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Does death make us all equal? Materialism and status-seeking under mortality salience

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Abstract

The thought of one's own death induces anxiety and threatens self-esteem. According to Terror Management Theory (TMT), to reduce this existential threat individuals (1) adhere more strongly to their cultural worldview, and (2) embrace behaviors aimed at boosting self-esteem. Previous psychological studies of TMT do not generally rely on incentive-compatible mechanisms. However, economic incentives are strong drivers of individuals' behavior, and needs to be studied along with intrinsic motivations. Here, we combined – for the first time – a real-effort task with psychological priming techniques. Crucially, we adopted a 'flat-wage' scheme to investigate whether individuals primed with death-related thoughts, i.e., a Mortality salience (MS) induction, increase their individual productivity more than individuals primed with a control topic (Music salience induction). We also investigated whether the effect of MS on performance is mainly driven by the quest for self-esteem vs. status-seeking, providing either private or public feedback on performance. Participants generally showed lower performance levels in the MS compared to the control condition. Public feedback bolstered performance, but its effect was milder under MS. These results suggest that in the absence of economic incentives to perform, individuals do not generally increase effort and productivity; they rather adhere more tightly to cultural (materialistic) worldviews, avoiding effort that is not compensated. The effect of MS, indeed, was strongly influenced by individual materialism.

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1 Introduction

As humans, we are aware that our life will come to an end, and we experience terror at the thought of our own death. According to Terror Management Theory (TMT), dating back to the work of Ernst Becker (1973), the fear of death has a unique effect on human mental life, inducing overwhelming anxiety and threatening self-esteem. According to Becker (1973), individuals attempt to reduce this existential insecurity by adhering more tightly to the cultural beliefs, values, and worldviews shared with their social group. For example, previous research has shown that after a Mortality salience (MS) induction (e.g., requiring individuals to focus on the thought of their own death), individuals exhibit more severe disapproval of violations of legal, social and cultural norms, a greater sense of social affiliation, ranging from social group identity to patriotic identification (Greenberg et al. 1997), and a more materialistic and greedier behavior (Kasser and Sheldon 2000). Although faith in shared cultural beliefs is an essential mean by which individuals secure protection from existential insecurity, it is not sufficient. Individuals also need to feel that they are significant contributors to their vision of a meaningful universe: they need to build and sustain self-esteem, showing they actually meet the standard of value prescribed by that worldview (Pyszczynski et al. 2015, Becker 2007). Thus, TMT predicts that under MS individuals would express stronger belief in their own cultural worldviews (e.g., focusing on material values), and also embrace behaviors associated with increased feelings of self-worth (e.g., high productivity). It has been noted, however, that contradictory worldviews at times coexist, for example with regard to the attitudes one should have towards money. For example, cultural norms encourage both generosity and the accumulation of material wealth, and the view that will prevail under MS will depend on the norms salient in a specific situation (Jonas and Greenberg 2013).

A substantial body of evidence supports TMT empirically, across a variety of measures, countries and demographic samples, showing that the thought of one's own death affects a wide range of human activities, including risk-taking, economic choice, creativity, close relationships, sexual attitudes, identification with groups, and prejudices (see Arndt et al. 2004a, Solomon et al. 2004, Solomon et al. 2004 for reviews). For example, previous psychological research has shown that MS has an important impact on individuals' economic choices, generally inducing purchase of symbolic luxury goods (see, for example, Arndt et al.2004b; Simon et al. 1997). Mandel and Heine (1999) had participants complete a fear of death scale or a control scale probing depressive thoughts, and then evaluate a series of advertisements featuring a Lexus automobile, a Rolex watch, a Geo-Metro automobile, and Pringles potato chips. Participants reminded of their own death rated the Lexus and Rolex more positively than control participants, whereas MS had no effect on the appeal of low-status objects. Kasser and Sheldon (2000) reminded participants of death or a control topic (i.e., listening to music) and then investigated their fiscal

expectations (e.g., their salary, the amount of money they expected to spend on luxury items) 15 years in the future. Participants' fiscal expectations were inflated following a MS induction relative to the 'listening to music' control induction.

Despite the increasing numbers of research on this topic in Psychology, the association between MS and economic behavior has not been fully investigated yet. The psychological motivation to preserve self-esteem under MS does not arguably act in isolation, but within a blend of multiple, interacting intrinsic and extrinsic motivations. Economic incentives are an example, and may interact with psychological instances. To what extent, for example, under MS individuals work harder to improve their self-esteem vs. gain more money? To what extent individuals desire luxury goods to affirm their self-worth or for their inherent economic value? The extant psychological studies on MS do not generally rely on incentive-compatible mechanisms (e.g., using cash to motivate the subjects), which are instead at the core of experimental research in economics. On the contrary, we believe that – in addition to self-esteem – economic incentives are strong drivers of individuals' behavior, and their contribution to behavior needs to be controlled for, and clearly distinguished from that of motivations of different nature.

The first aim of this study is to test one of the main predictions of TMT, i.e., whether MS increases effort and productivity as a mean to improve self-esteem, combining psychological priming techniques with an experimental economic setting. Priming refers to the activation of mental concepts through subtle situational cues (in our case, asking participants to think about their own death) to measure the psychological impact of primed concepts on subsequent tasks (see Cohn and Maréchal 2016). The experimental economic setting implies the adoption of an incentive-compatible mechanism. Importantly, we adopted a 'flat-wage' scheme, such that participants received a fixed amount of money to perform a real-effort task, regardless of their performance levels, and therefore had no economic incentive to perform (see also Charness et al. 2013, Falk and Ichino 2006, Mas and Moretti 2009). Participants performed the real effort task under two experimental conditions: after a MS induction (i.e., requiring them to focus on the thoughts and emotions felt at the thought of their own death) or after a Music salience induction (i.e., requiring them to focus on the thoughts and emotions felt at the thought of listening to music) (see Kasser and Sheldon, 2000 for a similar manipulation). Our aim is to test whether MS increases individuals' productivity, as predicted by TMT, even when there are no economic incentives to perform, and therefore individuals would be mainly driven by the quest for self-esteem.

