How Long Will It Take?

Power Biases Time Predictions

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Abstract

People tend to underestimate the time it takes to accomplish tasks. This bias known as the *planning fallacy* derives from the tendency to focus attention too narrowly on the envisaged goal and to ignore additional information that could make predictions more accurate and less biased. Drawing on recent research showing that power induces attentional focus, four studies tested the hypothesis that power strengthens the tendency to underestimate future task completion time. Across a range of task domains, and using multiple operationalizations of power, including actual control over outcomes (Study 1), priming (Studies 2 and 3), and individual differences (Study 4), power consistently led to more optimistic and less accurate time predictions. Support was found for the role of attentional focus as an underlying mechanism for those effects. Differences in optimism, self-efficacy, and mood did not contribute to the greater bias in powerful individuals' forecasts. We discuss the implications of these findings for institutional decision processes and occupational health.

How Long Will It Take?

Power Biases Time Predictions

Time is a crucial factor in people's everyday lives.   Business executives,

policy makers, engineers, nurses, teachers or students routinely plan their work and

estimate the time it will take to accomplish tasks. Psychological research shows that

these estimates are systematically biased, and people tend to underestimate the time it

takes to accomplish tasks. Biased time predictions are a widespread phenomenon that

affects mundane everyday activities as well as large-scale business projects (e.g.,

Buehler, Griffin, & Ross, 1994; Hall, 1980; Schnaars, 1989). Unreliable time

predictions have attracted a great deal of public attention and are commonly known as

the *planning fallacy* (Kahneman & Tversky, 1979).

Considering the practical relevance and common interest, relatively little is

known about the factors that alter biases in time predictions. Interventions to reduce

the planning fallacy have had limited success overall (e.g., Byram, 1997; see Roy,

Christenfeld, & McKenzie, 2005, for a review). The present research extends past

research by focusing on the way the wider social context affects time predictions. In

particular, we suggest that being in a position of power strengthens the tendency to

underestimate future task completion time. Our proposal derives from recent research

indicating that power promotes a goal-directed attentional focus (e.g., Guinote,

2007a), and from the observation that biases in time predictions originate from a too

narrow focus on the envisaged goal.

Attentional Focus and Biased Time Predictions

Biased estimates of time originate from the ways individuals process

information (e.g., Newby-Clark, Ross, Buehler, Koehler, & Griffin, 2000; Buehler &

Griffin, 2003; Kahneman & Lovallo, 1993). Specifically, individuals tend to focus

attention too narrowly on the event in question and disregard additional information that could make predictions more accurate and less optimistic. Below, we discuss three sources of information that are commonly neglected.

Kahneman and Tversky (1979) suggested that when people plan the future they adopt an 'inside view' that overemphasizes the uniqueness of a target event. By ignoring the distribution of similar events people fail to consider how long similar tasks usually take (see also Kahneman & Lovallo, 1993). Later research confirmed that people are reluctant to consider past experiences in their planning, and this makes them prone to bias in their forecasts (Buehler et al., 1994; Buehler & Griffin, 2003).

Underestimates of time also derive from the failure to take contingencies sufficiently into account (e.g., Buehler et al., 1994). Future plans often resemble best-case-scenarios and people tend to focus on the ways they can successfully accomplish their goals (e.g., Newby-Clark et al., 2000). By ignoring alternative ways how the future may unfold people are prone to misjudge impediments (e.g., Griffin, Dunning, & Ross, 1990); a bias which sharply increases with the number of potential setbacks (Bar-Hillel, 1973).

Finally, people also tend to focus too heavily on a global representation of the task at hand. As a result, they may not consider all subcomponents that a task affords (Kruger & Evans, 2004; see also Fischhoff, Slovis, & Lichtenstein, 1987). Task subcomponents that are less evident are especially at risk of being ignored (cf. Kruger & Evans, 2004). Consistent with this reasoning, unpacking tasks into subcomponents can decrease the tendency to underestimate task completion time (Kruger & Evans, 2004), and focusing attention on the intended outcome increases bias (e.g., Taylor, Pham, Rivkin, & Armor, 1998).

In sum, biases in time predictions operate through attentional mechanisms. People tend to focus too narrowly on the event in question and do not consider sufficiently additional information that could make predictions more accurate. The more people focus on the intended outcome, the more they are prone to bias in their forecasts. Factors that alter people's attentional focus can, therefore, strengthen or alleviate the tendency to underestimate time. For example, enhancing people's goal-focus by means of instructions (Buehler & Griffin, 2003), or incentives (Buehler, Griffin, & MacDonald, 1997; Byram, 1997) renders time predictions less accurate.

One social variable that has a profound impact on goal-directed attentional focus is social power – the ability to influence and control others' outcomes and resources (see Fiske & Berdahl, 2007). As discussed next, individuals in power display a processing orientation that should make them more prone to bias in predictions of task completion time.

Power Affects Goal-Directed Attention

At the basic cognitive level, power fosters selective attention, enhancing the processing of task relevant information and leading to the inhibition of secondary information (Guinote, 2007b). Consequently, powerful individuals typically display a more simplified, narrow focus of attention consistent with activated constructs (e.g., goals, needs, affordances), whereas powerless individuals pay less attention to primary constructs and attend more to secondary information (see Guinote, 2007a, for a review of the Situated Focus Theory of Power).

When goals are activated, powerful individuals pay more attention to information that pertains to their focal goal, and less attention to secondary information as compared to powerless individuals (Guinote, 2007b, 2007c; see also Overbeck & Park, 2001; Slabu & Guinote, in press). For instance, research on social

perception shows that powerful individuals focus more unequivocally on stereotypic, or on individuating information depending on their current goals (Overbeck & Park, 2001) and influence strategies (Vescio, Snyder, & Butz, 2003). In contrast, powerless individuals show less clear prioritizations between these different sources of information.

Power also fosters an approach-related motivational orientation (see Keltner, Gruenfeld, & Anderson, 2003, for a review of the Approach/Inhibition Theory of Power). As a result, powerful individuals are more oriented towards achieving gains and rewards, and less apprehensive about avoiding threats or constraints as compared to powerless individuals (see also Galinsky, Magee, Gruenfeld, Whitson, & Liljenquist, 2008). Power thus magnifies people's focus on desired outcomes and reduces the tendency to consider potential setbacks and threats to successful goal attainment.

