53)
Topic 4: Help others in public	- (-)	3.51** (1.52)	3.55 (2.30)
Topic 6: Empathy / compassion towards close ones	- (-)	2.72* (1.37)	2.24 (2.46)
Constant	4.65*** (0.31)	4.37*** (0.47)	1.67*** (0.52)
N	133	133	133
R^2	0.11	0.13	0.13

OLS; *** = $p < 0.01$; ** = $p < 0.05$; * = $p < 0.1$

Considering however the size of the coefficient estimates in model 21.3, it appears that especially topic 4 is responsible for the treatment effect of the *Care* treatment on self-reported compassion motivation in comparison to the treatment dummy itself.

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[59] A robustness check in the appendix that regresses the LDA topics from the models in Table 21, the word categories from Table 24 as well as the *Care* and *Anger* treatment dummies confirms the significance that topics 4 and 6 have on subsequent compassion ratings. Moreover, when LDA topics, treatment dummies and word categories are together in one model to predict compassion motivation, no variable shows a significant relationship with compassion motivation except topics 4 and 6.

Result 2: Topics that are associated with the Anger treatment influence subsequent motivational states of anger significantly. Hypothesis 2 is confirmed.

The results from model 22.2 in Table 22 indicate that the more subjects across treatments wrote about topic 1 or topic 2, the more anger motivation they reported.[60]

Table 22 Regression of angry motivational states on LDA topics in motivational states part

Dependent variable: Self-reported anger motivation rating in ms-p			
Model	22.1	22.2	22.3
Care treatment dummy	0.10 (0.38)	- (-)	0.85 (0.94)
Anger treatment dummy	1.43*** (0.38)	- (-)	1.44 (0.96)
Topic 1: Frustration at uni / job	- (-)	2.94** (1.29)	0.81 (1.91)
Topic 2: Anger at school	- (-)	3.08*** (1.17)	0.27 (2.18)
Topic 4: Help others in public	- (-)	0.20 (1.31)	-1.23 (1.98)
Topic 6: Empathy / compassion towards close ones	- (-)	-1.15 (1.19)	-2.32 (2.12)
Constant	1.50*** (0.27)	1.26*** (0.41)	1.67*** (0.52)
N	133	133	133
R^2	0.12	0.12	0.13

OLS; *** = $p < 0.01$; ** = $p < 0.05$; * = $p < 0.1$

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[60] A robustness check in the appendix that regresses the LDA topics from the models in Table 22, the word categories from Table 25 as well as the *Care* and *Anger* treatment dummies on anger motivation rating confirms that the *Anger* treatment dummy has a significant impact on anger ratings while the anger LDA topics do not. Topic 6 has a significant negative relationship with reported anger motivation, while the result for the anger word category to have a significant negative influence on anger ratings persists. Together with the previous footnote this suggests that compassion motivation ratings can be explained well by the respective LDA topics while this does not hold for anger motivation when control variables are present.

a) Topic 1: "Frustration at school"

b) Topic 2: "Insult and anger"

c) Topic 3: "Yesterday"

d) Topic 4: "Help (elderly in public)"

e) Topic 5: "Everyday routine"

f) Topic 6: „Compassion (towards friends

and family)"

Figure 42 Estimated LDA topics from corpus of pilot and experimental essays illustrated as word clouds

A similar picture to the one under model 21.3 emerges in model 22.3. Integrating the LDA topics and the treatment dummies into the same model in order to predict subjects' ratings of anger motivation leads to the findings that none of these variables shows a significant relationship with anger motivation. However, taking a closer look at the coefficient estimates under model 22.3 I see that compared to model 22.1 the size of the coefficient estimate on the *Anger* treatment dummy stays almost equal between the two models. On the other hand, comparing the coefficient estimates on the topic variables between models 22.2 and 22.3 shows that those for topics 1 and 2 decrease considerably. I take this as suggestive evidence that topics 1 and 2 represent certain dimensions of what constitutes the *Anger* treatment effect, but not all as the influence of the *Anger* treatment dummy stays relatively large even when these two topics are in the model. Note that the opposite insights emerge from Table 21, where it seems like topics 4 and 6 approximate the treatment effect of *Care* on self-reported compassion motivation well.

Result 3: Topic 4 which treats helping others, has a significantly positive influence on behavior and beliefs in the public goods game. Both topics that are associated with Anger *have an influence on outcomes (preferences, perceptions and attentional patterns) from the public goods game whose direction is as hypothesized. I find support for hypothesis 3.*

The presentation of the following results should be considered under the light of the insights from Table 20 above. Except for perception of the public goods game to be either a competitive or a cooperative game, where *Anger* leads subjects to perceive the game to be significantly more competitive, I find no significant influence of the treatments on the full sample of the pgg-p by means of regression analysis.[61] The LDA topics allow to expand this analysis into two further dimensions. First, the topic distributions over the narratives that a subject wrote, or topic shares, represent a quantitative variable as opposed to the treatment dummies that are binary. Second, LDA synthesized specific topics. According to results 1 and 2, *Care* gets split up into helping especially the elderly in public and situations of empathy and compassionate feelings towards friends and family. *Anger* is divided up into frustration with exam situations and insult / conflict in the school or at sports. This allows to relate behavior, beliefs and

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[61] This picture changes however, when we consider the comprehension sample.

perceptions in the public goods game to more specific topics, i.e. what subjects actually wrote about within treatments as synthesized by LDA. This enables to check the predictions stemming from motivation psychology against the actually realized narrative contents as synthesized by LDA.

Model 23.1 in Table 23 shows that there exists a significant relationship between the *Care* topic of helping others and contributions to the public good. Interestingly, the other topic that is related to the *Care* treatment, empathy towards close ones, has no significant and a directionally negative influence on contributions. Evidence from motivation psychology may rationalize this finding. While empathy is a necessary first step such that compassionate goals and action tendencies materialize, it crucially needs to be distinguished from compassion. Empathy means to feel with a person and share the same feelings of this person. Topic 6 prominently contains the words fear and sad among its most defining terms. Therefore, to the extent that subjects recalled narratives in which other persons were sad, this might have made them sad again too.

Table 23 Influence of LDA topics on outcome variables in the public goods game

Dependent variable:	Public good contrib.	Belief about other's contrib.	Perception of the game (1 = competit.)	Attention to own payoff	Attention to other's payoff	Probability to be cond. con.
Model	23.1	23.2	23.3	23.4	23.5	23.6
Topic 1: Frustration at uni / job	0.35	0.22	1.13	4.46**	1.01	0.75
	(2.12)	(1.94)	(1.57)	(1.98)	(1.72)	(1.61)
Topic 2: Anger at school	-0.22	1.94	2.85**	-2.86	0.37	-2.66**
	(1.87)	(1.71)	(1.36)	(1.75)	(1.52)	(1.34)
Topic 4: Help others in public	3.02*	2.80*	-0.29	0.56	0.32	0.97
	(1.74)	(1.60)	(1.44)	(1.64)	(1.42)	(1.41)
Topic 6: Empathy / compassion towards close ones	-1.76	-1.27	1.46	-2.35	-1.93	0.17
	(1.56)	(1.43)	(1.22)	(1.47)	(1.27)	(1.23)
Constant	5.64***	4.52***	-2.05***	5.73***	4.35***	1.22*
	(0.62)	(0.56)	(0.55)	(0.58)	(0.50)	(0.62)
N	184	184	184	184	184	184
Regression	OLS	OLS	logit	OLS	OLS	Logit
R^2 / AIC	0.02	0.03	AIC: 205.37	0.05	0.02	AIC: 210.01

OLS; *** = $p < 0.01$; ** = $p < 0.05$; * = $p < 0.1$

Compassion on the other hand is conceptualized as feeling for another person. You are interested in the well-being of the other and actively want to promote it which motivates prosocial action tendencies towards the other person (Klimecki and Singer, 2012). Therefore, narratives about helping might have reactivated the experience of being compassion motivated and of becoming active and doing something for others, while topic 6 might have led to empathic distress or sadness which previously was associated

with self-protective and avoidant choices (Batson et al., 1983). A very similar picture emerges for beliefs about the contribution of the other group member. Subjects that have a higher share of the helping topic in their narratives, have higher beliefs. No other topic is significantly associated with beliefs, and the sign on the coefficient estimate for topic 6 is again negative. Topic 2, anger at school / sports, displays a significant positive relationship with a competitive perception of the game form of the public goods game. This finding is supported by motivation psychological evidence. Smith and Lazarus (1990) find that anger leads subjects to perceive a situation as unjust. It was also argued that anger leads to a more selective perception towards a more hostile one (Finucane, 2011). High narrative shares of frustrating experiences significantly increase the subsequent attention to the own payoff. Van Kleef et al. (2008) summarize in a literature review that the anger motive leads subjects to pursue more competitive behavior, which potentially increasing their focus on their own payoff relative to the other's. Conditional contributors increase their contribution if they believe that the other group member does so as well (Fischbacher et al., 2001). As Van Lange et al. (2017) argue, this conditionally cooperative behavior relies on the belief of the strategy of the other group member and is therefore a genuine trust situation. Taking this into account, it was found by Dunn and Schweitzer (2005) that anger significantly decreases trust. This argumentation is supported by the evidence depicted in model J6. Topic 2 that is associated with *Anger* leads subjects significantly less often to adopt the strategy of conditional cooperation.

5.4.4 Dictionary Method

In the dictionary method, sometimes also called lexical or "bag of words" method, pre-defined dictionaries are used that map a word to a certain concept or group of words like "negative emotion" or "expressions related to cars". Applied to the present research this approach implies that every word within a narrative text is assigned to a certain category as indicated by the used dictionary. Subsequently, the narrative text can be represented as a frequency distribution over the word categories of the dictionary. The dictionary I use to check the marker word hypothesis is the German version of LIWC (Pennebaker et al., 2001; Wolf et al., 2008) which I augmented by seven motivation word categories. These seven motivation word categories are: achievement, affiliation,

anger, care, consumption seeking, fear and power.[62] The LIWC dictionary covers around 80% of the words that are used in everyday language, written or spoken and organizes these words within categories. Table 29 in appendix D.3 presents the category counts from the narrative texts.