An additional aim of this study is to tease apart the effect of MS on self-esteem and status-seeking. Self-esteem refers to a person's evaluation of, or attitude toward, him/herself (James, 1890). According to TMT, self-esteem serves as a buffer against existential threat, by endowing individuals with a sense of self-worth capable to counteract the annihilating awareness of their mortal nature (Pyszczynski et al., 2004). Self-esteem proves indeed capable to reduce distal defences to reminders of mortality

(Greenberg et al. 1992; Harmon-Jones et al. 1997). Several experimental studies have investigated the effect of performance feedback aimed at improving self-esteem on performance. Kuhnen and Tymula (2009), for example, showed that individuals' utility is affected by (private) information regarding their performance. Kosfeld and Neckermann (2011) found that awarding individuals with a congratulatory card for the best performance increased productivity by approximately 12% (see also Blanes i Vidal and Nossol 2011). Although self-esteem is by definition resultant from one's own assessment of the extent to which one meets cultural standards of value, validation coming from other people also plays an important role (Festinger 1954). Charness et al. (2013), indeed, found that individuals tend to make even more effort when they receive information on their rank publicly as compared to privately. Providing subjects with public (as opposed to private) feedback on their performance (e.g., their rank in a group), has an impact on social status, i.e., an individual's relative standing in a social group (Leary et al. 1995; see also Rustichini 2008). Status-seeking is another strong incentive to performance. Different from self-esteem, status entails some form of public recognition, and acts as a social signal of one's competence and value (Rustichini 2008; Charness et al. 2013). Falk and Ichino (2006) and Mas and Moretti (2009) observed an increase in productivity in workers who observed each other output. Azmat and Iriberri (2010) carried out a natural experiment in a Spanish school where, for one year, students were provided with information on whether they were performing above or below their classmates' average or the usual individual performance information. They found that providing public feedback information increased students' grades by approximately 5%. Azmat and Iriberri (2011) also found that providing subjects with relative performance feedback boosted their performance, and elicited feelings of dominance (see also Blanes i Vidal and Nossol 2011). Overall, these findings suggest that private feedback provides participants with incentives to perform even in the absence of economic incentives. However, public recognition constitutes an additional incentive to perform, having an impact on social status in addition to self-esteem. We predicted, therefore, that the effect of MS on productivity would be enhanced in a context where performance levels were made public, as this would increase status-seeking as a further mean to increase feelings of self-worth and contrast death-related thoughts.

The present study

We tested the effect of MS on performance in a real effort task using a 2 (type of priming) X 2 (type of feedback) between-subject design. Participants were allocated randomly to two priming conditions: the MS condition and the Music salience condition. In both conditions, they could receive either private feedback or public feedback on their performance. In all 4 treatments, subjects performed a real-effort task (i.e., a three-digit summation task). As anticipated, TMT predicts that under MS individuals would (1) express stronger belief in their own cultural worldviews (e.g., material values), and (2) embrace behaviors associated with increased feelings of self-worth (e.g., high productivity). Our main

hypothesis (H1) is that, in line with prediction #2 from TMT, participants would perform better in the MS compared to the Music salience condition. To rule out the effect of economic incentives, subjects were compensated with a fixed amount of money regardless of performance (a flat-wage scheme). This way, any increase in productivity under MS would arguably depend on individuals' quest for self-esteem (as opposed to economic incentives). Note that, economically speaking, under a flat-wage scheme, participants should not exert effort above the minimum (i.e. zero), because this is not compensated with cash. It is possible, therefore, that the effect of MS on productivity would be offset by the absence of economic incentives to perform induced by the flat-wage scheme. Under this scheme, therefore, it is possible that the main consequence of MS would be increased adherence to cultural worldviews (prediction #1 from TMT), as is the materialistic principle of least possible effort, leading to a relaxation -not an increase-of performance levels under MS (see Kasser and Sheldon 2000; Arndt et al. 2004b). We further anticipate, therefore, that the quest for self-esteem would be offset by the absence of economic incentives to perform in individuals high in trait materialism, who place disproportionate value in the acquisition/maintenance of material objects (Arndt et al. 2004), but apparent in individuals low in trait materialism, for which economic incentives are less salient. We additionally hypothesize (H2) that the effect of MS should be magnified when subjects are publicly informed about their ranking, as the drive to improve one's social status in addition to self-esteem should constitute an additional incentive to performance and a further way to improve feelings of self-worth.

2 Methods

2.1 Participants

The experiment was conducted in May 2013 at the LES Laboratory of the University of Bologna, and involved 126 students who were compensated for participation – on average – with 8.5 Euros (see Table 1 for participants' demographic data). The experiment consists in a 2 X 2 between subject design. Participants were allocated randomly to two priming conditions – The Mortality salience (MS) condition (N = 66) and the Music salience condition (N = 60). In both conditions, they could receive either a Private Feedback (MS: N = 36, Music: N = 30) or a Public Feedback (MS: N = 30, Music: N = 30). Participants gave written consent to participate in the study, according to the Declaration of Helsinki (Helsinki (1991)) and the Ethical Committee of the University of Bologna.

2.2 Materials and procedures

Overview of procedures

The experiment consisted of a single session, comprising four phases (explained in detail below) in the following order: (1) a priming phase, during which individuals were primed with thoughts about their own death (MS induction condition) or about a control topic (listening to music; Music salience condition), followed by an incidental memory procedure aimed at verifying the success of the priming technique; (2) a series of questionnaires assessing personality traits known to affect the deployment of psychological defences against MS; (3) a real-effort task; (4) a series of exit questionnaires assessing other variables who may have an effect on performance. In the following, we describe each step of our experimental procedure in detail.

Mortality vs. Music salience induction. At the beginning of the experiment, participants received either a MS induction or a Music salience induction. Participants in the MS condition answered two questions aimed at reminding them of their own death: (1) "Please describe as specifically as you can the emotions felt at the thought of your own death", and (2) "Please describe as specifically as you can what you think will happen as you physically die". Participants in the Music salience (control) condition answered the following questions: (1) "Please describe as specifically as you can the emotions felt at the thought of listening to classical music", and (2) "Please describe as specifically as you can what happens to you when you listen to classical music". In both conditions, participants then rated the level of effort and emotion felt while writing the essay on a Likert scale (1 = not much; 5 = very much). Finally, they reported whether they had experienced a loss in the recent past.