The propensity to achieve rewarding outcomes facilitates action (Galinsky, Gruenfeld, & Magee, 2003; Keltner et al., 2003; see also Guinote, Judd, & Brauer, 2002), and powerful individuals benefit from their greater focus during goal striving (Guinote, 2007c). However, little is known about how power affects the planning of future tasks. The same cognitive orientation that benefits goal-striving should ironically create conditions for stronger biases in time predictions.

Powerful individuals' greater focus on single sources of information facilitates an 'inside view' (Kahneman & Lovallo, 1993) and reduces the likelihood that powerful individuals will consider distributional information in their forecasts. As a result, powerful individuals are more likely to ignore the duration of similar events that have taken place in the past. By the same token powerful individuals are less likely to consider multiple alternatives in their future plans, and therefore are less

prone to recognize potential setbacks and interfering events (cf. Buehler, Griffin, & Ross, 2002; Griffin et al., 1990; Hoch, 1985). Due to their greater focus on primary sources of information, powerful individuals may also fail to consider task subcomponents that are not readily apparent. The greater approach-motivation of powerful individuals further contributes to the neglect of threatening and impeding information, and it makes powerful individuals more oriented towards task outcomes in detriment of task subcomponents (cf. Keltner et al., 2003).

Differences in attentional focus may not be the only reason why powerful individuals are prone to underestimate time. Powerful individuals might dismiss impediments or threats because they are generally more optimistic about the future (Anderson & Galinsky, 2006). Powerful individuals might also have greater confidence in their abilities to overcome impediments and to complete tasks successfully (Anderson & Galinsky, 2006). Such differences in self-efficacy beliefs (Bandura, 1982) could lead to greater bias in forecasts (cf. Hinds, 1999). Lastly, power can promote positive affect (Keltner et al., 2003; Wojciszke & Struzynska-Kujalowicz, 2007), which could induce more optimistic estimates of future task completion time.

The prospect that optimism contributes to greater bias in the time predictions of powerful individuals is, however, dampened by past research that failed to find an association between optimism and temporal bias (Buehler & Griffin, 2003; Jørgensen & Faugli, 2006). Likewise, empirical evidence is lacking that confirms the link between mood and biased time predictions. Finally, past research on power and decision making found that elevated self-efficacy beliefs do not necessarily lead to more optimistic decisions in powerholders (Anderson & Galinsky, 2006). Taken

together, differences in optimism, self-efficacy, and mood might be less influential in promoting greater bias in the time predictions of powerful individuals.

The Present Research

The present article tests the hypothesis that power increases the tendency to underestimate task completion time. We suggest this to be the case because power affects attention in ways that promote biased time predictions. Specifically, power induces a goal-directed attentional focus and the tendency to disregard additional information that lies outside the focal goal. Powerful individuals are, therefore, less likely to consider information that could make predictions more accurate and less biased (i.e., impediments, task subcomponents, and past experiences).

Previous research has shown that biases in time predictions arise through the ways people allocate attention in the planning of future events. This led us to posit that attentional focus is a key mechanism through which power fosters greater bias in forecasts. At the same time, we also examined the role of optimism, self-efficacy, and mood as additional pathways through which power may affect time predictions.

We conducted four studies to test the hypothesis that power increases bias in predictions of task completion time. Studies 1 and 4 compared predicted and actual completion time of students' coursework projects, Study 2 examined biased time predictions in a computerized formatting task, and Study 3 focused on time estimates for everyday activities. One study examined attentional focus as underlying mechanism for the effects of power (Study 3), two studies examined self-efficacy (Studies 2 and 4) and mood (Studies 3 and 4), and one study explored the role of optimism (Study 4). Power was operationalized using different experimental manipulations (Studies 1-3) and an individual difference measure (Study 4).

Study 1

In the present study, students estimated the time it would take them to complete an important coursework assignment. The study was conducted longitudinally, and estimates (time 1) were compared against actual completion time (time 2). Power was manipulated at time 1 by having half of the participants believe their opinion would have important consequences for others, placing them in a position of control over others' outcomes (see Fiske & Dépret, 1996). As part of an ostensibly unrelated task, participants then predicted the completion time of their assignment. If powerful participants focused more on the envisaged goal (i.e., completion of the coursework) at the expense of considering additional information such as impediments or past experiences, then they should anticipate an earlier completion time than participants who did not have power. This should lead to a greater discrepancy between actual and predicted completion times for powerful individuals compared to individuals who did not have power.

Method

Participants and Design

Twenty students (11 females and 9 males) from the University of Kent participated on a voluntary basis. They were randomly assigned to the experimental conditions (powerful vs. control).

Procedure and Materials

Participants were approached on a university campus and were invited to take part in a study focusing on student-life perception. Power was manipulated using a procedure adopted from Goodwin and Fiske (1995; cited in Fiske & Dépret, 1996), such that half of the participants believed they controlled the outcomes of other students. Specifically, participants learned about alleged plans of the University to

introduce a university-wide course credit scheme that would make it compulsory for future students across all disciplines to participate in Psychology projects. Participants in the powerful condition were informed that their opinions received a fixed weight of 50% towards the final decision of the University. In contrast, participants in the control condition were told that the University was interested in their opinions, but these would not affect the future introduction of the scheme.

As part of a purportedly unrelated task, participants then indicated the deadline for their next coursework assignment. They also rated how important they considered their assignment (1=*not at all*, 9=*very much*). Subsequently, participants estimated when they expected to finish (a) a first draft of their assignment, (b) the final version, and (c) when they expected to submit their assignment. Actual completion time was assessed two weeks later over the telephone.