I augmented the LIWC categories by motivation specific categories which were obtained as follows. Chierchia et al. (2018) conducted a semantic categorization task to investigate how subjects typically conceptualize the seven motives of achievement, affiliation, anger, care, consumption seeking, fear and power semantically. For every motive, the authors identified a list of words (21 on average) that significantly differentiated the motive from the six other motives.[63] Subsequently, for each motive category, this list of words was augmented by finding German synonyms for every word. To this end, I wrote a script that returned for every specific motivation word the synonyms that can be found in the Deutscher Wortschatz project of Leipzig University[64] which contains text corpora in German. The synonyms were added to the initial list of motivation words for each of the seven motivations respectively.[65] Following this, the original LIWC categories were appended by these seven new synthesized motivation word categories.[66] For every subject, category counts over her two narrative texts were added. This is feasible since narrative themes were treatment specific and designed such that a common behavioral response could be expected after having recalled the two narratives per treatment. Implicitly, this also reduces the width of the data point per subject considerably and can therefore be interpreted as a measure

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[62] All LIWC category and motivation category words were also stemmed before their counts in the narratives were assessed since tokens in the narratives were also stemmed.
[63] I wanted the motive category words to be maximally discriminative and typical for a motive, so I selected a significance level of below 5%. Put differently, the motive words I selected were exclusively associated with the target motive in Chierchia et al's study at the 95% confidence interval.
[64] http://wortschatz.uni-leipzig.de/de
[65] The complete lists of words can be obtained from the author upon request. On average, adding all synonyms for each word within a motivation category increased the size of these word categories by factor 25, which made them comparable in size to other LIWC categories.
[66] The original LIWC already contains categories that are relevant for identifying motivation words that I study. LIWC contains the sub-categories Anxiety, Anger and Achieve. Words from within these categories were merged with the three respective motivation word categories fear, anger and achievement.

to reduce dimensionality while preserving the original information.[67] Some category counts deviate substantially from a normal distribution, violating an assumption of OLS-regression analysis. Every category that did not appear in more than 50% of the subjects' narratives under a certain treatment was dichotomized. More info on this can be found under Table 29 in appendix D.3.

5.4.4.1 Marker Word Hypothesis

The underlying hypothesis that is tested in the narrative texts corpus by the LIWC-based dictionary method is the marker word hypothesis. It postulates that motives within a text can be assessed by identifying and counting so called "marker" words (Schultheiss, 2013). Put differently, does the appearance of certain motive specific words indicate the presence or absence of a motivational need? Traditionally, presence or absence of implicit motivation[68] in texts is evaluated by content coding of picture story exercises (PSE) (McClelland et al., 1989). This consists of subjects writing down imaginative narratives about a series of pictures that show stylized social situations. These narrative texts are subsequently analyzed by research assistants who use coding systems developed for this purpose to analyze the motivational intensity within the narrative. This process is resource intensive but still prevalent in current research. Several studies have suggested that human assessment of motivational needs that underlie a narrative can at least be approximated by taking the use of marker words into account (Pennebaker and King, 1999; Smith, 1968; Seidenstücker and Seidenstücker, 1974; Hogenraad, 2003, 2005).

5.4.4.2 Dictionary Method: Empirical Design and Hypotheses

The empirical strategy for the dictionary method seeks to find a regression model, i.e. a linear combination of relevant categories from the dictionary I consider, that

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[67] Also, the goal of the study is to analyze narratives that can be attributed to the same motive as I have specific hypotheses for this case.

[68] It should be noted that our design allows to test the marker word hypothesis rather in its explicit dimension as subjects are asked to recall specific memories from their own lives and subsequently rate their motivational state on a scale. Albeit, the data from the pgg-p allow also insights into more implicit motivational expressions.

consistently explains two different groups of dependent variables across treatments.[69] For one, I am looking for a combination of dictionary categories that predicts across all treatments self-reported ratings of compassion / anger motivation, the dependent variable from the ms-p. In a second step, I use this model that I validated on self-reported motivational ratings to also explain findings about behavior, beliefs and perception in the pgg-p. In terms of model selection, I rely on previous insights obtained from Schultheiss (2013) and Chierchia et al. (2018). The latter find that at the semantic level, compassion (care) and affiliation are closely related.[70] Based on this finding, I use the analysis of Schultheiss (2013) to select the relevant dictionary categories to predict self-reported ratings of compassion motivation (the compassion model) in the "motivational states part". Specifically, I use the LIWC dictionary categories that Schultheiss found to predict the affiliation motivation as variables to be informative about subjects' motivational states of compassion. This list of predictors was further augmented by the motivation word categories of care and affiliation which I hypothesize have an impact on compassionate motivational states if the marker word hypothesis is true.[71]

Hypothesis 4 –Predominantly, the use of care words predicts self-reported motivational ratings of compassion motivation. Word categories that are related to compassion motivation are also relevant for predicting compassionate motivational states.

A similar approach was used for the variable selection of the model that predicts self-reported anger ratings (the anger model) from the ms-p. First, it was found by Chierchia

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[69] Initially, we investigate whether specific categories of motivation words are sensitive to experimental arousal. To this end, we investigated differences in the use of specific groups of motivational words between narrative treatments. For the ms-p and the pgg-p, rank sum tests show that *Care* leads to significantly more care words than *Control* (at 1% significance level). A similar, yet more nuanced result emerges for the use of anger motivation words between treatments. Refer to appendix section C.2 for details.

[70] Both revolve around the common theme of communion (see also: Abele et al., 2008). This closeness of compassion and affiliation is further supported by means of principal component analysis that demonstrated an overlap in the factor loadings of care and affiliation words as well as an almost equal positioning in terms of valence and arousal (Chierchia et al. 2018).

[71] In particular, I used the variables from Table 4 of Schultheiss (2013) and augmented them by the motivation word categories of care and affiliation.

et al. (2018) that power and anger motivation are semantically close to one another.[72] Therefore, I use the insights from Schultheiss (2013) about word categories that predict power motivation for the selection of the anger model and augment this by the anger motivation word category from my augmented dictionary. In addition, the compassion and anger models will also contain *Care* and *Anger* treatment dummies as a robustness check.

Hypothesis 5 - Predominantly, the use of anger words predicts self-reported motivational ratings of anger motivation. Word categories related to anger motivation are also relevant for predicting angry motivational states.

Subsequently, the explanatory variables from the compassion model and those from the anger model are combined to predict behavior, beliefs and perceptions in the public goods game. This procedure allows insights whether models that were tested on self-reported motivational state changes may also have the ability to predict response variables from the pgg-p. This outlined empirical design probes the marker word hypothesis with a focus on generalizability: a) Does the presence of specific marker words regardless of the narrative treatment predict motivational state changes? b) If so, do these predicting word categories also predict responses in a controlled laboratory public goods game experiment?

Hypothesis 6 – The marker word regression model will significantly predict behavioral response variables from the public goods game. Dictionary categories related to care predict prosocial behavior in the game while those related to anger predict antisocial behavior.

5.4.4.3 Dictionary Method: Results and Discussion

Result 4: Care marker words are not linked up to motivational state ratings of compassion. Also, word categories related to care words have no systematic influence on compassion motivation. I find no evidence for hypothesis 4.

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[72] This manifests in a very similar valence of the two motivations as well as similar factor loadings as obtained from the principal component analysis that Chierchia et al. conducted on words that are specific to these two motivations. The two motivations also trigger similar behavioral responses.

Table 24 contains three regression models that regress the self-reported compassion motivation after subjects wrote narratives across all three treatments on a list of variables. These variables follow from the empirical strategy outlined above and depending on the model comprise of the treatment dummies, care motivation and affiliation motivation word categories as well as categories related to these motivations as indicated by Schultheiss (2013). Model 24.1 demonstrates that treatment assignment to *Care* in the ms-p has a significantly positive influence on subsequent states of compassion motivation. Leaving the treatment dummies aside, model 24.2 indicates that while the influence of the use of care and affiliation motivation words in narratives has a positive influence on subsequent compassion motivation, this influence is not significant. Interestingly, the more subjects wrote about communication that lower compassionate states they reported afterwards. Model 24.3 however reveals that when you integrate the variables from models 24.1 and 24.2 into one model, the *Care* treatment dummy coefficient estimate loses its significance. This can be interpreted that the variables from model 24.2 contain explanatory power that was attributed to the treatment dummy in model 24.1 which indicates that taken the selected dictionary word categories together, they possess some explanatory power for predicting compassionate motivational states.

Result 5: The anger word category has significant explanatory power in predicting anger motivation, which supports hypothesis 5.

Table 24 Influence of word categories on compassionate motivational states

Dependent variable: Self-reported compassion motivation rating in ms-p			
Model	24.1	24.2	24.3
Care treatment dummy	1.22*** (0.44)	- (-)	1.07 (0.70)
Anger treatment dummy	-0.50 (0.45)	- (-)	-0.60 (0.60)
"Other reference"	- (-)	0.14 (0.11)	0.07 (0.11)
"Positive emotion"	- (-)	0.05 (0.03)	0.05 (0.03)
"Care"	- (-)	0.07 (0.09)	0.03 (0.09)
"Affiliation"	- (-)	0.47 (0.40)	0.65 (0.40)
"Tentative"	- (-)	-0.13 (0.10)	-0.12 (0.10)
"Communication"	- (-)	-0.09* (0.05)	-0.05 (0.06)
"Friends"	- (-)	-0.07 (0.08)	-0.11 (0.08)
"Family"	- (-)	0.06 (0.09)	-0.04 (0.09)
"Humans"	- (-)	0.63 (0.45)	0.36 (0.53)
Constant	4.65*** (0.31)	4.25*** (0.55)	4.49*** (0.56)
N	133	133	133
R^2	0.11	0.11	0.17

OLS; *** = $p < 0.01$; ** = $p < 0.05$; * = $p < 0.1$

A clearer picture becomes evident for the motivational state of anger as the dependent variable. Table 25 depicts three regression models that regress either the treatment dummies, the word categories relevant for anger motivation or the combination between the two onto angry motivational states. It can be inferred from model 25.1 that participation in *Anger* has a strong positive influence on subsequently reported anger motivation.

Table 25 Influence of word categories on angry motivational states

Dependent variable: Self-reported anger motivation rating in ms-p			
Model	25.1	25.2	25.3
Care treatment dummy	0.10 (0.38)	- (-)	0.39 (0.42)
Anger treatment dummy	1.43*** (0.38)	- (-)	1.38*** (0.41)
"Power"	- (-)	0.09 (0.06)	0.04 (0.06)
"Anger"	- (-)	0.14** (0.06)	0.12* (0.07)
"Tentative"	- (-)	-0.11 (0.09)	-0.12 (0.09)
Constant	1.50*** (0.27)	1.20*** (0.38)	1.04** (0.41)
N	133	133	133
R^2	0.12	0.07	0.15

OLS; *** = $p < 0.01$; ** = $p < 0.05$; * = $p < 0.1$

The significance on the coefficient estimate on the anger motivation words category in model 25.2 presents evidence that as hypothesized, the more anger words a subject uses within a narrative the higher are the states of anger motivation that he subsequently reports. Model 25.3 demonstrates that this result is robust to re-integrating the treatment dummies back into the regression model. This suggests that using anger words is not merely a substitute for having participated in the *Anger* treatment, but that the use of anger words leads to increased anger motivation also when used in other narratives.