Incidental memory procedure. One crucial aspect for this study is the success of the MS and Music salience induction. Participants may or may not comply with the request of focusing on their own death, and, more in general, the priming strategy may be differentially effective at activating death-related or music-related thoughts across participants. Several measures were used to assess the efficacy of our priming procedures. A content analysis reassured us that, in all cases, participants wrote about their own death in the MS condition and about music in the Music salience condition. We also devised an incidental memory task (Moscovitch and Talmi 2007) in order to measure the relative accessibility of death (or music) contents after MS or Music salience induction. Immediately after writing about death (or music), participants were presented with pairs of words, appearing in the center of the computer screen. In each pair, one word was related to the main theme of the relevant induction - death for the MS condition (e.g., "funeral") and music for the Music salience condition (e.g., "violin") - while the other word was not related to the theme. Participants had to determine which word was longer. In a later surprise memory test, participants were required to recall as many words as they could. The assumption is that individuals for which the (MS or Music salience) priming procedure was more effective should

be the ones more inclined to attend, and successfully encode, words congruent with the primed theme (see Cohn et al. 2014 for a similar strategy), resulting in increased recall rates for death-related words (in the MS condition) and music-related words (in the Music salience condition) (e.g., Moores et al. 2003). The subjects earned 0.25 cent for each word they correctly recalled.

INSERT TABLE 1 ABOUT HERE

Personality questionnaires. Participants then filled in a personality questionnaire (i.e., a short version of the Big Five Inventory). The aim of this questionnaire is to construct personality indicators to investigate, and control for, the effect of personality traits on the deployment of psychological defenses against MS. We were mainly interested in psychological traits associated to reciprocity behaviors toward the experimenter (e.g., agreeableness and openness), which can be observed under a flat-wage scheme (see Giannetti and Orsini 2014, Ben-Ner et al. 2004).

Real Effort Task. In both conditions, after the induction, participants performed a real-effort task (i.e., three-digit summation task), for which they were paid a fixed amount of money (i.e. 7 Euros) regardless of individual performance (number of correct answers, or points). The task was quite simple and a little tedious in order to induce some disutility. The participants were always informed about their entries. If a submitted answer was not correct, the numbers were displayed until the correct answer was provided. In addition, subjects were informed that they could stop at any time during the experiment. No external aids (calculators, scratch paper, etc.) were allowed. As alternative activities in case participants decided to not do the summation task, we allowed them to read magazines or other material of their own, reducing the possibility that subjects carried out the real-effort task simply to avoid boredom (Charness et al. 2013). We adopted a 'stranger matching protocol' (in a similar contest, see also Charness et al. 2013), such that, at the beginning of each of seven blocks of the real-effort task, subjects were randomly assigned to groups of three participants each. The main advantage of using the stranger matching protocol is having individuals playing several times the same (one-shot) game with different persons. In our setting, this is crucial to rule out reputation effect (see also Andreoni and Croson 2008 for a discussion in a public-good game). This way, we obtain a larger number of independent observations, i.e. for each participant, we have multiple independent observations across blocks. At the end of each block, participants received personal feedback regarding their performance, and whether they had ranked “first”, “second” or “last” in that specific block/group. At the beginning of each block, participants were also provided with their personal ranking history thorough the entire game (whether they had ranked first/second/last across all previous blocks/groups). In the Public feedback condition, each group member's personal ranking history

was available to all participants in the group, whereas in the private feedback condition it was not. At most, in the private condition participants could infer their standing relative to the other members of that specific group, and only at the end of the block.

Exit questionnaires. Finally, in addition to subjects' personality traits, we collected information on participants' characteristics and attitudes by means of a series of questionnaires, in order to control for the potential effect of these variables on individual performance. These variables are summarized in Table (1). First of all, given that the effort task involved summations, we collected information on individuals' ability in mathematics (i.e. *Math Ability*), asking subjects to rate – from 1 (i.e. definitely false) to 5 (i.e. definitely true) – their agreement with the following statement: "In the past I have proved to have good mathematical skills". Moreover, given that the experimental procedure assesses participants' attitude towards whether or not to make effort in order to receive the same money, we administered a scale of materialism (Rindfleisch et al. 2009), requiring to rate one's agreement with 4 statements (e.g., "I would be happier if I could buy more things") on a 1 (low agreement) to 5 (high agreement) Likert scale. Finally, because the effect of MS is influenced by individual levels of insecurity, with more (compared to less) insecure individuals experiencing stronger MS effects (Rindfleisch et al. 2009), we controlled for participants' level of insecurity in three domains, namely their relationships with others (i.e. *Development Insecurity scale*), their personal skills and abilities (i.e. *Personal Insecurity scale*), and their appearance and social interactions (i.e. *Social Insecurity scale*) (Rindfleisch et al. 2009). MS effects are also influenced by personal values, such as religiosity and personal relations (Rindfleisch et al. 2009). Therefore, we asked participants to rate to what extent family, friends, work and religion were important in their lives on a scale from 1 (definitely not important) to 5 (definitely important). In addition to personality traits, we measured participants' attitudes towards reciprocating behavior, by asking participants to rate – from 1 (i.e. definitely not) to 5 (i.e. definitely yes) their agreement with the following statement: "If someone does something that is beneficial to you, would you be prepared to return the favor even if this was not agreed upon in advance and may be costly for you?" We controlled for reciprocating attitudes because our experimental procedure involves deciding whether or not to perform more or less effort in the absence of economic incentives. Therefore, we wanted to reduce the possibility that participants performed the task merely to reciprocate the experimenter's effort in setting up the experiment.

3 Results

3.1 Manipulation checks

Table 2 reports the proportion of theme-related and theme-unrelated words correctly recalled in the MS and in the Music salience condition, as well as other variables concerning the effect of the two types of induction. Importantly, in both conditions theme-related words were recalled more frequently than theme-unrelated words, supporting the success of the priming strategy. This effect, however, was larger in the MS compared to the Music Salience induction, likely due to the fact that death-related words are more memorable than music-related words. The same results are obtained analysing the ratio of theme-related to total words recalled. Notably, there were no differences between conditions in the effort exerted in writing the essay or in the intensity of the emotions elicited, suggesting that the priming strategy had an effect on the *quality* of participants' thoughts (and, presumably, emotions), not the *quantity* of cognitive effort exerted or elicited emotion.

INSERT TABLE 2 ABOUT HERE

3.2 Univariate analysis

In this section we present a comparative analysis of performance at session level across treatments. Figure (1) shows the distributions of the total number of points (correct summations) by condition (MS vs. Music salience) and type of feedback (Private vs. Public).