Results and Discussion

Predicted and actual completion times were coded in number of days before the official deadline (see Table 1). Higher values indicate an earlier point in time compared to the deadline. The completion times for a first draft and a final version were more strongly associated with each other than with the completion times for submission (rs(18) $\geq$ .83, ps < .001 vs. rs(18) $\leq$ .54, ps $\geq$ .015), giving rise to sphericity. Where appropriate, the subsequent results are corrected for these differential associations using the Greenhouse-Geisser epsilon correction (e.g., Stevens, 1986). We submitted participants' predicted and actual completion times to a 2 (power: powerful vs. control) x 2 (time: predicted vs. actual completion time) x 3 (task: first draft vs. final version vs. submission) mixed model analysis of variance with repeated measurement on the last two factors. The analysis revealed a main effect of time, suggesting that participants' estimates were biased, $F(1, 18) = 100.92$,

$p < .001$, $\eta_p^2 = .85$. On average, participants took two days longer to complete their assignments than originally anticipated ($Ms = 3.82$ *vs.* 1.88 days). Of particular importance, a significant interaction between power and time emerged, $F(1, 18) = 7.68$, $p = .013$, $\eta_p^2 = .30$. As can be seen in Table 2, powerful participants showed a greater discrepancy between their predicted and actual completion times than control participants (powerful: $Ms = 4.93$ vs. 2.47 days; control: $Ms = 2.70$ vs. 1.30 days). Confirming our predictions, power led to greater underestimates of time. Further tests of simple effects confirmed that this bias derived from differences in participants' predictions. While power also led participants to complete their projects earlier ($t(18) = 3.99$, $p = .001$, d = 1.88), the predictions of participants in power were nevertheless further off and much more optimistic than the predictions of participants who did not have power, $t(18) = 4.78$, $p < .001$, d = 2.25. Overall, powerful participants erred 76% more in their predictions than control participants ($Ms_{\text{predicted vs. actual time}} = 2.46$ vs. 1.4 days), $t(18) = 2.77$, $p = .013$, d = 1.31.

A number of additional effects emerged from the analysis. A significant interaction between task and time indicated that underestimates of task completion time were more pronounced for earlier tasks (first draft, final draft) than for later tasks (submission), $F(2, 36) = 60.03$, $p < .001$. A main effect of task confirmed that completion times differed between the three tasks, $F(2, 18) = 158.22$, $p < .001$, $\varepsilon = .654$. There was also a main effect of power ($F(1, 18) = 24.93$, $p < .001$), qualified by an interaction with task ($F(2, 18) = 13.08$, $p = .001$, $\varepsilon = .654$), suggesting that completion times were overall swifter for powerful than for control participants, but only for earlier tasks (first draft, final draft). The three-way interaction between power, time, and task was not significant ($p = .154$), indicating that the effects of power on biased time predictions did not differ between the three tasks.

An examination of participants' ratings of task importance revealed that powerful and control participants considered their assignment equally important (Ms = 7.00 vs. 6.70), $t(18) < 1$.

The results of Study 1 provided support for the hypothesis that power induces biased predictions of time. Powerful participants were less accurate and tended to underestimate more the time it would take them to complete a future assignment compared to participants who did not have power.

Consistent with past research on goal pursuit (Guinote, 2007c) and action facilitation (Galinsky et al., 2003), powerful participants also completed some parts of their assignments earlier than control participants. It is noteworthy that these effects emerged several days after the manipulation of power at time 1.

One limitation of the present study is that we did not control for differences in the content of participants' assignments. It is possible that powerful participants chose more complex assignments than control participants, and such differences in task complexity could potentially account for the observed differences in time predictions (cf. Roy et al., 2005). Our next study thus controlled for differences in task content.

<div align="center">Study 2</div>

In the present study, all participants performed the same computerized task, using a common word editing software (Kruger & Evans, 2004). Participants received an unformatted text and their task was to amend the formatting of the text to make it look like a template provided (see Figure 1). This procedure allowed for predicted and actual completion times to be recorded within the same experimental session.

We manipulated power using an episodic priming procedure. Following Galinsky, Gruenfeld, and Magee (2003), participants recalled a past event in which they were either in a position of power, or in a position of powerlessness. Through the activation of affective, cognitive, and behavioral response repertoires associated with states of power or powerlessness, this procedure affords an examination of the effects of power in situations in which power is not directly experienced (cf. Galinsky et al., 2003). We hypothesized that participants primed with power would show a greater bias in their time predictions than participants primed with powerlessness.

The present study explored the role of self-efficacy beliefs in promoting greater bias in powerful individuals' forecasts. As noted earlier, power could lead to less accurate time predictions because powerful individuals have greater confidence in their abilities to accomplish tasks (cf. Hinds, 1999). To address this conjecture, participants indicated how capable they were of formatting texts (cf. Bandura, 1982).

<div align="center">Method</div>

Participants and Design

Forty students (27 females and 13 males) from the University of Kent participated in exchange for chocolate bars. Participants were randomly assigned to the experimental power conditions (powerful vs. powerless).

Procedure and Materials

Participants were informed that they would take part in a study on episodic memory, and in a separate study focusing on visual perception. At the beginning, participants were asked to provide a vivid written report of a past situation where they had power over another individual, or where someone else had power over them (Galinsky et al., 2003).

Subsequently, participants were asked to format a document using a standard word editing software (Kruger & Evans, 2004). Participants received three dictionary definitions as templates. As shown in Figure 1, the task required putting unformatted text in bold, italics, uppercase, lowercase, as well as to insert punctuations, symbols, brackets, and spaces.

Before participants began the formatting task, they filled in a measure of self-efficacy, asking them to indicate how skilled they were in formatting texts on a scale ranging from 1 (*not at all*) to 9 (*very much*).[1] A female experimenter, who was unaware of the experimental conditions, prompted participants for an estimate of how long it would take them to make all the formatting changes. Unbeknownst to participants, estimates were recorded, and actual completion time was measured using a stopwatch. After completion, participants were thanked, probed for suspicion, and debriefed.

<div align="center">Results and Discussion</div>

Manipulation Check

Participants indicated how much they felt in charge in the situation they described in their essays (1=*not at all*, 9=*very much*). Participants in the powerful condition felt more in charge than did participants in the powerless condition (*M*s = 6.50 vs. 4.05), $t(38) = 3.47$, $p = .001$, d = 1.12, indicating that the manipulation was successful in prompting the recall of past episodes in which participants felt powerful or powerless.