Result 6: Neither the anger nor the care word category predicts behavior, beliefs or perception in the public goods game.

Table 26 investigates whether the combination from the variables under models 24.2 and 25.2 have an influence on dependent variables from the public goods game. I find that subjects that use words related to friends or tentative words like "maybe" give more to the public good. Especially the former result is in line with expectations that the motive to care for or affiliate with friends leads to higher contributions to the public good. The result on the friends category carries over to beliefs about contributions of the other group member in the public goods game. Writing more about friends in the narrative might also be related to expect others to also care for oneself. Furthermore,

two other sub-categories from the Social root category, the family and humans word categories are associated with significantly less attention to the own payoff from public good decisions. This result is not only intuitive, it mirrors again perceptional and attentional patterns that can be expected when the compassion motivation drives behavior towards supporting others (Crocker and Canevello, 2012). The use of words from the affiliation motivation word category predicts attention to other's payoff. Again, this is an intuitive result and rationalizable by insights from motivation psychology. Affiliation motivation describes the need to be liked or the feeling to belong (Heckhausen and Heckhausen, 2010). In a public goods game, the own actions influence the payoff of the other group member. Subjects motivated by affiliation may hope to be liked more by the other group member if they produced a higher payoff for this group member. Finally, the pgg-p revealed significant differences in conditionally cooperative behavior between treatments in the game (Fischbacher et al., 2001). Model 26.6 shows that there exists a significant relationship between the use of words that refer to others and the probability to be a conditional cooperator. Intuitively, a focus on other's behavior is necessary to be a conditional cooperator who pursues a strategy to provide towards a public good if others do so too. While models 26.1 – 26.6 yield some intuitive results, I also observe relations that are not intuitive like the results on tentative and communication in models 26.1 and 26.2. An evident reason lies in the dictionary method itself which does not account for context and ambiguous meanings of words. Furthermore, generalizability of the dictionary method likely presents another hurdle. Smith (1968) pointed out that when marker-word dictionaries are derived, they are usually validated for a limited and specific scope of application. They may function well with sources that they were produced from and potentially validated on, but lose validity when applied to new and different applications. This is relevant to my study as the LIWC and the motivation dictionaries from Chierchia et al. that I used were developed from different sources than the narrative experiment.

Table 26 Influence of word categories on outcome variables in the public goods game

Dependent variable:	Public good contrib.	Belief about other's contrib.	Perception of the game (1 = competit.)	Attention to own payoff	Attention to other's payoff	Probability to be cond. con.
Model	26.1	26.2	26.3	26.4	26.5	26.6
"Power"	0.09	0.08	-0.05	0.04	0.02	-0.01
	(0.09)	(0.08)	(0.07)	(0.09)	(0.07)	(0.07)
"Anger"	0.12	0.08	0.02	-0.08	-0.11	-0.07
	(0.10)	(0.09)	(0.08)	(0.10)	(0.08)	(0.08)
"Other reference"	0.06	0.06	0.16	0.10	0.11	0.30**
	(0.15)	(0.14)	(0.11)	(0.14)	(0.12)	(0.14)
"Positive emotion"	-0.05	-0.03	0.05	-0.03	-0.03	0.00
	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)	(0.03)
"Care"	-0.09	-0.09	-0.07	-0.01	-0.01	-0.04
	(0.11)	(0.10)	(0.09)	(0.10)	(0.09)	(0.09)
"Affiliation"	0.32	0.09	0.13	0.50	0.78*	0.19
	(0.50)	(0.46)	(0.39)	(0.47)	(0.40)	(0.40)
"Tentative"	0.24*	0.05	0.07	0.08	-0.07	-0.07
	(0.14)	(0.13)	(0.11)	(0.14)	(0.12)	(0.11)
"Communication"	-0.11	-0.14**	0.02	0.10	0.06	-0.02
	(0.07)	(0.06)	(0.05)	(0.07)	(0.06)	(0.05)
"Friends"	0.18*	0.19*	0.02	-0.05	0.13	0.02
	(0.10)	(0.10)	(0.08)	(0.10)	(0.08)	(0.08)
"Family"	0.03	-0.04	-0.06	-0.16**	-0.10	-0.01
	(0.08)	(0.07)	(0.07)	(0.08)	(0.06)	(0.07)
"Humans"	-0.07	0.84	0.42	-0.88*	-0.19	0.20
	(0.56)	(0.51)	(0.44)	(0.52)	(0.45)	(0.43)
Constant	5.35***	4.76***	-2.06***	6.05***	4.26***	1.22*
	(0.81)	(0.75)	(0.64)	(0.77)	(0.65)	(0.62)
N	184	184	184	184	184	184
Regression	OLS	OLS	logit	OLS	OLS	Logit
R^2/ AIC	0.06	0.06	AIC: 218.53	0.08	0.09	AIC: 220.31

*** = $p < 0.01$; ** = $p < 0.05$; * = $p < 0.1$

5.4.5 Human Coding of Motivation and Intensity

As outlined above, human coding represents the "gold standard" in quantifying narrative content in terms of accuracy and previous usage within economics. In my implementation of the human coding, two research assistants were provided with information about the two target motives compassion and anger. This information summarized the motives with respect to reactions, behavioral tendencies, thought patterns, appraisal tendencies, perception tendencies and accompanying emotions. Essentially, it was a condensed, yet accessible version of chapters 2.2.2.1 and 2.2.2.2 of this manuscript.[73] This information refrained from indicating to the RA's which parts of narratives were typical for a specific motive thus preserving an unsupervised element

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[73] Please find a translated version of this information in section E of the appendix.

of the human coding. After having studied the information, the two RA's independently rated every narrative of the pgg-p[74] along three dimensions. These are: *How compassion-motivated were behavior, perceptions and sentiments of the narrating person in the situation it described?*; *How anger-motivated were behavior, perceptions and sentiments of the narrating person in the situation it described?*; *How high was the intensity in the narrated situation for you / How much did the narrated situation touch you / changed something in you?* RA's had to indicate their rating on a scale from 0 ("Not at all") to 11 ("Absolutely"). I made no effort to mediate agreement between coders since I wanted the ratings to be as independent as possible such that any potential errors are uncorrelated. The RA's were completely unaware of the study's hypotheses as they were only presented with the narratives and had no information about the structure or instruction materials of the experiment. Notably, the research assistants were unaware of which narrative was written under which treatment since they were given the narratives in random order and without any other additional information than the narrative text. Like in the previous two parts I use averages at the subject level. This means that RA's coded narratives at the individual level, but that their ratings were averaged over the two narratives a subject wrote per treatment as well as over the two RA's. For every subject this resulted in three new variables that ranged from 0 to 11 and which described how compassion-motivated, anger-motivated and intense the content of a subject's narratives was. With these design choices I follow previous work by Brandts and Cooper (2007).

5.4.5.1 Human Coding of Motivation and Intensity: Empirical Design and Hypotheses

The human coding sought to meet a comparable goal like the dictionary method and LDA approaches. Narrative texts of each subject should be represented as a number of quantitative variables that are supposed to capture the degree of motivational intensity that the narratives contained. I hypothesize that human coders can assess the

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[74] Due to resource constraints this human coding section could only consider one part of the experiment for the narrative analysis. I think that it is interesting to compare the two computerized approaches with a human assessment of motivational intensity and focused on the more interesting behavioral part, the pgg-p before having to leave out the human coding analysis completely.

motivational content of a narrative due to their human interpretation skills of the meaning behind texts, as well as being able to empathize and putting themselves in the positions of the narrators. Therefore, I expect that human coders can assess how clear a motivation comes through in a narrative, thus adding a quantitative dimension how motivational content can be accounted for other than the binary treatment dummies. It is therefore insightful to account for a proxy of the research assistants' abilities to discriminate between different motivations and assess their intensities. For this purpose, I look at the mean human motivation ratings of narratives between treatments and compare whether motivation scores that RA's gave narratives from different treatments differ directionally:

Hypothesis 9 – Anger motivation ratings as assigned by the human coders are significantly higher in narrative texts from the *Anger* treatment than in narratives from *Control.*

Hypothesis 10 – Compassion motivation ratings as assigned by the human coders are significantly higher in narrative texts from the *Care* treatment than in narratives from *Control.*

If these two hypotheses are true, they jointly indicate with results 0.1 and 0.2 above that human coders can assess the degree of prevalence of a certain motivation within a subject that produced a narrative by assessing this narrative. It is then natural to link these assessments to behavior in the subsequently observed public goods game as follows:

Hypothesis 11 – Higher compassion motivation ratings as assessed by the human coders lead to more prosocial behavior, beliefs and perceptions in the public goods game, while higher anger motivation ratings analogously lead to more antisocial outcome variables. Higher motivational intensity leads to less social behavior, beliefs and perceptions.

I further hypothesize that higher intensity in a text leads to less social behavior, beliefs and perceptions. I conjecture that high intensity ratings as perceived by the RA's indicate a high arousal of the subject while writing up the narrative and therefore also while experiencing the original situation. Arousal describes a state of activeness in both mind and body that makes humans more vigilant. The degree of arousal can be scaled

from low to high. It was previously observed that typically, discrete emotivational[75] states are connected to specific levels of arousal. According to Schachter and Singer (1962) an emotivational state is determined by the physiological arousal and how this arousal is cognitively evaluated. Goetz et al. (2010) find that compassion-inducing stimuli lead to low levels of arousal while sadness, fear and distress-inducing stimuli are associated with high levels of arousal. At the same time sadness, fear and distress are related to avoidant, antisocial and self-protecting tendencies (Gu et al., 2010) which should influence subsequent behavior in the public goods game if the narratives elicited such states in the subjects. To the contrary, compassion motivation is characterized by approaching behavioral tendencies as well as the urge to help and care for another person but at the same time low levels of arousal. Furthermore, there is ample evidence that anger is usually accompanied by states of high arousal and is characterized by antisocial decisions (Lerner and Tiedens, 2006). Therefore, high levels of arousal are indicative of a motivational state that is related to antisocial tendencies.

5.4.5.2 Human Coding of Motivation and Intensity: Results and Discussion

Result 9: Human coders assign narratives written under Anger a significantly higher anger score than to narratives stemming from Control. Hypothesis 9 is supported.

As can be seen by the left of the three groups in Figure 43, the human anger coding of narratives from *Anger* were coded on average with a 2.9 while the RA's on average coded anger motivation in *Control* narratives with an average of 1. By means of a Wilcoxon-Mann-Whitney-Test, this difference is statistically significant at the 1% significance level.