As it is apparent, the distributions of the number of points in the MS and the Music salience induction have a different shape, for both the Private and Public feedback condition. In order to test the statistical significance of the effects, we first compared the number of points between conditions (MS and Music salience). Since we adopted a stranger matching protocol to achieve independence among observations (i.e. to account for correlation of observations within groups), we analysed the average number of points for each group per block. This way, we have one independent observation for each group per block (in a similar setting, see Charness et al. 2013). The results reported in Table (3) from unpaired and one-sided t-tests suggest that there are significant differences when comparing the distributions according to the priming strategy: individuals reported fewer points under MS compared to Music salience (the mean difference of the two distributions is -0.653, significant at 5% level), and more points when they received public compared to private feedback (the mean difference of the two distribution is 1.071, significant at the 1% level), though the magnitude of this effect was lower under MS (i.e. 0.905) than under Music salience (i.e. 1.386).

As Figure (1) points to larger variance under Music than MS, comparing the means of distributions may not be sufficient. Indeed the Mann-Withney and Kolmogorov tests strongly rejected the null hypothesis that groups are drawn from two populations with the same distribution in all cases. The only exception is MS, which appears to have the same distribution under both types of feedback. As a result, the difference between the MS and the Music salience condition is numerically (though not significantly) larger when participants received public vs. private feedback (-0.292 vs. -0.948), suggesting that the effect of MS (a reduction of productivity) is more pronounced in the Public compared to the Private Feedback condition.

Overall, this first set of analyses indicates that individuals perform worse when they are primed with death-related (compared to music-related) thoughts, with an additional effect on the variance of the distributions of points, such that individuals tended to behave more homogeneously in the MS condition compared to the Music salience condition. Thus, contrary to our hypothesis H1, we observed a relaxation- not an increase- in performance in the MS compared to the Music salience condition. Under a flat-wage scheme, MS did not seem to promote individuals' quest for self-esteem (prediction #2 from TMT), but, rather, adherence to cultural worldviews (prediction #1 from TMT), as is the materialistic principle of least possible effort (avoid effort that is not compensated) (see Kasser and Sheldon 2000; Arndt et al. 2004b). We also found that individuals generally performed better when provided with public feedback, though this effect was mitigated under MS. We comment more on this in the Discussion.

INSERT FIGURE 1 AND TABLE 3 ABOUT HERE

3.1 Multivariate analysis

In this section we analyse participants' performance under the MS and Music salience induction, while accounting for a number of control variables measured at individual level (see Table (1) for a description of these variables). As the dependent variable will be, in both cases, the total number of points, which is left-censored at zero, we rely on a Tobit model that is suitable for this type of variable.[1]

INSERT TABLE 4 ABOUT HERE

[1] The Tobit model (Tobin, 1958) was developed in econometrics for analyzing data of household expenses, which have a high amount of zero data for luxury goods. The Tobit model is a generalization of ANOVA: if there is a small number of zeroes in the data, the results of ANOVA and Tobit will be nearly the same (as in standard linear regressions). If, on the other hand, there is a large number of zeros in the data, the estimated differences will emerge in the Tobit analysis. Hence, the Tobit model is suitable when the dependent variable is one that is roughly continuous over strictly positive values, but is zero for a nontrivial fraction of the population (Marin-Galiano and Kunert, 2006).

In line with mean comparisons tests in Table (3), in column *a* we observe a larger (though not significant) effect of public feedback under the Music salience compared to the MS induction, both with private and public feedback, confirming the results from the univariate analyses. In order to control for the success of our priming strategy, we added, in column *b*, the number of words a subject was able to remember from the incidental memory task in the MS and in the Music salience conditions. The variable named *Theme-related words* indicates the number of correctly recalled music-related words in the Music salience condition, while the interaction term (i.e., *Theme-related words*MS)* indicates the number of correctly recalled death-related words in the MS condition. The coefficient for *Theme-related words* in the MS condition is positive (+0.500) and significant, suggesting that individuals for whom the MS induction was stronger were also those that achieved more points. In contrast, the coefficient for *Theme-related words* in the Music salience condition was not significant, indicating that thinking about music (as opposed to death) had no effect on performance (see also Kassel and Sheldon, 2000). Notably, this result holds even when controlling for the number of neutral words (*Theme-unrelated words*) a subject was able to remember from the study phase (or if we use the ratio of theme-related to total words recalled). Thus, it was the propensity to retrieve death related words in the MS condition (and hence the relative strength of the MS induction), and not the mere quantity of words recalled, that had an impact on participants' performance in the real-effort task in the MS condition.[2] We also added a categorical variable to column *c* (*Block*), which accounts for possible temporal trends in the experiment. The *Block* coefficient was positive (+0.365) and statistically significant, suggesting that subjects progressively achieved more points across blocks, suggesting practice effects, or that participants became more competitive with time. This effect, however, was lower under the public feedback treatments: the interaction term of *Block* with *Public Feedback* is negative (-0.273) and statistically significant.[3] This suggests that in this treatment there was no increase in performance across blocks. It is important to note that the size and significance of *Theme-related Words*MS* remained the same after controlling for *Block*, while the *Public Feedback* dummy became statistically significant. To control for individual unobservable abilities, we further added subjects' ability in mathematics to column *d* (*Math Ability*), along with a dummy variable equal to 1 for those subjects who experienced the loss of a loved one in the recent past (*Loss*). Although the coefficient on *Math Ability* had a positive (+0.736) and statistically significant effect on the number of points, the size and significance of *Theme-related Words* remain the same. *Loss* was not significant.

Thus, even though the results from the univariate analysis indicate a general relaxation of

[2] There are not significant effects when Theme-Related Words are interacted with public-feedback.

[3] There are not significant effects when *Block* is interacted with the *MS* condition.

performance under MS vs. Music salience induction, individual susceptibility to the MS induction was positively correlated with performance. Why could this be the case? As anticipated, MS has been suggested to operate through two cannels: on the one side, it strengthens individuals' adherence to salient values and worldviews (1); on the other side, it promotes behaviors that boost self-esteem (2). One possibility, therefore, is that in individuals high in trait materialism MS mainly strengthened adherence to materialistic worldviews (least possible effort) induced by the flat-wage scheme under #1. In contrast, in individuals low in trait materialism, for whom materialistic instances are presumably less salient, MS bolstered the quest for self-esteem and productivity (#2). To test this hypothesis, we divided participants into a High Materialism group and a Low Materialism group based on a median split, and re-ran the Tobit model on each group separately (see Table 5). Consistent with our hypothesis, we found that the previously described effect of the variable *Theme-related words* on the number of correct summations was significant in individuals low in trait materialism (0.621; $p < 0.001$), but not in those high in trait materialism (0.355; n.s.), for whom mathematical abilities were the main factor driving performance in the summation task.