Task Completion Time

Two participants were identified as outliers (>3 x SD) and removed from subsequent analyses. We subjected the two measures of predicted and actual completion time to a 2 (power: powerful vs. powerless) x 2 (time: predicted vs. actual

completion time) mixed model analysis of variance with repeated measurement on the last factor. The analysis yielded the expected main effect of time, $F(1, 36) = 107.83$, $p < .001$, $\eta_p^2 = .75$. Participants took considerably longer to complete the formatting task than they had predicted (Ms = 5.13 vs. 9.02 min). Of special importance, a significant interaction between power and time emerged, $F(1, 36) = 8.22$, $p = .007$, $\eta_p^2 = .19$ (see Table 2). As expected, participants primed with power showed a greater discrepancy between their forecasts and their actual completion time than participants primed with powerlessness (powerful: Ms = 3.95 vs. 8.91 min; powerless: Ms = 6.32 vs. 9.13 min). An examination of simple effects revealed that, while power did not alter participants' actual completion time ($t(36) < 1$), it led to shorter time predictions, $t(36) = 4.70$, $p < .001$, d = 1.57. Paralleling the findings of Study 1, power fostered greater bias in predictions of task completion time. Overall, participants primed with power erred 77% more in their predictions than participants primed with powerlessness (Ms$_{predicted\ vs.\ actual\ time}$ = 4.96 vs. 2.81 min), $t(36) = 2.87$, $p = .007$, d = .96.

We subsequently examined the contributions of self-efficacy to the effects of power.[2] Priming power did not alter participants' self-efficacy beliefs (Ms = 5.68 vs. 5.16), $F < 1$. Inclusion of self-efficacy as a covariate in the mixed model analysis of variance described above also did not alter the effects of power; the interaction between power and time remained unchanged ($F(1, 35) = 7.40$, $p = .010$), and none of the effects involving self-efficacy were significant, ps $\geq .271$. The effects of power on biased time predictions appear, therefore, to be unrelated to differences in self-efficacy beliefs.

The results showed that powerful participants did not complete the formatting task earlier than powerless participants. This contrasts with previous research, which

has found that power facilitates action and can lead to earlier goal-attainment (Galinsky et al., 2003; Guinote, 2007c). Consequently, we also examined participants' performance in terms of number of mistakes made. There was no difference between the experimental conditions (Ms = 16.20 vs. 13.55; $F < 1$), suggesting that in the present study power did not lead to differences in actual performance.

Studies 1 and 2 support the hypothesis that power fosters biases in estimates of task completion time. Across studies, power was associated with greater error in forecasts. These effects emerged in different task domains and could not be attributed to differences in self-efficacy beliefs.

The findings of Studies 1 and 2 are consistent with the notion that powerful individuals focus too narrowly on the anticipated outcome and do not consider sufficiently information that can potentially debias predictions. In the next study, we examined more directly the role of attentional focus as an underlying mechanism for the effects of power.

Study 3

The goal of the present study was to provide evidence for the role of attentional focus in promoting differences in the time estimates of powerful and powerless individuals. To this end, we employed an experimental approach in which we manipulated attentional focus. If the greater bias in the time predictions of powerful individuals derives from a narrow focus of attention on the goal at hand, then drawing attention to additional information that has a bearing on task completion time should render the forecasts of powerful individuals less optimistic. Importantly, no such effect should be observed for powerless individuals, who naturally attend to information that lies outside the focal goal. In more generic terms, by manipulating

the pathway between power and attention (the proposed mediator), we expected to observe corresponding changes in the relationship between power and time estimates (the outcome variable). This would be a first indication for a mediating role of attentional focus (see Spencer, Zanna, & Fong, 2005).

The present study focused on predictions of completion time for everyday activities. Attentional focus was manipulated by drawing attention to relevant past experiences in half of the participants. As noted earlier, taking into account previous experiences can render time predictions more accurate and less optimistic. We expected that power would lead to more optimistic predictions, but this effect would diminish when participants' attention is drawn to relevant previous experiences. We also assessed mood to see if differences in participants' affective states contributed to the effects of power on time predictions.

Method

Participants and Design

Sixty-four students (30 females, 32 males, and 2 unknown genders) from the University of Kent participated in exchange for chocolate bars. They were randomly assigned to the conditions of a 2 (power: powerful vs. powerless) x 2 (attentional focus: past vs. control) between-subjects factorial design.

Procedure and Materials

Participants were informed that they would take part in a study dealing with people's perceptions of social situations, and a study dealing with the planning of future events. Power was manipulated using the same episodic priming manipulation employed in Study 2. As part of an alleged separate study, participants were then instructed to imagine themselves in four hypothetical scenarios that involved the completion of future tasks. Specifically, participants imagined they had to write a

2000-word essay, to get ready for an evening out, to shop in the supermarket, and to prepare a three-course meal. For each scenario, participants could choose one of several response alternatives to indicate their anticipated completion time. For 'essay writing', response alternatives varied from 1 to 14 days in 1-day incremental steps; for 'getting ready to go out' and 'supermarket shopping', response alternatives ranged from 15 min to 4 h in steps of 15 min; and for 'preparing a three-course meal', the responses ranged from 30 min to 6 hs in incremental steps of 30 min.[3] Participants were instructed to imagine themselves having to perform the four tasks. To manipulate attentional focus, half of the participants were instructed to recall how much time it had taken them in the past to complete the tasks described in the scenarios. Following Buehler and colleagues (1994), they were also asked to write a short description of how they were going to perform the tasks in the future considering their previous experiences. This manipulation was designed to draw participants' attention to previous experiences that were relevant for completing their goals (cf. Buehler et al., 1994). Upon completion, all participants estimated the task completion times for the four tasks by choosing one of the response alternatives. Participants also rated their current mood on four 7-point scales, ranging from -3 (*very bad*; *very sad*; *very discontent*; *very tense*) to 3 (*very good*; *very happy*; *very content*; *very relaxed*). On completion, participants were thanked and debriefed.

<div align="center">Results</div>

Manipulation Check

Participants responded to the same manipulation check employed in Study 2. Participants in the powerful condition felt more in charge of the situation than did participants in the powerless condition (Ms = 7.20 vs. 2.74), $t(60) = 11.88$, $p < .001$, d = 3.07, indicating that the priming manipulation was successful.