Result 10: Human ratings of compassion motivation are the highest for narratives under Care. The difference compared to Control is statistically significant which presents evidence for hypothesis 10.

I find the result that narratives from *Care* are assigned a significantly higher (at the 1% level, Mann-Whitney-Test) compassion motivation rating than narratives from *Control*.

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[75] Anger was previously studied as a core emotion. However, emotions have a motivational dimension as they cause typical action tendencies. Roseman (2011) calls them therefore emotivations.
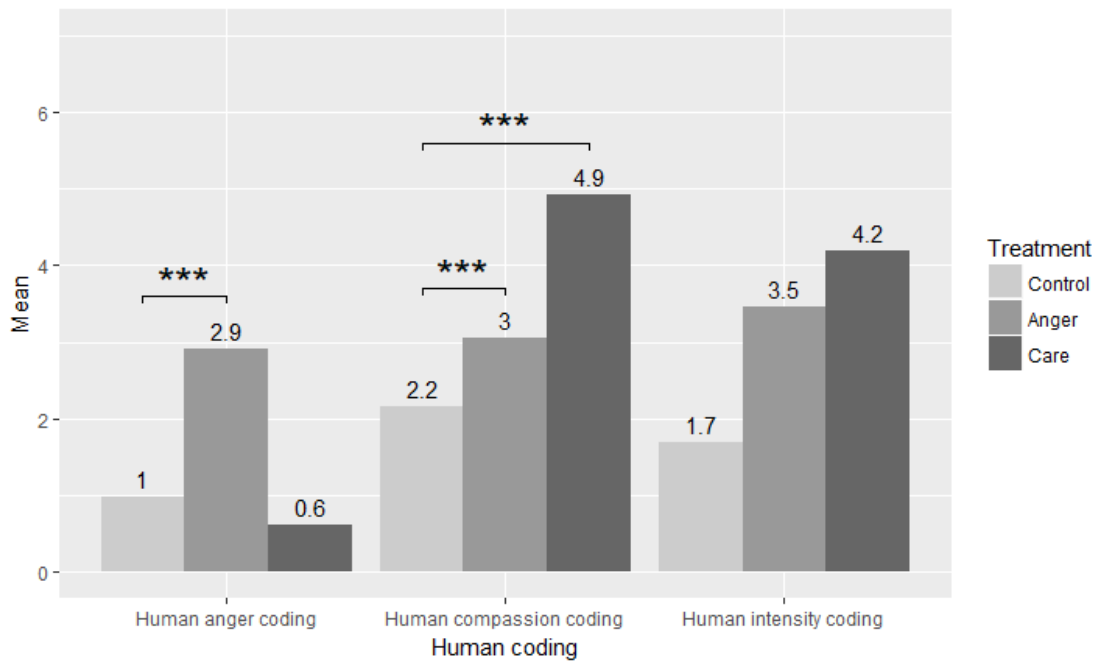
Figure 43 Ratings of motives in narratives from human coders

However, I find at the same time that narratives written under *Anger* are rated with a significantly higher compassion motivation rating than those from *Control* (also significant at the 1% level, Mann-Whitney-Test). While the result for human coding of anger motivation shows that research assistants perceive the degree of anger motivation in narratives stemming from *Care* as even lower compared to those from *Control*, a different picture emerges for the assessment of compassion motivation. Interestingly, the RA's assign narratives stemming from *Care* a higher mean intensity score than those from *Anger*. This is indicative of subjects under *Care* being more aroused than subjects under *Anger* which points towards subjects that wrote about sadness, fear and distress under *Care* as opposed to truly compassionate experiences.[76] Note that the differences between mean *Control* and *Anger* scores as well as between mean *Anger* and *Care* scores for human intensity coding are both statistically significant at the 1% level by means of a Mann-Whitney-Test. Recall also that RA's could rate narratives in the range of 0 – 11. The mean scores over the bars in Figure 43 show that no variable on average received a higher rating than 4.9. This can be seen as evidence that the

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[76] By means of analyzing Spearman correlation coefficients, I find that $r_{\text{human compassion, human intensity}}$ to be 0.74 and significant at the 1% level, while the correlation between human anger rating and intensity rating, $r_{\text{human anger, human intensity}}$ is 0.11 and not significant.

degree to which motivations and intensities were present in the text was not perceived as very pronounced by the RA's.

Result 11: Human ratings of Anger motivation predict antisocial behavior in the public goods game. No other hypothesized influence of human ratings on behavior, beliefs, attention and perception is detectable. Except for weak suggestive evidence for Anger*, hypothesis 11 is rejected.*

By using OLS regression specifications Table 27 shows six dependent variables from the public goods game and the influence that the human coding variables of motivation and intensity have in terms of explaining their variation. As can be seen, human assessment of intensity within narratives never has a significant influence on contributions in the public goods game. Strangely, human encoding of compassion motivation within narratives shows a positive influence on subjects' perceptions to judge the public goods game to be of competitive nature. This stands in contrast to the a priori expectation that *Care* leads subjects to perceive the game form to be significantly more often of a cooperative nature than subjects under *Anger* and *Control.* However, as already indicated by Figure 39, subjects under *Care* perceive the public goods game slightly more often to be competitive than subjects under *Control.* However, model 27.3 in Table 27 fails to replicate the finding that writing narratives under *Anger* increases the perception that the public goods game is a competitive game. This makes the finding on human care coding in model 27.3 questionable. Potentially, the finding could be rationalized for those *Care* subjects that actually wrote narratives featuring sadness, fear or empathic distress.

Table 27 Influence of human motivation coding on outcome variables in the public goods game

Dependent variable:	Public good contrib.	Belief about other's contrib.	Perception of the game (1 = competit.)	Attention to own payoff	Attention to other's payoff	Probability to be cond. con.
Model	27.1	27.2	27.3	27.4	27.5	27.6
Human Care	0.03	-0.11	0.40*	-0.02	0.09	-0.09
encoding	(0.26)	(0.24)	(0.21)	(0.25)	(0.21)	(0.20)
Human Anger	0.10	-0.05	0.27	0.22	0.28	-0.32*
encoding	(0.21)	(0.20)	(0.17)	(0.20)	(0.17)	(0.16)
Human motivational	-0.15	0.06	-0.28	-0.07	-0.17	0.21
intensity encoding	(0.28)	(0.26)	(0.23)	(0.27)	(0.23)	(0.23)
Constant	6.07***	5.32***	-2.09***	5.52***	4.04***	1.28***
	(0.64)	(0.59)	(0.54)	(0.61)	(0.52)	(0.49)
N	184	184	184	184	184	184
Regression	OLS	OLS	logit	OLS	OLS	Logit
R^2/ *AIC*	<0.01	<0.01	AIC: 205.72	0.01	0.02	AIC: 207

*** = $p < 0.01$; ** = $p < 0.05$; * = $p < 0.1$

As the evidence for Figure 41 shows, subjects under Anger are significantly less conditionally cooperative in contributing to a public good. This result is mirrored in the human coding of anger motivation in model 27.6 in Table 27. An increase in RAs' assessments of anger motivation within a narrative is associated with a significant decrease in the probability to be a conditional cooperator. While this might be driven by the raters' abilities to identify the *Anger* narratives, the anger motivation coding OLS coefficients in models 27.3 and 27.5 consistently demonstrate the positive influence that human anger coding has on the perception of the game and attention towards other's payoff respectively. It can therefore be summarized that human coding of motivation within narratives shows weak predictive ability in inferring behavior in the public goods game. While human coding of anger motivation shows a significant correlation with the probability to be a conditional contributor, confirming the previous result and intuition, the coefficient estimates for the human compassion motivation rating on dependent variables in the public goods game yields no meaningful results. Potentially, this is due to the content that the *Care* narratives contained which might have been partly driven by sadness, fear or empathic distress.

5 Robustness and Summary of Overall Results

So far, the effect of LDA topics, dictionary method words and human coding within narratives on motivational states and on the public goods game was considered in isolation. Section D.4 in appendix D provides robustness checks of the results from

section 4 above. Initially, I contrast the results of the dictionary method and LDA as well as treatment dummies on the ms-p with one another. This is achieved by adding the variables from these three parts into one regression model. This model either predicts compassionate or angry motivational states that subjects self-reported after having written down narratives in the ms-p. I continue to find that an increase in the presence of anger words from the dictionary robustly predicts motivational states of anger. Likewise, the positive influence of LDA topics 4 (help others in public) and 6 (empathy / compassion towards close ones) on compassionate motivational states remains robust after controlling for relevant dictionary word categories and treatment dummies. I further find that LDA topics 1's (frustration at uni / job) and 2's (anger / insult at school) positive impact on subsequent self-reported anger motivation ratings is robust to controlling for relevant word categories from the dictionary. However, the effect is not robust to including dictionary categories and treatment dummies. This indicates that by and large, the results on the ms-p are robust to controlling simultaneously for different factors that show an influence on self-reported motivational states.

Furthermore, the results from the pgg-p are subjected to a robustness analysis. Table 27 revealed that there is no strong or systematic relationship between how existent a motivation is perceived in a narrative by the human coders and the influence of this narrative on behavior in the public goods game. Since human motivation coding therefore yields no explanatory insights for behavior in the public goods game, I consider it only in so far in the robustness check that the only sensible result of the human coding will be reviewed.[77] Also, as Table 20 shows, treatment dummies give few insights on what drives behavior, beliefs and perceptions in the public goods game. Therefore, they are also not present in the robustness analysis. Accordingly, the robustness check for the results relevant for the public goods game contains the LDA

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[77] Table 34 in the appendix exposes the human coding result that an increase in human anger motivation coding is associated with a significant decrease in the likelihood to be a conditional cooperator to a robustness analysis. The analysis contains the human coding variables, LDA topic variables and dictionary word category variables and regresses them on dependent outcome variables in the public goods game.

topics and synthesized dictionary word categories in one regression model.[78] This procedure confirms that the "friends" word category has a positive and significant influence on contributions and beliefs in the public goods game. Moreover, when subjects use more words from the "family" and "humans" categories in their narratives, then this reduces the attentional focus of these subjects towards their own payoff. This dictionary method result does not survive the comparison with LDA topics within the same model. In terms of the robustness of other dictionary method results, I can confirm the robustness of the results on the "affiliation motivation" and "other references" word categories: The more affiliation words are used, the more attention to other's payoff; the more other references are used the higher was the likelihood to be a conditional cooperator. I can also confirm the stability of the result that LDA topic 4 (help others in public) has a positive and significant influence on contributions and beliefs in the public goods game. Likewise, the effect persists that a relatively larger share of topic 2 (anger / insult at school) leads to more competitive perceptions of the game form of the public goods game. On the one hand, I cannot confirm the positive impact of a more pronounced presence of topic 1 (frustration at uni / job) on attention towards the own payoff. On the other hand, topic 2 (anger / insult at school) continues to have a negative and significant effect on the likelihood to be a conditional cooperator. Finally, even when LDA topics and dictionary categories are present, an increased human anger encoding is reliably associated with a subject being less likely to be a conditional contributor.