INSERT TABLE 5 ABOUT HERE

3.2 Additional robustness check

In Table (A1) in the *Appendix*, we control for the robustness of the previous results to a number of other controls. Firstly, we rely on a general indicator of reciprocity. The inclusion of this variable in column *a* does not alter our results. Secondly, we control for individual agreeableness and openness (as measured through the short version of the big-five questionnaire) in column *b*, as these traits are associated with reciprocating behavior (Giannetti and Orsini 2014). We add two indicators of, respectively, the effort exerted by the subjects (i.e. *Effort*), and the reported intensity of emotions they felt (i.e. *Emotion*) while writing their essay, in column *c* (see Table (2)). Again, the results remain the same, although the strength of the emotion felt while writing the essay had a positive and significant effect on the number of correct summations entered, again in support of the hypothesis that individual susceptibility to the MS induction had a positive impact on productivity. Finally, we added participants' age (*Age*) and sex (*Female*) to column *d*, and variables indicating individual's level of uncertainty in relationships with others (i.e. *Development Insecurity*), in personal skills and abilities (i.e. *Personal Insecurity*), and in appearance and social interactions (i.e. *Social Insecurity*) in column *e*. Although the coefficient for *Personal Insecurity* is marginally significant at a level of 10%, the size and significance of the coefficients on the main variables of our interest do not change. Lastly, we also control for other possible cultural worldviews such as religious beliefs, family, friends and work attachment. The results

(not reported) are also robust to these last controls.

4 Discussion

Humans are the only living beings who are aware of their mortality. As postulated by Terror Management Theory (TMT), human behavior and mental life are strongly motivated by the need to defend from existential anxiety arising from mortality awareness, which is achieved by (1) adhering tightly to cultural worldviews and shared values and (2) engaging in behaviors boosting self-esteem. The aim of this experiment was to test the main predictions from TMT in an economy experiment that combined psychological priming techniques with economic, incentive-compatible mechanisms. After writing about death or a control topic (i.e. music), subjects were randomly divided into groups of three to perform a real-effort task, for which they were paid a fixed wage. Our design, involving a flat-wage scheme, allowed us to explore the effect of intrinsic incentives on individual performance while disentangling it from that of economic incentives. Under this scheme, indeed, participants have no economic incentive to perform. To further distinguishing between self-esteem and status-seeking, our participants received either public or private feedback on their relative ranking.

Different from what expected (hypothesis H1), the main result of the present study is that participant performed more poorly under MS vs. Music salience, entering a lower number of correct summations. Before discussing this result, it is important to note that it is unlikely to be due to a decrease in cognitive resources following the MS (compared to the Music salience) induction, because participants self-reported similar levels of effort after writing the essay between conditions. Self-reported levels of emotion, too, were similar between conditions. Obviously the type of emotion may have differed, but the intensity of reported emotions did not, suggesting that individuals were similarly engaged by the two induction procedures. Another possible concern about our experimental design is that individuals may exert effort simply to please the experimenter, as a form of reciprocation (Zizzo 2010; Giannetti and Orsini 2013). We think, however, that reciprocating behavior does not underly our main findings. First, it is not clear why this tendency should be more marked in the Music salience vs. MS condition. Second, our findings held when we controlled for the self-reported tendency towards reciprocation and for personality traits associated with this tendency by including them in our regression model (Ben-Ner et al. 2004; Giannetti and Orsini, 2013). As well, it does not seem that our findings reflected a change in discounting modes under MS, for example a preference towards immediate over delayed gratification in response to increased awareness of the end of life. Indeed, MS has been found to reduce, not increase, delay discounting, making individuals more future-oriented, and less interested in immediate gratification (Kelley and Schmeichel 2015).

As anticipated, TMT postulates that MS may operate through two channels: (1) strengthening one's adherence to cultural worldviews and shared values, and (2) promoting behaviors that boost self-esteem. Notably, different worldviews and values may be salient depending on the specific situation (Jonas and Greenberg 2013). We note that the flat-wage scheme we adopted does not provide monetary incentives to perform; on the contrary, in that economic setting effort is subjectively costly but not rewarded. We argue, therefore, that the relaxation of performance under MS reflects individuals' general adherence to materialistic values and worldviews, such as the principle of least possible effort: avoid effort that is not compensated. Thus, in the absence of economic incentives, it is prediction #1 from TMT that prevails (as opposed to the quest for self-esteem) in determining the effect of MS on productivity. Interestingly, the relaxation of performance under MS came along with a significant shrink in variance, such that individuals behaved more homogeneously (conformistically?) under MS, as one would expect if individuals were indeed obeying a "shared" value, as materialism no doubt is, at least in our society. Thus, our results fit with previous research showing that individuals tend to become more materialistic (i.e. more sensitive to economic incentives) and less creative (i.e. in order to reduce differentiation from the majority position) when reminded of their own death (see, for example, Kasser and Sheldon 2000; Arndt et al. 2004b).

The results from multivariate analysis, however, showed that MS did not necessarily translate into materialism across all individuals, and that individual differences influenced the effect of MS on performance. We analysed the number of theme-related words (i.e., death- related words in the MS condition and music-related words in the Music condition) individuals were able to recall after the mortality and music salience induction as an index of the effectiveness of the induction. We found that the number of theme-related words recalled under MS correlated positively with the number of correct summations entered, whereas theme-related words recalled under music salience had no effect on productivity, as if individuals' susceptibility to the MS induction induced them to pursue high performance levels, in accordance with previous research (Pyszczynski et al. 2015; Becker 2007). Consistent with this, the intensity of emotions felt while writing the essay about one's own death (but not music) also correlated positively with performance levels. Interestingly, the relation between memory for death-related words and performance held for individuals low in trait materialism, but not for those high in trait materialism. Thus, whereas individuals high in trait materialism avoided effort that was not compensated, individuals low in trait materialism, for which materialistic precepts are less salient, showed a tendency to increase their level of performance depending on their susceptibility to the MS induction. Thus, in individuals low in trait materialism, the quest for self-esteem favored effort and high performance levels despite the absence of economic incentives to perform. Also, it was in individuals low - not high - in trait materialism that we observed an effect of a recent personal loss on

performance under MS, highlighting again differences in the deployment of distal defenses to MS depending on personality.

A secondary aim of this study was to compare the effect of private and public feedback on performance. We found that, across conditions, individuals performed better when public feedback was provided, in line with previous experimental economic research (e.g. Charness et al. 2013). However, different from what expected (hypothesis H2), we found that the magnitude of the effect of public feedback on performance was lower under MS compared to Music salience. This result is interesting, as it indicates that when individuals are reminded of their own death, they care relatively less about public recognition; despite low, their effort appears totally driven by the intrinsic need for self-esteem, not status. Consequently, there is no additional effect on performance from the provision of a public (as opposed to only private) feedback.