Task Completion Time

    Attentional Focus. Answers given to the four scenarios were transformed into continuous measures (i.e. *days* or *min*), standardized, and then collapsed into a single score of predicted task completion time (α = .44).[4] This score was subjected to a 2 (power: powerful vs. powerless) x 2 (attentional focus: past vs. control) between-subjects analysis of variance. The analysis yielded the predicted interaction between attentional focus and power, $F(1, 60) = 4.01$, $p = .050$, $\eta_p^2 = .06$ (see Table 3). An examination of simple effects confirmed that, in the control condition, powerful participants predicted on average shorter completion times than powerless participants (*M*s = -.31 vs. .14), $t(60) = 2.21$, $p = .031$, d = .57. Paralleling the findings of the previous studies, power led to more optimistic time predictions. Importantly, when participants' attention was drawn to previous experiences, the predictions of participants primed with power no longer differed from the predictions of participants primed with powerlessness (*M*s = .14 vs. -.05), $t(60) < 1$. Planned contrasts confirmed that drawing attention to relevant past experiences rendered the predictions of participants primed with power less optimistic ($t(60) = -2.05$, $p = .045$, d = .53), but it did not affect the predictions of participants primed with powerlessness, $t(60) < 1$. No other significant effects emerged, Fs < 1. These results lend support to the assumption that differences in attentional focus underlie the effects of power on time predictions.

    Mood. There was a marginal tendency for participants primed with power to report being in a better mood than participants primed with powerlessness (Ms = .65 vs. .16), $t(60) = -1.81$, $p = .075$, d = .47. Nevertheless, inclusion of mood as a covariate in the analysis of variance described above did not alter the effects of power; the interaction between attentional focus and power remained unchanged ($F(1,$

57) = 4.61, p = .036), and differences in mood did not account for any variance in time predictions, $F < 1$. These results indicate that the effects of power were unrelated to differences in mood.

Retrospective Time Estimates. If power affected time predictions by altering the ways participants allocated attention in the planning of the future, then one would expect no difference in the retrospective time estimates of powerful and powerless participants. To confirm this supposition, we created a composite index of past completion time (α = .56), which did not differ between powerful and powerless participants (Ms = .12 vs. -.16), $t(32)$ = 1.25, p = .220. We also examined the correlations between past and future completion times. As expected, this correlation was very high ($r(32)$ = .93, $p < .001$) and did not differ as a function of power, $z < 1$. These results support the conclusion that power affected time estimates through its effects on future planning behavior.

The findings of Study 3 support the hypothesis that power affects goal-directed attention in ways that induce optimistic predictions of task completion time. Similar to the previous studies, participants primed with power predicted shorter completion times than participants primed with powerlessness. Drawing participants' attention to relevant information that lies outside the focal goal (here: past experiences) eliminated the effects of power on time predictions. The manipulation of attentional focus only affected powerful, but not powerless participants. Moreover, power only led to differences in future time estimates, but it did not affect time estimate for the past. These results are consistent with a causal role of attentional focus in promoting greater bias in powerful individuals' forecasts.

We conducted a subsequent study to establish the generalizability of our findings. To this end, we examined individual differences in power within a larger

survey that was conducted over the course of an academic term. The study also explored further underlying mechanisms of the effects of power. As noted earlier, a greater bias in the time predictions of powerful individuals could also arise from differences in optimism. Powerful individuals might dismiss debiasing information because they are generally more optimistic about the future (Anderson & Galinsky, 2006). Our next study examined the role of optimism in the present findings. We also included measures of self-efficacy and mood to see if these variables contributed to the effects of power in the context of the field survey.

Study 4

In the present study, students estimated the time it will take them to complete a coursework assignment, and estimates were compared against actual completion time, paralleling the procedure of Study 1. Unlike Study 1, the present study followed an individual difference approach and participants indicated how much power they experienced in their everyday relationships with other people (Anderson, John, & Keltner, 2005; cited in Anderson & Galinsky, 2006). This measure of *sense of power* was embedded in a university-wide survey. The survey was carried out towards the beginning (time 1) and the end (time 2) of the academic term. We reasoned that if individual differences in power predict bias in time estimates in this diverse sample, and over a prolonged period of time, then this would be a strong indicator for the generalizability of our findings.

Another goal of the present study was to examine different underlying mechanisms for the effects of power. Specifically, we included a measure of optimism to see if the greater optimism typically observed in powerful individuals contributes to the greater bias in powerful individuals' forecasts. As in Study 3, we assessed mood to see if power promoted more optimistic estimates because power can

elevate people's mood (Keltner et al., 2003). Lastly, as in Study 2, we measured self-efficacy to examine whether power leads to greater bias in time estimates in part because powerful individuals have greater confidence in their abilities.

Method

Participants and Design

Four-hundred and twenty-one students (270 females and 151 males) from the University of Kent participated in the first part of this correlational study (time 1). Lottery tickets for a £50 (~ $70) cash-prize draw were offered in return for participation. Two-hundred and forty-nine students (165 females and 84 males) completed the second part of the study (time 2). Participants were enrolled in various degrees across more than twelve subject areas; 83% studied at undergraduate level and 17% pursued graduate studies.

Procedure and Materials

Towards the beginning of the academic term (time 1), an email was distributed university-wide, inviting students to participate in an online study on individual differences and student-life perception. The web-based survey asked participants to specify a written coursework assignment that they had to submit by the end of the academic term, as well as the exact deadline for their assignment (week, day, hours). Next, participants made a number of time predictions for different tasks required to complete their assignment. They indicated when they were going to start reading for their assignment, when they were going to start writing, when they were going to finish writing, and when they were going to submit their assignment. Participants were given the opportunity not to respond if a task did not apply to their particular assignment.

The survey also employed a number of individual difference measures. Eight items assessed how much power participants had in their everyday relationships with other people (Anderson, John, & Keltner, 2005). Example items include '*In my relationship with others, I can get people to listen to what I say*', or '*I can get others to do what I want*' (1=*disagree strongly*, 7=*agree strongly*). Furthermore, a ten-item scale measured participants' degree of optimism (LOT-R; Scheier, Carver, & Bridges, 1994). Example items include '*In uncertain times, I usually expect the best*', or '*I rarely count on good things happening to me*' (reverse coded) (1=*disagree a lot*, 5=*agree a lot*). A ten-item scale assessed participants' self-efficacy beliefs (Schwarzer & Jerusalem, 1995). Example items are '*I am certain that I can accomplish my goals*', or '*I can always manage to solve difficult problems if I try hard enough*' (1=*not at all true*, 4=*exactly true*). Finally, a four-item scale measured participants' mood (-3=*very bad, very sad, very discontent, very tense*; 3=*very good, very happy, very content, very relaxed*). Participants also indicated their academic and demographic background, and at the end they described what they thought were the aims of the study.