6 Concluding Discussion

This paper provided a study of the causal effects of narratives on behavior and motivation through the lens of psychological motives. To this end, conditional and unconditional contributions, beliefs as well as perceptions and attentional patterns were collected within a controlled laboratory setting after subjects recalled personal narratives. The goal of this study was further to present three different approaches to textual analysis in experimental economics and compare their relative performances in the context of studying narratives. One of these approaches is LDA for which I

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[78] Table 34 offers the interested reader to observe robustness of previous LDA and dictionary method results when LDA topics, relevant dictionary categories and human motivation coding variables are all in one regression model.

demonstrated the usefulness for the quantitative analysis of text as data within experimental economics. The LDA method shows convergent validity as topics for which exist clear hypotheses from motivation psychology predict motivational states and at the same time behavioral and psychological responses in the public goods game. An analysis of the robustness of the findings shows that in particular, topic 4 ("help others in public") and topic 2 ("anger at school") have this convergent validity and are the main drivers behind the public goods game results. These results are consistent with insights from motivation psychology. Topic 4 clearly centers around helping actions and doing something for others. This stands in contrast to topic 6 ("empathy / compassion towards close ones") which is prominently defined by words like "sad", "tried", "conversation" and "fear", indicating the presence of empathic distress. Psychologists argue that there exists a decisive difference between empathy and compassion and that empathy can either lead to empathic distress or compassion (Singer and Klimecki, 2014; Klimecki and Singer, 2012). Empathy describes the capacity to share the feeling of others. Empathic distress is a self-protective reaction to suffering of others that can manifest in escaping the situation that causes empathic distress. Importantly, this empathic distress does not lead to the behavioral response of caring for and being prosocial to others. This is however the main behavioral response for states of compassion. Active compassion motivation is therefore hypothesized to lead to prosocial behavior in the public goods game and increased levels of self-reported prosocial or caring motivation. To the extent that topic 4 expresses compassionate content in narratives I find that recalling compassionate narratives leads to compassion motivation and prosocial behavior in a public good context.

I find evidence that LDA topics and word category frequencies are no substitutes to each other. Both anger related topics (1 and 2) as well as anger word category counts have a positive influence on anger motivation when one controls for the influence of the respective other across all treatments. The same holds for behavior in the public goods game. The robustness analysis reveals that LDA topics and word categories rather complement each other in predicting behavior in the public goods game.

The results further indicate that detecting the influence of marker words on motivation and behavior is more delicate than finding these influences with LDA topics. This is particularly true for compassion motivation which suggests a heterogeneity in detectability, inadequate selection of words for the compassion motivation word

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category, or a larger complexity of the compassion motivation compared to anger motivation. This insight stems from the result that I do not find a significant relationship between word categories supposedly related to compassion and motivational states of compassion as well as prosocial responses in the public goods game. Interestingly, the positive effect of *Care* on subsequent self-reported states of compassion motivation is mostly captured by the topics 4 and 6. This picture however reverses under *Anger*, where it is rather the treatment dummy that drives the effect on motivation rather than the two anger related topics. Given that the *Anger* treatment did lead to increases in anger motivation, I interpret this as suggesting that the actual topics that subjects wrote about under *Anger* are broad and could not be approximatively and exhaustively captured by the two LDA topics 1 and 2. Under *Care* however, the actual narrative content was likely to be more homogeneous and could therefore be represented in the two LDA topics 4 and 6.

Exemplarily, topic 6 also highlights limitations of the LDA method. Topics need to be subjectively filled with an identity and meaning which is not an unambiguous task. This is connected to the feature that individual words within LDA topics may appear prominently in different topics which makes a selective attribution of meaning difficult and increases degrees of freedom that researchers have in the interpretation of LDA topics and their implications. The present study overcomes these concerns partly due to the design and context of a controlled laboratory experiment in which subjects were asked to recall six particular narratives that were picked up by LDA and easily interpretable given the instructions of the experiment.

Human encoding of motivations within narratives is not clearly associated with predicting behavior in the game. However, the encoding through assistants gave insights about intensity of motivations in narratives. By means of the dictionary method I find that *Anger* leads to more use of words from the care category than *Control*. This finding is mirrored by the human assessment of motivation within narratives. It reveals that compassion motivation was found to be significantly higher in anger narratives than in control narratives. The presence of anger and compassion motivation as well as overall motivational intensity was rated as not very high. This is in line with previous analyses on narrative recollection method to induce emotional or motivational states: the method works to induce target states in the right direction but the effect is not particularly strong (Angie et al. 2011). While letting subjects recollect own narratives

has the advantage of featuring less potential for experimenter demand effects, this comes at the cost that control is lost about the content of the narratives. Through human encoding I found evidence that the general intensity within *Care* narratives was perceived higher as those in *Anger* narratives. This is suggestive of higher levels of arousal within subjects under *Care* which is not backed by psychological evidence about states of compassion that are associated with low physiological arousal (Goetz et al., 2010; Stellar et al., 2014). Not only for these reasons should future research attempt to investigate the causal influence of narratives that do not stem from the own biography and identity on behavior.

Digitalization and the evolution of the internet have led to an unprecedented increase in the amount of data being available for economic analyses. In particular, data from social media like users' posts and as well as texts that are put online or where digitized from sources like historic archives contain information that become newly available to economists (Gentzkow et al., 2017). The digital and often real-time availability of such data provides new opportunities to incorporate them into economists' quantitative empirical research targeted at studying narratives. Recent methodological developments have provided tools like LDA to quantify the information content of narratives with the help of statistical models. Much more research on the influence of narratives from parties such as companies, governments, think tanks and historical sources will therefore be conducted in the future as research methods advance and are taken up. This research should make use of latest developments in textual analysis methods. Exemplarily, part of speech and collocations recognition, tf-idf ranking and tone recognition are methodological catchwords in textual analysis that were not showcased in this study but show great promise for conducting textual analysis.

Research on narratives will yield insights on deliberation processes, feedback mechanisms between narrative exposure and behavior as well as storytelling and manipulations by pressure groups. Hopefully, this will lead to positive policy recommendations that take into account the influence of narratives. Building on insights from psychology, the present study attempted to analyze the motivational implications of narratives and how they manifest in behavior. Such "micro-level" narrative research could be applied to data that observes texts like diaries, private letters and therapists' therapy notes in combination with life decisions and events to study human deliberation processes in more depth. My study provided an exposition of the methods that can be

applied for such research endeavors and provided first insights into the weaknesses and strengths of these approaches.

APPENDIX D

D.1 LDA Statistical Model

Latent Dirichlet Allocation (LDA, Blei et al., 2003) is a generative statistical model that finds latent semantic topics in a set of documents (corpus) in an unsupervised way. Latent topics are found in the corpus by identifying groups of words which regularly appear together within documents.

Introduction of terminology and notation:

1. A token $t \in [1, \dots, V]$ is the smallest form of discrete data.
2. A document m is a sequence of N tokens denoted by $m = (t_1, t_2, \dots, t_N)$, where t_n is the nth token in m.
3. A corpus is a collection of M documents denoted by $\mathcal{M} = [m_1, m_2, \dots, m_M]$. $\mathcal{M}$ will be used as a term representing the corpus in the conditional parameter statements and learning algorithm below.
4. A topic $k \in [1, \dots, K]$ is a probability distribution over the vocabulary of V tokens.
5. α is a parameter of the Dirichlet distribution and a LDA hyperparameter. It gives a prior belief about topic sparsity/uniformity in the documents, i.e. does one document usually contain only a few or most of the topics.
6. β is a parameter of the Dirichlet distribution and a LDA hyperparameter. It gives a prior belief about token sparsity/uniformity in the topics, i.e. does one topic usually contain only a few or most of the words.

The model assumes the following data generating process. For each m in $\mathcal{M}$, a topic weight vector θ_m (modeled by a Dirichlet random variable α) of dimension K is drawn, that informs about which topics appear in m with which weight. Following this, each t in m is mapped onto exactly one topic according to θ_m. Now, each t in m is generated by using the topic it was mapped onto. This happens by drawing a token from the probability distribution over tokens of the assigned topic which is denoted by $\phi_{i,j}$. More formally:

For each m in $\mathcal{M}$:

1. Choose a K-dimensional topic weight vector θ_m from the distribution $p(\theta|\alpha) = Dirichlet(\alpha)$.

2. For each token indexed by $n \in [1, \dots, N]$ in a document m:

   (a) Choose a topic $k_j \in [1, \dots, K]$ from the multinomial distribution $p(k_j = k|\theta_m) = \theta_m^k$ resulting in $\theta_{n,m}^{k_j}$ the token topic assignment of token n in document m_m with topic k_j. $\boldsymbol{\theta}_m^k$ describes the current topic assignment for each of the V tokens in the corpus.

   (b) Given the chosen topic k_j, draw a token t_n from the probability distribution $p(t_n = i|k_j = j, \beta) = \phi_{i,j}$.

D.1.1 Learning

In order to fulfill the task of finding topic representations of each document and the tokens associated with each topic, posterior inference needs to be applied. For this, the above generative process needs to be reversed in order to learn the posterior distributions of the latent variables (topics, topic shares for each document) in the corpus. In LDA, this means solving the following equation:

$$p(\theta, \phi, \boldsymbol{\theta}_m^k | \mathcal{M}, \alpha, \beta) = \frac{p(\theta, \phi, \boldsymbol{\theta}_m^k, \mathcal{M} | \alpha, \beta)}{p(\mathcal{M}|\alpha, \beta)} \tag{D.1}$$

This equation is however impossible to be computed since $p(\mathcal{M}|\alpha, \beta)$ cannot be computed exactly. In order to infer k topics with the latent distributions θ and ϕ however, one can use approximative inference techniques such as collapsed Gibbs sampling. Gibbs sampling is one member of the Markov Chain Monte Carlo class of algorithms (Gilks et al., 1995). This algorithm aims to build a Markov chain that arrives at the distribution of the latent variables conditional on the corpus as its steady state. In our case, I am interested of the posterior distributions of the topic weight vectors θ_m, the topic-word distribution $\phi_{i,j}$ and the topic word assignment θ_m^k. Note that the conditional distributions of θ_m as well as $\phi_{i,j}$ can be calculated just from θ_m^k. The *collapsed* Gibbs sampler uses this insight to facilitate the algorithm and just sample over θ_m^k. To this end the sampler needs to calculate the probability that a topic k_j is

assigned to token t_n in document m given the mapping between all other tokens with topics in the entire corpus. Or, formally:

$$p(\theta_{n,m}^{k_j}|\boldsymbol{\theta}_{-n,m}^{k_j}, \boldsymbol{\mathcal{M}}, \alpha, \beta) \qquad (D.2)$$

where $\boldsymbol{\theta}_{-n,m}^{k_j}$ means all other current token – topic allocations except $\theta_{n,m}^{k_j}$. The complete derivation of the collapsed Gibbs sampling equation for LDA can be found in Carpenter (2010) or Heinrich (2008). These sources contain the solution to (A 2). Following Darling (2011) the sampling algorithm can be conceptualized as follows:

Input: $\boldsymbol{\mathcal{M}}$

Output: $\boldsymbol{\theta}_m^k$ and therefore implicitly counts how many tokens within a document can be attributed to which topic ($n_{m,k}$), counts how often a token was assigned to a topic ($n_{t,k}$) and counts how often topics appear in the corpus ($n_{k,\boldsymbol{\mathcal{M}}}$).