An alternative interpretation of our findings is based on competition. That is, MS may have reduced competition (as opposed to activate distal psychological defences, such as the quest for self esteem and adherence to shared worldviews), while public feedback reduced it. In our experimental setting, self-esteem and competition are obviously interwined. Why should individuals compete in entering summations if not to improve their self-esteem, given the absence of monetary incentives? We think, however, that the pattern of results we obtained favors an interpretation based on psychological defenses. Were the results driven by competitiveness, indeed, individuals more sensitive to the MS induction, i.e., those who recalled more death-related words, should have proved the least competitive, entering relatively fewer correct summations. We, however, observed the opposite, which is more in line with the hypothesis that MS increased performance, at least in non materialistic individuals.

To conclude, using an experimental economic setting we have contributed to qualify the effect of MS on individuals' motivations and behavior. We have shown that individuals protect themselves from MS through different mechanisms, which depend, at least in part, on the specific experimental setting and on personality factors. Under an economic flat-wage scheme, MS flattened individuals to exert the least possible effort in the task, embracing and obeying shared, materialistic worldviews and values. The effect of MS on materialistic instances was indeed maximally apparent in individuals high in trait materialism. In individuals low in trait materialism, however, we observed a tendency to increase performance levels under MS, which tracked individuals' susceptibility to the MS induction, as if the quest for self-esteem were the main antidotes these individuals deployed against existential anxiety. Our findings, therefore, make us agree with, yet qualify, John Donne's famous saying "*death makes us all equal when it comes*": This is favored by materialism, and opposed by vivid experience of death-related contents.

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Table 1: SUMMARY STATISTICS BY CONDITION

		MORTALITY (N=66)				MUSIC (N=60)			
Variable Name	***Description***	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**Mean**	**Std. Dev.**	**Min**	**Max**
Points	*A discrete variable measuring the number of correct summations the subjects entered in each period*	12.506	3.985	0	22	13.16	4.905	0	25
Public Feedback	*A dummy variable which is equal to 1 for treatment with public feedback, and 0 otherwise*	0.455	0.498	0	1	0.5	0.501	0	1
Theme- related Words	*This variable measures the number of words a subjects was able to remember in the the memory task which are related to the treatment (death-related for MS, and music-related for Music)*	4.606	2.977	0	11	2.683	2.323	0	7
Theme-unrelated words	*This variable measures the number of neutral words remembered in memory task*	1.758	1.406	0	5	1.350	1.329	0	5
Loss	*A dummy variable which is equal to 1 if subjects experienced the loss of a close person one in the recent past, and 0 otherwise*	0.273	0.446	0	1	0.200	0.400	0	1
Math Ability	*A categorical variable that measures individual past-ability in mathematics.*	3.227	1.217	1	5	3.333	1.301	1	5
Effort	*A categorical variable which measures subjects' evaluation on the amount of effort exerted to write the essay.*	3.379	0.692	2	5	3.433	0.864	1	5
Reciprocity	*A categorical variable which measures individual tendency to reciprocate.*	3.900	0.79	1	5	3.750	0.789	2	5
Age	*Participants' age in years.*	23.95	5.367	19	56	22.71	2.879	18	35
Gender	*A variable equal to 1 for female and 0 otherwise*	0.545	0.498	0	1	0.433	0.496	0	1
Agreeableness	*A categorical variable which measures individual agreeableness and it is derived from a short version of the Big-Five questionnaire.*	10.409	2.446	6	18	11.100	2.437	5	16
Openness	*A categorical variable which measures individual openness and it is derived from a short version of the Big-Five questionnaire.*	7.985	2.309	4	14	9.050	2.751	5	20
Social Insecurity	*This variable measures individual level of uncertainty in appearance and social interactions.*	0.075	0.743	-2.535	1.031	-0.083	0.828	-3.064	1.031
Personal Insecurity	*This variable measures individual level of uncertainty in personal skills abilities.*	-0.018	0.841	-2.061	1.748	0.019	0.892	-1.69	1.825
Development Insecurity	*This variable measures individual level of uncertainty in relationship with others.*	0.087	0.857	-1.357	1.671	-0.096	0.898	-1.357	1.732

Table 2: PRIMING STRATEGY SUCCESS

The variable *Total words* measures the total number of words recalled. The variable *Theme-related words* measures the number of death-related words and the number of music-related words recalled in the MS and Music salience condition, respectively. The variable *Theme-unrelated words* measures the number of neutral words recalled in both conditions. *Effort* is a self-reported measure of the effort experienced while writing the essay, whereas *Emotion is a self-reported* measure of the intensity of the emotion felt while writing the essay. P-values are from one-sided test.

	MORTALITY					MUSI					DIFF
	Mean	**Std**	**Mi**	**Max**	**N**	**Mean**	**Std**	**Min**	**Max**	**N**	MS vs
Total words	6.367	4.002	0	14	66	4.033	3.124	0	10	60	p=0.000
Theme-unrelated words	1.758	0.174	0	5	66	1.350	0.172	0	5	60	p=0.050
Theme-related words	4.606	2.997	0	11	66	2.683	2.340	0	7	60	p=0.001
*Theme-related vs. unrelated**	2.848	2.440	-2	10	66	1.333	2.186	-3	7	60	p=0.000
Effort	3.433	0.871	1	5	66	3.379	0.696	2	5	60	p=0.349
Emotion	2.413	0.993	1	5	66	3.300	1.124	1	5	60	p=0.380

*This difference is significant both within and between conditions.

Table 3: MEAN COMPARISONS ACROSS CONDITIONS: NUMBER OF POINTS

The table reports the mean differences in the number of points attained across conditions (Mortality Salience, Music Salience) and treatments (Public feedback, Private feedback). Means are computed considering one observation for each group. P-values are from one-sided test.