At time 2, an invitation for a follow-up survey was sent to participants' email-addresses, typically within 2 weeks after their assignment had been due. Participants were reminded of the nature of their assignment. They then indicated when they had completed each of the four tasks (i.e., start reading, start writing, finish writing, submission) using the same items employed at time 1. At the end, participants were probed for suspicion and debriefed. Background information was sent to all participants enrolled in the study.

<div align="center">Results</div>

Data Preparation

For unknown reasons, 39 participants made predictions for past assignments, or assignments that were due shortly after (<2 weeks) time 1. Moreover, four participants expressed an intention to submit their assignments more than one week past the deadline. These participants were omitted from subsequent analyses.[5] The final sample consisted of 206 participants.

We only considered time estimates for future tasks. For example, if participants had already begun reading for their assignment at time 1, then their time estimates for this task (start reading) were not considered. This procedure resulted in the omission of 16.8% of all temporal data (i.e., predicted and actual completion time). In addition, 1.2% of the temporal data was discarded because of missing time 1 or time 2 comparators.

We coded predicted and actual task completion time in number of days before the deadline, separately for each of the four tasks. Higher values indicate earlier completion times. Table 4 displays descriptive statistics for these data. On average, participants completed all four tasks later than predicted. This difference was significant for all but one task ('start reading').   Next, we created single indices for all variables in preparation for subsequent regression analyses.[6] We standardized participants' time 1 predictions for the four tasks and averaged those scores into a single index of predicted task completion time ($\alpha = .81$, $M = .04$, $SD = .87$). A single index of actual task completion time was created in the same way for the time 2 data ($\alpha = .85$, $M = -.02$, $SD = .90$). We also subtracted the actual from the predicted completion times, separately for each of the four tasks to create indices of temporal bias. This was done using the unstandardized raw data. The difference scores were then standardized and merged into a single index of biased time predictions ($\alpha = .86$, $M = .05$, $SD = .89$). Higher values indicate greater underestimates of task completion

time. Lastly, we averaged the individual differences measures into single indices of

sense of power (α = .84, M = 4.66, SD = .88), self-efficacy (α = .86, M = 3.00, SD =

.44), optimism (α = .80, M = 3.26, SD = .78), and mood (α = .81, M = .67, SD = 1.16).

Reverse coded items were recoded prior to data aggregation.

Task Completion Time

    Sense of Power. Table 5 displays the zero-order correlations between all

indices derived from the present study. As can be seen, sense of power was positively

related to predicted task completion time, $r(204)$ = .20, p = .005. Paralleling the

findings of the previous studies, the greater participants' sense of power, the earlier

participants anticipated completing their assignments. Differences in power did not

relate to differences in actual completion time, $r(204)$ = -.03, p = .667. Most

importantly, power was associated with an increased bias in participants' forecasts,

$r(204)$ = .21, p = .003. The greater participants' sense of power, the more participants

underestimated the time it would take them to complete their assignment.

    Mediating Variables. Sense of power was positively related to optimism, self-

efficacy, and mood (see Table 5), rs(204) $\geq$ .19, ps $\leq$ .008. To see if any of these

variables contributed to the effects of power, we conducted a series of regression

analyses in which we entered sense of power and the control measures as predictors of

predicted task completion time, and as predictors of bias. Controlling for the effects

of optimism, sense of power exerted a significant effect on predicted task completion

time (β = .17, p = .023), and on bias (β= .22, p = .004). Similarly, controlling for the

effects of self-efficacy, the effects of power remained significant (predicted task

completion time: β = .18, p = .019; bias: β = .15, p = .044). The same picture

emerged when we controlled for differences in mood (predicted task completion time:

β = .17, p = .013; bias: β = .18, p = .009). Lastly, when all control measures were

entered simultaneously in multiple regression, power emerged as the only significant ($p<.05$) predictor (predicted task completion time: $\beta = .16$, $p = .036$; bias: $\beta = .16$, $p = .035$).   Additional Sobel tests revealed that there were no indirect effects of sense of power on predicted task completion time, or on bias via any of the control measures (optimism: $Z_{Sobel}s \leq 1.14$, $ps \geq .253$; self-efficacy: $Z_{Sobel}s \leq 1.59$, $ps \geq .110$; mood: $Z_{Sobel}s \leq 1.57$, $ps \geq .116$).   Together, these results indicate that power affected time estimates independently of optimism, self-efficacy, and mood.[7]

Additional Analyses

Gender. The larger sample size of Study 4 allowed us to explore the role of gender differences. Independent sample *t*-tests revealed that gender was unrelated to predicted and actual task completion times, and it did not account for any variance in bias, $ts(204) < 1$. Inclusion of gender in the above described multiple regression analyses did not alter the effects of sense of power (predicted task completion time: $\beta = .20$, $p = .004$; bias: $\beta = .21$, $p = .003$). Additional moderated multiple regression analyses following the procedure outlined by Aiken and West (1991) confirmed that gender did not moderate the effects of sense of power, $ps \geq .159$. Taken together, gender did not contribute to the present findings.

Task complexity. To examine whether power affected time predictions independently of task content, we also explored the role of task complexity. Two independent coders rated the complexity of the assignments described by participants at time 1 on a five-point scale (1=*not at all,* 5=*very much*). The ratings were highly correlated and averaged into a single score ($\alpha = .81$, $M = 3.19$, $SD = .73$). We then conducted two separate moderated regression analyses, using the standardized complexity ratings, the sense of power scores, as well as the interaction term of those two variables as predictors of predicted task completion time, and as predictors of bias

(see Aiken & West, 1991). Only sense of power emerged as a significant predictor from these analyses (predicted task completion time: $\beta = .20$, $p = .004$; bias: $\beta = .21$, $p = .003$), and none of the effects involving task complexity were significant, $ps \geq .156$. This suggests that power affected time predictions irrespectively of task complexity.

Focusing on individual differences in power, Study 4 provided further evidence for the hypothesis that power biases time predictions. A university-wide survey found that the more students experienced a sense of power in their everyday relationships with others, the earlier they anticipated completing a future assignment, and the more their time predictions were prone to error.

Study 4 also explored the contributions of a number of factors to the effects of power. Consistent with past research on time planning (Buehler & Griffin, 2003; Jørgensen & Faugli, 2006), no support was found for the role of optimism in promoting greater error in the forecasts of powerful individuals. Corroborating the findings of Studies 2 and 3, the effects of power were independent from differences in self-efficacy and from differences in mood. Contributing to the generalizability of the present findings, the effects of power emerged outside the laboratory in a diverse sample, over a prolonged period of time, and across a range of tasks.