Start

Randomly assign a $\boldsymbol{\theta}_m^k$.

For i in # iterations do:

   For each t in $\boldsymbol{\mathcal{M}}$ do:

      Assign t to a k; due to this assignment in this iteration, change counters $n_{m,k}, n_{t,k}, n_{k,\boldsymbol{\mathcal{M}}}$

         For each topic in $k \in [0, ..., 1 - K]$:

         Compute new conditional probabilities that a token gets assigned a topic $p(\theta_m^k| \cdot) =$

         $(n_{m,k} \times \alpha)(\frac{n_{t,k}+\beta}{n_{k,\boldsymbol{\mathcal{M}}}+\beta \times \boldsymbol{\mathcal{M}}})$

         End

      Assign t a new topic by sampling from $p(\boldsymbol{\theta}_m^k| \cdot)$; due to this assignment in this iteration,

         change counters $n_{m,k}, n_{t,k}, n_{k,\boldsymbol{\mathcal{M}}}$

   End

End

Return $\boldsymbol{\theta_m^k}, n_{m,k}, n_{t,k}, n_{k,\mathcal{M}}$

End

D.2 LDA Topics

The lists of words are ordered in descending order: the first word in each cell in the right column has the highest probability in the topic.

Table 28 LDA topics

Topic 1: "Frustration at school / job"	klausur, studium, aufgab, fuehlt, entschied, kolleg, frag, pruefung, bekam, geld, not, praktikum, stellt, sem, arbeitet, frustriert, unternehm, studi, hausarbeit, lern, punkt, gelernt, trotz, mitarbeit, frustrier (~19%)
Topic 2: „Insult and anger"	mensch, klass, schul, leut, red, beleid, lehr, grupp, liess, erinn, beleidigt, schlimm, kopf, gehoert, versucht, nam, fussball, sass, wuetend, fuehlt, beschimpft, schwer, fing, verhalt, unterricht (~19%)
Topic 3: „Yesterday"	Freund, freundin, gegang, wohnung, gemeinsam, gegess, traf, gefahr, entspannt, aufgestand, fing, mued, aufgewacht, beschloss, anschluss, broetch, fuhr, wochen, ass, lust, haus, naeh, bier, getrunk, sass (~26%)
Topic 4: „Help (elderly in public)"	sah, stand, bus, fuhr, aelt, strass, fiel, hilf, dacht, schwer, schoen, auto, helf, bedankt, platz, hand, lief, bemerkt, fahr, dam, blick, bot, kiel, freut, wartet (~24%)
Topic 5: „Everyday routine"	uni, ess, haus, fruehstueck, vorles, fahr, bett, dusch, anschliess, steh, kaffe, weck, treff, schlaf, koch, mensa, freund, aufsteh, schau, bus, klingelt, nachricht, mittag, nachmittag, fahrrad (~33%)
Topic 6: „Compassion (towards friends and family)"	freundin, freund, gefuehl, vat, kind, wusst, elt, famili, leb, mutt, erzaehlt, schwest, versucht, gespraech, helf, haus, traurig, aug, merkt, wohnt, lieb, oma, schoen, angst, gluecklich (~25%)

D.3 Dictionary Method Results

D.3.1 Overall Word Category Counts

This table shows the LIWC and motivation word categories that were evaluated as well as the average count in these categories of narrative texts at the treatment level after text pre-processing.

Table 29 Word category counts

	Motivational States Part			Public goods game Part		
	Control	Anger	Care	Control	Anger	Care
"Pronoun"	1.13	1.76	2.98	0.93	2.34	2.43
	(1.1)	(1.39)	(2.17)	(1.19)	(1.62)	(1.6)
"I"	0.53	0.57	1.07	0.33	0.73	0.91
	(0.76)	(0.77)	(1.14)	(0.66)	(0.96)	(0.8)
„We"	0.11	0.24	0.17	0.14	0.16	0.2
	(0.38)	(0.53)	(0.53)	(0.35)	(0.45)	(0.47)
"Self"	0.64	0.81	1.24	0.47	0.89	1.11
	(0.77)	(0.99)	(1.16)	(0.78)	(0.98)	(0.94)
"You"	0.04	0.1	0.28	0.0	0.21	0.22
	(0.21)	(0.37)	(0.62)	(0.0)	(0.52)	(0.48)
"Other"	0.27	0.21	0.85	0.04	0.47	0.69
	(0.58)	(0.42)	(1.07)	(0.19)	(0.69)	(0.97)
"Mixed text components"	Control	Anger	Care	Control	Anger	Care
"Negate"	0.2	0.79	0.5	0.19	0.76	0.49
	(0.5)	(0.72)	(0.66)	(0.52)	(0.86)	(0.83)
"Assent"	0.51	0.95	0.57	0.12	1.6	0.52
	(0.73)	(1.13)	(0.72)	(0.33)	(1.46)	(0.81)
"Article"	0.38	0.31	0.2	0.37	0.42	0.37
	(0.58)	(0.56)	(0.45)	(0.67)	(0.59)	(0.65)
"Preps"	4.33	5.29	4.91	4.84	5.71	4.69
	(2.57)	(3.26)	(2.80)	(2.26)	(2.99)	(2.49)
"Numbers"	3.82	2.67	2.15	4.39	1.98	1.92
	(2.35)	(1.96)	(1.73)	(3.25)	(1.49)	(1.74)
"Affect"	14.0	18.81	18.17	12.86	18.18	16.68
	(6.0)	(7.44)	(7.19)	(5.13)	(6.09)	(5.29)
"Positive emotion"	10.58	10.4	11.52	9.86	10.45	10.92
	(4.76)	(4.63)	(5.24)	(4.54)	(4.56)	(4.24)
"Positive feeling"	0.56	0.71	1.76	0.65	0.71	1.66
	(0.76)	(1.02)	(1.48)	(0.92)	(0.84)	(1.63)
"Optimism"	1.62	2.02	1.87	1.46	1.82	2.0
	(1.61)	(1.57)	(1.60)	(1.35)	(1.56)	(1.9)

"Negative emotion"	3.42 (2.46)	8.43 (4.58)	6.72 (3.64)	3.11 (2.6)	7.77 (3.83)	5.82 (2.56)
"Sad"	1.47 (1.25)	2.02 (1.98)	2.8 (2.25)	1.33 (1.26)	1.85 (1.66)	2.74 (1.91)
"Cognitive mechanism"	10.51 (4.48)	17.86 (6.9)	15.61 (6.01)	11.02 (4.27)	17.06 (5.98)	14.75 (6.21)
"Cause"	1.47 (1.39)	2.52 (1.63)	1.89 (1.8)	1.49 (1.15)	3.02 (1.93)	1.82 (1.54)
"Insight"	4.8 (2.18)	6.81 (3.42)	6.85 (3.59)	4.89 (2.46)	5.92 (3.03)	6.05 (3.46)
"Discrepancy"	0.49 (0.76)	1.48 (1.29)	1.07 (1.22)	0.58 (0.94)	1.08 (1.15)	0.97 (1.02)
"Inhibition"	0.51 (0.87)	0.93 (1.2)	0.33 (0.56)	0.53 (0.87)	0.97 (1.14)	0.45 (0.73)
"Tentative"	1.53 (1.56)	2.52 (2.16)	2.8 (2.07)	1.46 (1.58)	2.27 (1.74)	2.45 (1.78)
"Certain"	1.82 (1.7)	4.24 (2.51)	3.17 (2.29)	2.25 (1.79)	4.35 (2.33)	3.77 (2.82)
"Social"	10.44 (4.62)	15.69 (6.57)	17.93 (6.48)	9.14 (4.51)	16.98 (6.37)	16.09 (6.43)
"Communication"	4.24 (2.39)	8.38 (4.02)	6.96 (3.97)	4.16 (2.33)	8.48 (3.87)	5.68 (3.17)
"Other reference"	0.49 (0.76)	1.0 (1.01)	1.61 (1.58)	0.47 (0.68)	1.24 (1.22)	1.37 (1.29)
"Friends"	4.11 (2.53)	2.36 (2.21)	3.07 (2.74)	3.16 (2.38)	2.08 (2.26)	2.65 (2.37)
"Family"	0.89 (1.25)	1.52 (1.76)	4.17 (2.95)	0.82 (1.82)	2.31 (2.83)	3.98 (3.76)
"Humans"	0.18 (0.49)	1.88 (2.35)	3.3 (2.13)	0.39 (1.08)	2.74 (2.53)	3.49 (2.74)
"Time"	21.71 (6.25)	13.93 (4.71)	15.09 (4.66)	23.65 (6.41)	14.85 (5.11)	14.52 (4.85)
"Past"	15.24 (4.43)	20.79 (7.51)	22.33 (7.23)	15.04 (4.16)	20.69 (6.6)	19.63 (5.6)
"Present"	30.18 (8.06)	19.31 (9.08)	18.11 (6.65)	27.61 (6.58)	16.68 (5.74)	16.45 (7.03)
"Future"	0.84 (0.95)	0.45 (0.55)	0.3 (0.63)	0.93 (0.96)	0.34 (0.57)	0.37 (0.57)
"Space"	5.44 (3.16)	5.62 (3.2)	6.54 (3.67)	5.6 (2.8)	6.27 (3.27)	6.23 (3.53)
"Up"	0.84 (1.07)	0.55 (0.71)	0.7 (0.76)	0.74 (0.72)	0.56 (0.88)	0.52 (0.75)
"Down"	0.13 (0.34)	0.21 (0.47)	0.28 (0.58)	0.16 (0.41)	0.29 (0.55)	0.22 (0.45)
"Incl"	1.16 (1.17)	0.86 (1.03)	1.52 (1.31)	1.19 (1.47)	1.24 (1.14)	0.89 (0.87)