Treatments	**Music**	**MS**				
	Mean	**Mean**	**Diff**	**P-value**	**Mann-Withney**	**Kolmogorov**
MS vs. Music	13.159	12.509	-0.653	0.015	0.053	0.062
Public vs. Private	13.378	12.307	1.071	0.001	0.001	0.000
MS Public vs. MS Private	12.905	12.174	0.730	0.026	0.069	0.272
Music Public vs. Music Private	13.853	12.467	1.386	0.002	0.002	0.000
MS Private vs. Music Private	12.467	12.175	-0.292	0.251	0.787	0.323
Ms Public vs. Music Public	13.853	12.905	-0.948	0.009	0.019	0.256

Table 4: INDIVIDUAL PERFORMANCE (NUMBER OF CORRECT SUMMATIONS) ACROSS TREATMENTS: TOBIT REGRESSION MODEL

The dependent variable is the number of points individuals obtained in each period. **Public feedback** is a dummy variable equal to 1 if subjects received a public feedback on individual rank, whereas it is equal to 0 if subjects received a private feedback. **Theme-related words** is the number of treatment-related words (death- related for MS, and music-related for Music) subjects were able to recall, whereas **Theme-unrelated words** measures the number of neutral words subjects were able to recall. **Loss** is equal to 1 if subjects experienced a loss in the recent past and 0 otherwise. **Math ability** is a categorical variable capturing self-reported mathematical ability. **Block** is a categorical variable, which ranges from 1 to 7 and account for the period of the game. For a more detailed description, see Table (1

	a	*b*	*c*	*d*
Public Feedback	1.476	1.311	2.405**	2.454**
	(1.022)	(1.012)	(1.058)	(1.026)
MS	-0.206	-1.172	-1.170	-1.194
	(0.978)	(1.313)	(1.313)	(1.269)
*MS*Public Feedback*	-0.731	-0.683	-0.687	-0.632
	(1.414)	(1.380)	(1.380)	(1.344)
Theme Related Words		-0.045	-0.046	-0.108
		(0.236)	(0.236)	(0.231)
*Theme Related Words*MS*		0.500**	0.500**	0.484**
		(0.195)	(0.195)	(0.190)
Theme-unrelated Related Words		0.717*	0.717*	0.772**
		(0.402)	(0.402)	(0.390)
*Theme-unrelated Words*MS*		-0.296	-0.296	-0.246
		(0.414)	(0.414)	(0.402)
Block			0.365***	0.365***
			(0.054)	(0.054)
*Block*Public Feedback*			-0.273***	-0.273***
			(0.078)	(0.078)
Loss				-0.447
				(0.799)
Math Ability				0.736***
				(0.261)
Constant	12.361***	11.599***	10.139***	7.848***
	(0.723)	(0.879)	(0.905)	(1.242)
Log-likelihood	-2178	-2173	-2149	-2145
N observations	882	882	882	882

p<0.10, p<0.05, ***p<0.01*

Table 5: INDIVIDUAL PERFORMANCE AND MATERIALISM

The dependent variable is the number of points individuals obtained in each block of the MS condition. Independent variables are defined as in Table (4) and Table (1).

	Materialism	
	High	Low
	3.14	3.14
Public Feedback	0.563	0.589
	(1.227)	(1.028)
Theme-related Words	0.355	0.621**
	(0.231)	(0.228)
Theme-unrelated Words	-0.068	-0.617
	(0.443)	(0.527)
Loss	0.237	-2.059*
	(1.310)	(1.186)
Math Ability	0.862**	-0.053
	(0.424)	(0.505)
Block	0.256***	0.232**
	(0.070)	(0.066)
Log-likelihood	-603	-471
N observations	252	210