General Discussion

People tend to underestimate the time it takes them to accomplish future tasks. This bias in time predictions originates from the way people allocate attention in the planning of future events. Specifically, people tend to focus too narrowly on the intended outcome and tend to neglect additional information that could make predictions more accurate and less biased (i.e., impediments, previous experiences, and task subcomponents). In the present article, we tested the hypothesis that power increases biases in predictions of task completion time. This hypothesis derived from

previous research showing that power induces a goal-directed attention focus (Guinote, 2007a, 2007c).

Four studies tested, and found support for these hypotheses. Across different domains, involving the planning of academic work (Studies 1 and 4), computerized tasks (Study 2), and everyday activities (Study 3), powerful participants, more than control (Study 1) or powerless participants (Studies 2-4), consistently underestimated the time it would take them to complete future tasks. This pattern was observed using a variety of operationalizations of power, ranging from actual control over outcomes (Study 1), to priming power and powerlessness (Studies 2 and 3), and measuring individual differences in sense of power (Study 4). Together, these studies show for the first time that power has a fundamental impact on planning behavior, increasing biases in time estimates. These findings are important because the planning of powerful individuals has wide-ranging implications for individual, organizational, and societal outcomes.

Across the four studies, we examined several factors that are of relevance to the link between power and underestimates of time. We did not find evidence that power leads to greater bias in time predictions because powerful people are more optimistic; consistent with previous research on time planning (see Buehler & Griffin, 2003; Jørgensen & Faugli, 2006). Likewise, the effects of power could not be attributed to differences in people's beliefs in their abilities (i.e., self-efficacy), or to differences in mood.

Consistent with previous research on time predictions (e.g., Buehler & Griffin, 2003; Buehler et al., 2002; Newby-Clark et al., 2000; Kruger & Evans, 2004), Study 3 found support for the role of attentional focus as an underlying mechanism for the effects of power. In this study, drawing participants' attention to relevant information

that lies outside the focal goal eliminated the otherwise observed differences in the time predictions of powerful and powerless individuals. This lends support to the assumption that the effects of power on time predictions derive from the way power affects the allocation of attention in the planning of future events.

Some caveats of the present research should be addressed. First, none of our studies manipulated powerlessness together with a baseline condition. The present research is, therefore, not conclusive as to whether lacking power *reduces* the tendency to underestimate time. Lack of power broadens individuals' attentional focus (Guinote, 2007b) and lessens motivational states associated with approach (Keltner et al., 2003; Smith & Bargh, 2008). By the same token that high power increases bias in time predictions we believe that low power should reduce the tendency to underestimate time. Tentative support for this assertion derives from Study 3, which found a linear increase in bias moving from low levels of experienced power to high levels of power.

Second, while previous research has shown that power facilitates action (Galinsky et al., 2003) and leads to swifter goal-attainment (Guinote, 2007c), the current work provided only mixed evidence for such effects. Power benefited goal striving in Study 1, but it did not lead to faster goal-attainment in Studies 2 and 4. Different factors could account for the variability in the findings. The formatting task in Study 2 was repetitive and not very demanding on executive functions (e.g., prioritization, cognitive flexibility), which could have minimized the benefits of power for goal pursuit. In Study 4, participants had to deal with a multitude of goals that typically arise throughout the course of an academic term. Power might have led to greater efficiency in the pursuit of other, more immediate goals that were not

assessed in the study (e.g., other assignments, social goals), which could explain the discrepancy between past research and the present findings.

Finally, only one study provided direct evidence for the role of attentional focus in contributing to the effects of power. More research is needed to further investigate how attentional focus operates to promote differences in the time predictions of powerful and powerless people. For instance, it would be important to establish which sources of information are neglected by powerful individuals that render their time estimates less accurate. This information might vary between tasks and contexts. For example, the tendency to neglect previous experiences might be more influential in promoting bias in the predictions of mundane activities (Study 3), while the tendency to neglect detailed aspects of a task might carry greater weight in promoting bias in a novel formatting task (Study 2).

Power affects *how* people conceive information that lies in the focus of attention. Specifically, power fosters abstraction (Smith & Trope, 2006; see also Guinote et al., 2002), leading powerful individuals to construe information at a higher-level of information processing (cf. Semin & Fiedler, 1988; Trope & Liberman, 2003; Vallacher & Wegner, 1987). One question that arises is what role abstraction plays in the present findings. When people construe tasks in abstract terms they tend to focus more on the desirability of end-states and less on the feasibility of reaching those end-states (Liberman & Trope, 1998). By drawing individuals' attention to task outcomes and away from task subcomponents, abstraction can contribute to *increase* biases in time predictions (cf. Kruger & Evans, 2004).

At the same time, abstraction can also contribute to *reduce* biases in time predictions. It has been shown that when people form concrete plans about the future

they are more prone to bias in their forecasts (Buehler & Griffin, 2003). One reason why this tends to be the case is that events that are construed at a concrete level are perceived as more atypical and unique (e.g., Liberman, Sagristano, & Trope, 2002; Smith, 1998). Conversely, events that are construed at a more abstract level are perceived as more prototypical and common. As a result, abstraction counteracts the 'inside view' and increases the likelihood that people will consider past experiences in their forecasts (cf. Kahneman & Lovallo, 1993). Taken together, abstraction may be a double-edged sword and may have opposing effects on the tendency of powerful individuals to underestimate time.

It is important to note that we only examined time predictions for tasks that were unrelated to the exercise of power. Previous research on time planning has shown that the greater individuals' motivation to accomplish a goal, the more people tend to be biased in their forecasts (Buehler, Griffin, & MacDonald, 1997; Byram, 1997). One might well expect that power fosters even greater bias in forecasts when the stakes are high. Indeed, some of the historic mistakes in time planning occurred when those in charge were under pressure to succeed (Hall, 1980; Schnaars, 1989). Empirical research is required to establish how power affects time estimates for tasks that are relevant to the maintenance, or to the furtherance of people's power.

Lovallo and Kahneman (2003) pointed out that the same mechanisms that make people prone to underestimate time also increase the likelihood that individuals take unwarranted risks. The present findings thus complement past research that has shown that power promotes more optimistic risk-assessment (Anderson & Galinsky, 2006). The planning behavior of powerful individuals could be another factor that contributes to the propensity of powerful individuals to take risks.