"Excl"	0.67	1.38	1.52	0.77	2.26	1.25
	(0.74)	(1.55)	(1.5)	(0.95)	(1.81)	(1.23)
"Motion"	10.09	4.74	6.02	9.21	3.98	5.58
	(4.67)	(3.21)	(3.26)	(3.84)	(2.22)	(2.6)
"Occupation"	21.04	17.81	12.43	22.65	17.79	11.08
	(5.35)	(7.33)	(5.41)	(7.55)	(6.19)	(5.87)
"School"	8.51	7.29	3.65	10.07	7.24	3.71
	(3.78)	(4.95)	(3.0)	(4.55)	(4.53)	(3.97)
"Job"	7.64	6.33	4.28	7.75	6.79	3.78
	(4.16)	(4.07)	(3.1)	(3.96)	(3.78)	(2.62)
"Leisure activity"	12.38	4.74	4.96	11.11	4.5	4.26
	(4.46)	(3.58)	(2.95)	(4.71)	(3.89)	(2.87)
"Home"	7.87	1.64	3.24	7.18	1.53	2.82
	(3.18)	(1.86)	(2.5)	(3.38)	(2.04)	(2.3)
"Sports"	3.38	2.31	0.78	2.86	2.03	0.66
	(2.01)	(2.7)	(1.01)	(2.06)	(3.2)	(1.09)
"TV"	1.2	0.21	0.24	1.04	0.27	0.18
	(1.42)	(0.42)	(0.71)	(1.39)	(0.83)	(0.43)
"Music"	0.69	0.76	0.98	0.81	1.03	0.63
	(1.1)	(0.82)	(1.27)	(0.99)	(1.45)	(0.88)
"Money"	2.29	2.02	2.04	2.12	1.98	2.0
	(2.19)	(2.16)	(2.23)	(1.92)	(2.34)	(2.38)
"Metaphysical issues"	0.89	1.64	2.0	0.84	1.55	2.14
	(0.93)	(1.56)	(1.45)	(0.86)	(1.4)	(1.82)
"Relig"	0.62	1.33	1.02	0.53	0.94	1.05
	(0.78)	(1.52)	(1.16)	(0.76)	(1.1)	(1.35)
"Death"	0.27	0.31	1.02	0.32	0.65	1.2
	(0.54)	(0.64)	(1.22)	(0.51)	(0.93)	(1.44)
"Physical"	11.11	2.83	4.43	11.84	3.18	3.85
	(3.82)	(2.38)	(2.86)	(4.2)	(2.87)	(2.86)
"Body"	2.02	1.93	3.15	2.37	2.26	2.72
	(1.69)	(1.85)	(2.77)	(1.77)	(2.19)	(2.29)
"Sex"	0.2	0.24	0.52	0.21	0.29	0.38
	(0.5)	(0.58)	(0.81)	(0.45)	(0.69)	(0.84)
"Eat"	6.09	0.62	0.54	6.46	0.82	0.75
	(2.33)	(1.36)	(0.91)	(3.33)	(1.66)	(1.08)
"Sleep"	3.0	0.24	0.48	2.21	0.18	0.57
	(1.89)	(0.48)	(0.66)	(1.6)	(0.56)	(1.13)
"Grooming"	2.18	0.14	0.33	2.23	0.16	0.09
	(2.0)	(0.42)	(0.73)	(2.11)	(0.52)	(0.34)
"Motives and others"	Control	Anger	Care	Control	Anger	Care
"Swear"	0.11	0.88	0.22	0.04	0.71	0.22
	(0.32)	(1.25)	(0.55)	(0.19)	(1.15)	(0.62)
"Fillers"	0.04	0.0	0.02	0.02	0.03	0.02
	(0.21)	(0.0)	(0.15)	(0.13)	(0.18)	(0.12)

"Achievement"	10.09	8.69	8.15	9.51	9.18	6.85
	(4.13)	(3.26)	(3.74)	(3.97)	(3.56)	(3.11)
"Affiliation"	0.56	0.5	0.26	0.46	0.71	0.31
	(0.69)	(0.59)	(0.57)	(0.8)	(0.91)	(0.79)
"Anger"	4.22	4.88	2.52	4.02	4.48	2.26
	(2.45)	(2.87)	(1.86)	(2.39)	(2.48)	(1.57)
"Care"	2.4	3.14	4.33	2.61	3.98	4.45
	(1.7)	(2.27)	(2.56)	(2.13)	(1.93)	(2.77)
"Consumption"	1.22	1.5	1.07	1.39	1.23	1.09
	(1.62)	(1.49)	(1.02)	(1.16)	(1.3)	(1.23)
"Fear"	1.02	2.17	2.74	1.16	2.48	1.95
	(1.1)	(1.68)	(2.13)	(1.1)	(2.03)	(1.44)
"Power"	3.73	6.43	5.57	4.49	6.87	6.06
	(2.41)	(2.96)	(2.91)	(2.71)	(2.78)	(2.85)

Standard deviations in parentheses. In both parts the following categories were dichotomized: We, Negate, Assent, Article, Inhibition, Down, TV, Sex, Swear, Fillers, Affiliation. Note that this table shows mean category counts after pre-processing. This explains why the categories I, We, Self, You, Other, Negate, Assent and Article have so few counts: these categories consist of typical stopwords that were filtered out. In order to create more normally distributed variables, three new summary variables were produced. The variable PosEmo consists of the LIWC categories positive feeling, positive emotion and optimism. Likewise, the variable NegEmo sums up the categories negative emotion and sad. Finally, the variable Otherref contains the variables Other and Otherreference. Words from narratives and words from categories were tokenized and stemmed before the occurrences were counted.

D.3.2 Word Category Manipulation Results

Hypothesis C.2.1 –The *Care* treatment leads to the highest counts of care words per subject relative to narratives under *Anger* and *Control*.

Hypothesis C.2.2 –The *Anger* treatment leads to the highest counts of used anger words per subject compared to the *Care* and *Control* treatments.

Result C.2.1: The use of care words differs significantly between treatments and is significantly the highest in the narratives of the Care treatment. Hypothesis C.2.1 finds support.

Result C.2.2: The use of anger words differs significantly between treatments and is the highest in the narratives of the Anger treatment while it is significantly the lowest in the narratives of the Care treatment. Hypothesis C.2.2 is supported.

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Table 30 Motivation word category counts between treatments

Motives	"Motivational states part"			"Public goods game part"		
	Control	Anger	Care	Control	Anger	Care
"Achievement"	10.09	8.69	8.15	9.51	9.18	6.85
	(4.13)	(3.26)	(3.74)	(3.97)	(3.56)	(3.11)
"Affiliation"	0.56	0.5	0.26	0.46	0.71	0.31
	(0.69)	(0.59)	(0.57)	(0.8)	(0.91)	(0.79)
"Anger"	**4.22**	**4.88**	**2.52**	**4.02**	**4.48**	**2.26**
	(2.45)	**(2.87)**	**(1.86)**	**(2.39)**	**(2.48)**	**(1.57)**
"Care"	**2.4**	**3.14**	**4.33**	**2.61**	**3.98**	**4.45**
	(1.7)	**(2.27)**	**(2.56)**	**(2.13)**	**(1.93)**	**(2.77)**
"Consumption"	1.22	1.5	1.07	1.39	1.23	1.09
	(1.62)	(1.49)	(1.02)	(1.16)	(1.3)	(1.23)
"Fear"	1.02	2.17	2.74	1.16	2.48	1.95
	(1.1)	(1.68)	(2.13)	(1.1)	(2.03)	(1.44)
"Power"	**3.73**	**6.43**	**5.57**	**4.49**	**6.87**	**6.06**
	(2.41)	**(2.96)**	**(2.91)**	**(2.71)**	**(2.78)**	**(2.85)**

Mean counts of motivation category words by treatment and for both parts of the experiment (ms-p and pgg-p). Bold means significant differences at below 1% significance level between treatments as measured by KW test for both parts. For the pgg-p on the right side, all categories are significantly different from another as indicated by KW test except consumption category. This is potentially driven by larger sample size. For the ms-p and the pgg-p, *Anger* leads to the highest usage of anger motivation words, but not significantly so. What is however significant at the 1 % level is the reduction in the usage of anger words in *Care* narratives compared to *Control*. Writing about compassionate and helping memories reduces the usage of anger motivation words. As a side result, I also find evidence for a finding that was presented by Schultheiss (2013) which states that power and anger are positively associated. In both samples, *Anger* leads to significantly more use of power motivation words than *Control* (1% significance level).

D.4 Robustness Checks

Table 31 Robustness of results on compassion motivation in motivational states part

Dependent variable: Self-reported compassion motivation rating in ms-p		
Model	31.1	31.2
Care treatment dummy	-	-1.19
	(-)	(1.18)
Anger treatment dummy	-	-1.67
	(-)	(1.20)
Topic 1: Frustration at uni / job	-0.64	1.83
	(1.59)	(2.39)
Topic 2: Anger at school	-2.33	0.68
	(1.62)	(2.72)
Topic 4: Help others in public	4.86***	6.84***
	(1.78)	(2.49)
Topic 6: Empathy / compassion towards close ones	3.48*	5.03*
	(2.00)	(2.76)
"Other reference"	0.03	0.02
	(0.11)	(0.11)
"Positive emotion"	0.05	0.04
	(0.03)	(0.03)
"Care"	0.01	0.01
	(0.09)	(0.09)
"Affiliation"	0.56	0.51
	(0.38)	(0.39)
"Tentative"	-0.11	-0.11
	(0.10)	(0.10)
"Communication"	-0.06	-0.04
	(0.05)	(0.06)
"Friends"	-0.09	-0.06
	(0.08)	(0.09)
"Family"	-0.09	-0.08
	(0.10)	(0.10)
"Humans"	0.23	0.32
	(0.52)	(0.53)
Constant	3.94***	3.35***
	(0.69)	(0.82)
N	133	133
R^2	0.22	0.23