*p<0.10,** p<0.05,

Figure 1: DISTRIBUTIONS OF PERFORMANCE (POINTS) ACROSS TREATMENTS

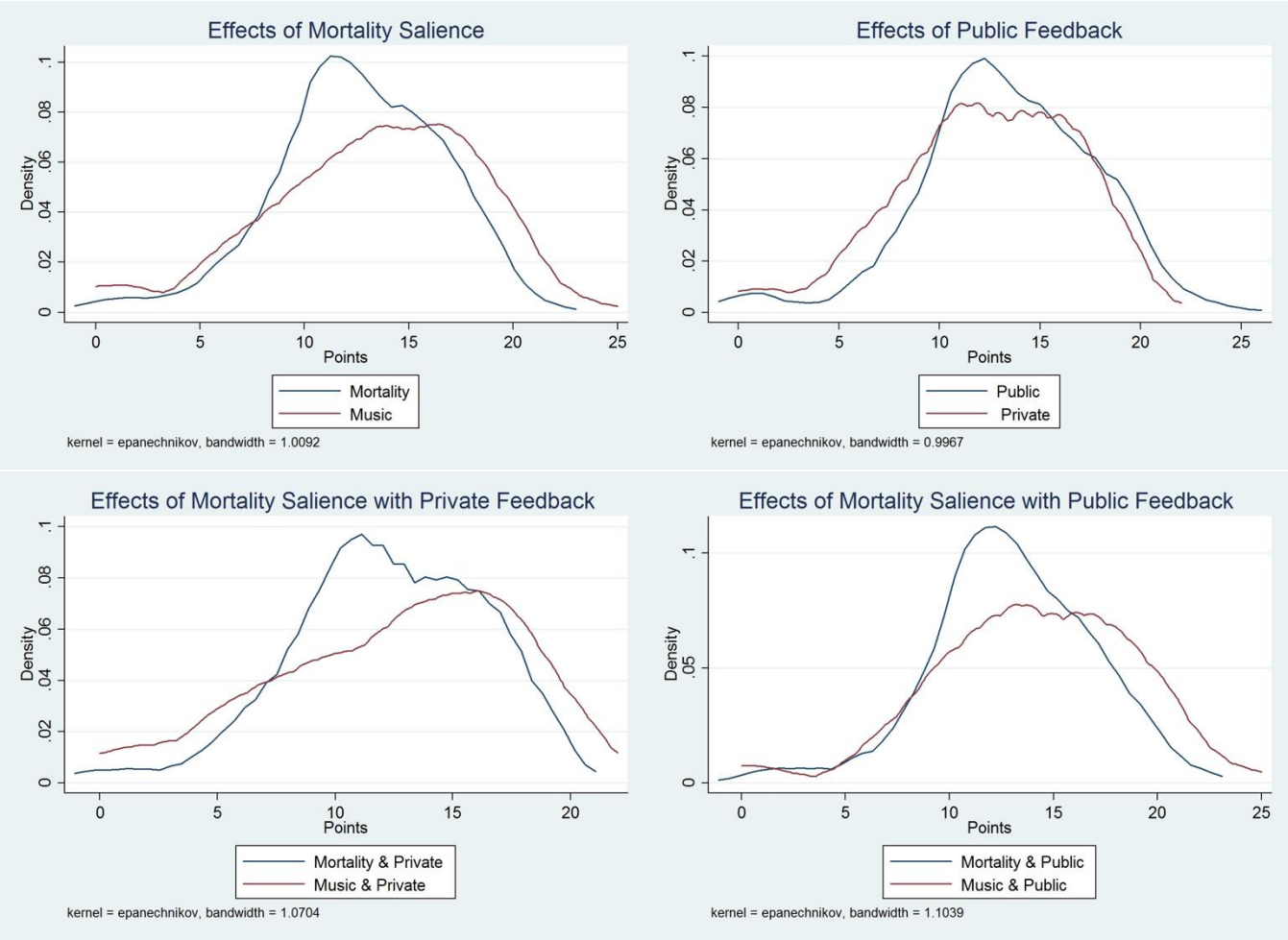

Table A1: ESTIMATION RESULTS INDIVIDUAL PERFORMANCE (POINTS): TOBIT REGRESSION WITH INDIVIDUAL CONTROLS

The dependent variable is the number of points individuals obtained in each period. **Public Feedback**, **Theme-related Words**, **Theme-unrelated Words, Loss, Math Ability**, and **Block** are defined in the same way as in Table (4). **Reciprocity** is a categorical variable capturing individuals' attitude to reciprocate. **Effort** and **Emotion** are categorical variables (from 1 to 5) measuring subjects' level of effort and emotion while writing their essay. **Agreeableness** and **Openness** are personality traits as measured through an entry questionnaire. **Age** is a variable which measures individual age, whereas **Female** is a dummy variable equal to 1 for female participants, and 0 for male participants. **Social**, **Personal** and **Development Insecurity** are categorical variables controlling for individual insecurity. For a more detailed description, see Section 2 and Table (1).

	Mortality					Music				
	a	*b*	*c*	*d*	*e*	*a*	*b*	*c*	*d*	*e*
Public Feedback	0.207	0.598	0.707	0.834	1.050	1.336	1.176	0.906	0.855	1.256
	(0.836)	(0.776)	(0.798)	(0.798)	(0.834)	(1.141)	(1.189)	(1.128)	(1.141)	(1.274)
Theme-related Words	0.520***	0.387**	0.481**	0.431*	0.450*	-0.129	-0.154	0.092	0.101	0.072
	(0.178)	(0.161)	(0.161)	(0.160)	(0.161)	(0.273)	(0.277)	(0.289)	(0.297)	(0.306)
Theme-unrelated Words	-0.179	-0.025	-0.271	-0.349	-0.394	0.787*	0.832*	0.534	0.497	0.552
	(0.375)	(0.341)	(0.342)	(0.337)	(0.338)	(0.450)	(0.457)	(0.461)	(0.468)	(0.477)
Loss	-0.620	-1.444	-0.514	-0.704	-0.817	-0.387	-0.599	-0.469	-0.495	-0.558
	(0.961)	(0.944)	(0.906)	(0.895)	(0.911)	(1.386)	(1.429)	(1.351)	(1.360)	(1.386)
Math Ability	0.448	0.579*	0.655**	0.620*	0.652*	0.853*	0.925**	0.840*	0.806*	0.741
	(0.344)	(0.307)	(0.320)	(0.312)	(0.317)	(0.428)	(0.432)	(0.409)	(0.422)	(0.474)
Block	0.191***	0.245**	0.245**	0.245*	0.245*	0.222*	0.222**	0.222**	0.222*	0.222*
	(0.050)	(0.048)	(0.048)	(0.048)	(0.048)	(0.063)	(0.063)	(0.063)	(0.063)	(0.063)
Reciprocity	-0.231					0.162				
	(0.537)					(0.736)				
Effort		0.547					-0.323			
		(0.590)					(0.745)			
Emotion		0.851**					0.323			
		(0.433)					(0.601)			
Agreeableness			-0.090	-0.099	-0.117			0.332	0.338	0.286
			(0.160)	(0.161)	(0.170)			(0.236)	(0.236)	(0.240)
Openness			0.235	0.207	0.204			0.185	0.209	0.236
			(0.170)	(0.167)	(0.167)			(0.208)	(0.217)	(0.220)
Age				-0.100	-0.101				-0.089	-0.054
				(0.074)	(0.074)				(0.207)	(0.218)
Female				-0.927	-1.001				-0.042	0.454
				(0.812)	(0.831)				(1.192)	(1.259)
Social Insecurity					-0.338					-0.140
					(0.541)					(0.847)
Personal Insecurity					-0.190					-0.547
					(0.518)					(0.792)
Developmental Insecurity					0.466					-0.309
					(0.523)					(0.701)
Log-likelihood	-976	-1077	-1079	-1077	-1077	-1060	-1060	-1059	-1059	-1058
Observations	420	462	462	462	462	420	420	420	420	420

INSTRUCTIONS

Welcome to LES Lab! This experiment will last about 60 minutes and it is divided into two parts.

In the first part, you will be asked to write a short essay on a specific topic that will appear on your screen. You will have about 10 minutes to write your essay. After that, you will be asked to compare the length of some words. By pressing the button "Right" or "Link" you can choose which word is the longest in a pair. Finally, you will undertake a short memory game. You will receive 0.25 cent for each word you will be able to remember in this memory game.

In the second part of this experiment, you will be asked to solve algebraic summations for 7 periods. In each period, you will be part of a group – always different and randomly assigned by the computer – of 3 participants, and you will have 120 seconds to enter the sums of numbers appearing on your screen. At the end of each period, you will be *personally* informed about your results, both in absolute (number of correct answers) and relative terms (compared to the other members of your group). Please note that the result could be *First, Second,* or *Last.* After the first period, you will able to see the history of the game by pressing a button appearing on your screen. [Public Feedback condition: On this screen, you can also see the results obtained by your peer-group members in the previous period.]

For each period you will earn 1 euro. You will thus earn in total 7 euro. You are not obliged to enter any summation, and you are allowed – if you wish – to do other activities. For example, you can read the magazines that you have at your desk or the materials you brought with you. Should you choose to do the summation task, remember that you are <u>not</u> allowed to use pens, pencils or calculators, nor to talk with other participants. Should you disregard any of these simple rules, we will be forced to exclude you from the experiment.

At the end of each phase, you will be asked to compile a questionnaire.

Your participation will remain anonymous to the other participants as well as to the experimenter. Your payment will be made through an identification number automatically assigned by the computer.

Rise your hand up, should you have any question. We will privately answer it. Thank you for your participation.