OLS; *** = $p < 0.01$; ** = $p < 0.05$; * = $p < 0.1$

Table 32 Robustness of results on anger motivation in motivational states part

Dependent variable: Self-reported anger motivation rating in ms-p		
Model	32.1	32.2
Care treatment dummy	-	1.99**
	(-)	(0.94)
Anger treatment dummy	-	2.05**
	(-)	(0.95)
Topic 1: Frustration at uni / job	2.70**	-0.24
	(1.33)	(1.93)
Topic 2: Anger at school	2.67**	-1.10
	(1.29)	(2.23)
Topic 4: Help others in public	0.52	-2.66
	(1.36)	(1.98)
Topic 6: Empathy / compassion towards close ones	-0.95	-4.32**
	(1.26)	(2.12)
"Power"	0.04	0.06
	(0.06)	(0.06)
"Anger"	0.12*	0.13*
	(0.07)	(0.07)
"Tentative"	-0.11	-0.13
	(0.09)	(0.08)
Constant	0.86*	1.53**
	(0.51)	(0.59)
N	133	133
R^2	0.15	0.18

OLS; *** = $p < 0.01$; ** = $p < 0.05$; * = $p < 0.1$

Table 33 Influence of LDA topics and word categories on variables in the pgg-p

Dependent variable:	Public good contrib.	Belief about other's contrib.	Perception of the game (1 = competit.)	Attention to own payoff	Attention to other's payoff	Probability to be cond. con.
Topic 1: Frustration at uni / job	1.99	3.16	1.81	3.64	1.46	-0.64
	(2.39)	(2.16)	(1.86)	(2.25)	(1.92)	(1.89)
Topic 2: Anger at school	0.34	3.90**	2.63**	-3.22	1.32	-3.93**
	(2.16)	(1.96)	(1.65)	(2.03)	(1.74)	(1.67)
Topic 4: Help others in public	3.73*	3.73*	-1.30	2.20	2.02	0.16
	(2.11)	(1.92)	(1.78)	(1.99)	(1.70)	(1.80)
Topic 6: Empathy / compassion towards close ones	-1.59	-0.86	1.36	-1.10	-2.35	-0.56
	(2.07)	(1.88)	(1.68)	(1.95)	(1.67)	(1.73)
"Power"	0.10	0.09	-0.07	0.01	0.02	0.04
	(0.09)	(0.08)	(0.08)	(0.09)	(0.07)	(0.07)
"Anger"	0.13	0.06	0.00	-0.04	-0.12*	-0.06
	(0.11)	(0.10)	(0.09)	(0.10)	(0.08)	(0.08)
"Other reference"	0.03	0.05	0.21*	0.04	0.09	0.31**
	(0.16)	(0.14)	(0.12)	(0.15)	(0.13)	(0.15)
"Positive emotion"	-0.04	-0.02	0.05	-0.01	-0.01	-0.01
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
"Care"	-0.10	-0.13	-0.11	0.01	-0.01	0.00
	(0.11)	(0.10)	(0.09)	(0.10)	(0.09)	(0.09)
"Affiliation"	0.30	-0.14	-0.07	0.26	0.37*	0.59*
	(0.28)	(0.25)	(0.22)	(0.26)	(0.22)	(0.31)
"Tentative"	0.21	0.05	0.05	0.10	-0.06	-0.11
	(0.15)	(0.13)	(0.12)	(0.14)	(0.12)	(0.12)
"Communication"	-0.13	-0.20***	-0.03	0.09	0.04	0.04
	(0.08)	(0.07)	(0.06)	(0.07)	(0.06)	(0.07)
"Friends"	0.27**	0.29***	0.05	0.00	0.21**	-0.03
	(0.11)	(0.10)	(0.09)	(0.11)	(0.09)	(0.09)
"Family"	0.04	0.01	-0.09	-0.12	-0.01	-0.06
	(0.10)	(0.09)	(0.08)	(0.09)	(0.08)	(0.08)
"Humans"	0.03	0.04	0.15*	-0.17	-0.09	0.09
	(0.12)	(0.11)	(0.09)	(0.11)	(0.09)	(0.10)
Constant	4.34***	3.79***	-2.25***	5.35***	3.73***	1.46*
	(0.96)	(0.87)	(0.82)	(0.90)	(0.77)	(0.76)
N	184	184	184	184	184	184
R²/ AIC	0.09	0.11	AIC: 217.34	0.11	0.11	218.75

OLS; *** = $p < 0.01$; ** = $p < 0.05$; * = $p < 0.1$

Table 34 Robustness check of results on outcome variables of the public goods game

Dependent variable:	Public good contrib.	Belief about other's contrib.	Perception of the game (1 = competit.)	Attention to own payoff	Attention to other's payoff	Probability to be cond. con.
Human Care encoding	-0.09	-0.22	0.33	0.06	0.03	-0.13
	(0.28)	(0.25)	(0.24)	(0.26)	(0.22)	(0.23)
Human Anger encoding	-0.02	-0.23	0.10	0.33	0.30	-0.39*
	(0.27)	(0.24)	(0.23)	(0.25)	(0.22)	(0.22)
Human motivational intensity encoding	-0.24	0.00	-0.36	0.05	0.01	0.25
	(0.31)	(0.28)	(0.26)	(0.29)	(0.25)	(0.25)
Topic 1: Frustration at uni / job	2.72	3.89*	2.45	2.47	0.46	-0.05
	(2.53)	(2.29)	(2.02)	(2.38)	(2.03)	(2.05)
Topic 2: Anger at school	0.70	4.80**	2.74	-4.60**	0.07	-2.81
	(2.35)	(2.13)	(1.82)	(2.21)	(1.89)	(1.80)
Topic 4: Help others in public	4.56*	4.16**	-1.31	2.20	2.16	-0.39
	(2.19)	(1.99)	(1.89)	(2.06)	(1.76)	(1.91)
Topic 6: Empathy / compassion towards close ones	-0.29	-0.31	1.75	-1.10	-2.14	-1.49
	(2.27)	(2.06)	(1.84)	(2.14)	(1.83)	(1.90)
"Power"	0.11	0.10	-0.08	0.00	0.01	0.05
	(0.09)	(0.08)	(0.08)	(0.09)	(0.07)	(0.08)
"Anger"	0.12	0.06	0.02	-0.07	-0.16*	-0.03
	(0.11)	(0.10)	(0.09)	(0.10)	(0.09)	(0.08)
"Other reference"	0.05	0.08	0.20*	0.02	0.07	0.33**
	(0.16)	(0.14)	(0.12)	(0.15)	(0.13)	(0.15)
"Positive emotion"	-0.04	-0.02	0.04	0.00	0.00	-0.02
	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
"Care"	-0.08	-0.11	-0.12	0.00	-0.02	0.01
	(0.11)	(0.10)	(0.09)	(0.10)	(0.09)	(0.09)
"Affiliation"	0.25	-0.15	-0.08	0.26	0.36*	0.60**
	(0.28)	(0.26)	(0.22)	(0.26)	(0.23)	(0.30)
"Tentative"	0.24	0.09	0.05	0.08	-0.07	-0.11
	(0.15)	(0.14)	(0.12)	(0.14)	(0.12)	(0.12)
"Communication"	-0.12	-0.19**	-0.04	0.09	0.03	0.04
	(0.08)	(0.07)	(0.06)	(0.07)	(0.06)	(0.07)
"Friends"	0.28**	0.32***	0.05	-0.02	0.20**	-0.01
	(0.11)	(0.10)	(0.09)	(0.11)	(0.09)	(0.09)
"Family"	0.03	0.02	-0.09	-0.15	-0.04	-0.03
	(0.10)	(0.09)	(0.09)	(0.10)	(0.08)	(0.09)
"Humans"	0.07	0.06	0.16*	-0.18	-0.09	0.07
	(0.12)	(0.11)	(0.09)	(0.11)	(0.10)	(0.10)
Constant	4.59***	4.07***	-2.47***	5.19***	3.63***	1.60**
	(0.99)	(0.90)	(0.87)	(0.93)	(0.80)	(0.79)
N	184	184	184	184	184	184
R2/ AIC	0.11	0.12	AIC: 220.55	0.12	0.12	220.66

OLS; *** = $p < 0.01$; ** = $p < 0.05$; * = $p < 0.1$

D.5 Translated Instructions for Human Coding

Compassion motivation

Persons motivated by compassion share with others without having an ulterior motive of expecting a favor in return. They care for the well-being of others and make decisions that benefit others; in particular when these others are close ones. Compassion motivation leads one to help others.

Compassion motivation is about intimacy, to look after someone and to shepherd someone, having empathy for a person and expressing this empathy through supporting behavior as well as being present for others. Compassion-motivated persons notice how needy of care others really appear to them. Compassion motivation is associated with positive emotions like warmth, love, affection, satisfaction, fulfillment, empathy, quiescence, choppiness and tender-heartedness.

Persons that are motivated by compassion are susceptible to signals of affection like for example a soft, soothing way of communicating, compassionate physical contact, laughing and smiling, or eye-contact. Moreover, they pay attention to the expression of the eyes. Also, there exists increased attention vis-à-vis needs of family members.

Compassion-motivated persons appear to others as warm, inartificial and caring. Furthermore, these persons tend to reveal themselves and to be trustful.

Anger motivation
Anger-motivated persons lean towards aggressive and risk-seeking behavior. At the same time, these persons are less cooperative and make decisions that do not take into account the well-being of others.

Persons with an active anger motivation feel negatively valenced emotions like anger, rage, or feelings of revenge and retaliation for the most part. In particular, these states manifest themselves if a person motivated by anger perceives her physical and psychological integrity as threatened. Causes for such a threat perception are transgressions of behavioral norms by others, own frustration and extreme physical conditions (hunger, coldness, injury). Under certain conditions, anger motivation can be associated with positive emotions like pride, power or self-esteem. Oftentimes under anger, heart rate and blood pressure increase.

Persons motivated by anger increasingly react to angry faces and outbursts of fury. Also, they show less refusal vis-à-vis immoral activities. Furthermore, persons under anger motivation realize less options for action within a situation. This results from the fact that anger-motivated persons can not consider new information differentiated, but process these through heuristical thinking in a fast and reactionist way.

Task
For all narratives in the folder, please indicate three assessments in numbers from 0 to 11:

1.) How compassion-motivated were behavior, perceptions and feelings of the narrating person in the described situation? (0-11)
2.) How anger-motivated were behavior, perceptions and feelings of the narrating person in the described situation? (0-11)
3.) How high was the intensity of the described situation for you / how much did the described situation touch you or change something in you? (0-11)

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Erklärung zum selbstständigen Verfassen der Arbeit

Ich erkläre hiermit, dass ich meine Doktorarbeit "Essays on Context-Dependent Preferences and on Choice Architecture" selbstständig und ohne fremde Hilfe angefertigt habe. Alle von anderen Autoren wörtlich übernommenen Stellen, wie auch die sich an die Gedanken anderer Autoren eng anlehnenden Ausführungen meiner Arbeit habe ich besonders gekennzeichnet und die Quellen habe ich nach den mir angegebenen Richtlinien zitiert.

Simon Bartke