Contributions

The present research contributes to the literature on time predictions by showing that one's position in a social hierarchy can alleviate or strengthen biases in forecasts. Previous research has focused primarily on the role of situational variables (e.g., incentives, see Buehler et al., 1997) and particularities of the task (e.g., duration, see Roy, Christenfeld, & McKenzie, 2005) as determinants of temporal biases. As the present findings show, the extent to which people control their own and other individuals' outcomes affects time estimates.

There has been a recent accumulation of evidence suggesting that power leads to greater efficiency in a number of domains, including decision making (e.g, Smith, Dijksterhuis, & Wigboldus, 2008), goal pursuit (e.g., Guinote, 2007c), and general cognitive functioning (e.g., Guinote, 2007b; Smith, Jostmann, Galinsky, & van Dijk, 2008). The present findings are important because they show that power does not always have beneficial effects; it can be detrimental for planning and lead to greater errors in forecasts.

The present findings have significant applied value as they point out that those who are typically in charge of planning (e.g., managers; decision and policy makers) are more at risk to fall prey to biases in their forecasts. This is not only important because of the economic costs associated with inaccurate time estimates (e.g., Buehler et al., 1994); overly ambitious time scales can put employees under pressure, induce stress, and contribute to overtime work (see Sparks, Cooper, Fried, & Shirom, 1997; Burchell, Ladipo, & Wilkinson, 2001). In this view, biases in time predictions of decision makers could have significant adverse effects on the well-being and general quality of life of employees. Future research should address these broader implications of the present findings.

Notably, the present research also points out ways to alleviate the biasing effects of power. Specifically, Study 3 suggests that forecasting accuracy could be improved by using techniques that draw people's attention to information that lies outside the focal goal. Moreover, changing the power structure of planning committees could also be a way to render forecasts more accurate (e.g., by assigning greater weight to the predictions of individuals who do not have power). It remains for future research to explore the applications of the present findings for the prevention of human biases in forecasts.

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Authors' Notes

Footnotes

[1] See Maibach & Murphy (1995) for a single judgment approach to measure self-efficacy.

[2] The self-efficacy scores were normally distributed and centered on the midpoint of the scale, $M = 5.42$, $SD = 2.20$, $Z_{\text{Kolmogorov-Smirnov}} = .80$, $p = .541$.

[3] The response alternatives were chosen based on a pre-test with students ($N = 42$) who had responded in an open-ended format to the four scenarios.

[4] The effects reported in Study 3 did not differ reliably between the four scenarios.

[5] Natural breaks in the data supported the decision on the cut-off points for excluding participants. Retention of all participants did not significantly alter the results.

[6] In Study 4 we chose multiple regression as the data analytic strategy due to the continuous nature of the independent variables (e.g., Aiken & West, 1991; Cohen & Cohen, 1983). All other studies employed the general linear model (GLM) procedure, which yields equivalent results as multiple regression analyses.

[7] Interestingly, the analyses also showed that sense of power mediated the effects of self-efficacy on temporal bias. When controlling for power, the effects of self-efficacy were no longer significant ($\beta = .12$, $p = .106$), and there was a reliable indirect effect of self-efficacy via power, $Z_{\text{Sobel}} = 1.95$, $p = .051$. One interpretation of the overall pattern of the results is that elevated self-efficacy beliefs were a consequence, but not an antecedent of the greater goal-focus of powerful individuals.

Table 1

Predicted and actual completion times of written assignment (Study 1)

Task	Task completion time				t	Df
	Predicted		Actual			
	M	SD	M	SD		
First Draft	6.50_a	2.57	3.60_a	1.60	9.45^{***}	19
Final Draft	4.00_b	1.69	1.55_b	1.00	9.20^{***}	19
Submission	$.95_c$	.76	$.50_c$	.51	2.13^{*}	19

Note. $^{*} = p < .05$, $^{***} = p < .001$. Means display number of days *before* a designated deadline. Means with differing subscripts within columns are significantly different, $p < .001$.

Table 2

Actual and predicted completion times as a function of condition (Studies 1-2)

| | | Task completion time | | | |
| | | Predicted | | Actual | |
		M	SD	M	SD
Study 1[a]					
	Powerful	4.93	1.33	2.47	.71
	Control	2.70	.66	1.30	.60
Study 2[b]					
	Powerful	3.95	1.27	8.91	1.28
	Powerless	6.32	1.80	9.13	2.51

[a] Scores indicate number of days *before* a deadline

[b] Completion time of formatting task in minutes

Table 3

Predicted task completion time as a function of experimental condition (Study 3)

	Powerful		Powerless	
Focus	M	SD	M	SD
Control condition	-.31	.39	.14	.70
Past focus	.14	.80	-.05	.57

Note. Scores are z-standardized time estimates for a series of tasks

Table 4

Predicted and actual completion times of written assignment (Study 4)

| Task | Task completion time | | | | | |
| | Predicted | | Actual | | | |
	M	SD	M	SD	*t*	*Df*
Start Reading	31.01$_a$	16.95	27.85$_a$	26.04	1.49	97
Start Writing	26.21$_b$	17.63	17.40$_b$	19.45	6.41***	159
Finish Writing	8.96$_c$	14.07	3.81$_c$	15.98	5.00***	188
Submission	3.33$_d$	9.16	-.83$_d$	14.54	4.24***	205

Note. *** = $p < .001$. Means display number of days *before* a designated deadline. Means with differing subscripts within columns are significantly different, $p < .001$.

Table 5

Zero-order correlations between individual difference measures and predicted and actual completion time (Study 4)

	Individual Difference Measures (t1)			Task completion time		
	Optimism	Self-Efficacy	Mood	Predicted	Actual	Difference (Bias)
Sense of Power	.345***	.436***	.185**	.196**	-.030	.207**
Optimism		.484***	. 388***	.142*	.070	.050
Self-Efficacy			.257***	.114	-.078	.190**
Mood				.155*	-.022	.158*

Note. * = p < .05, ** = p < .01, *** = p < .001. N = 206 for all analyses.

Figure Captions

Figure 1. Example of formatting task used in Study 2.

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anthropophagus *n., pl.* **–gi**. A cannibal. [Lat. *anthropophagus* < Gk. *anthropophagos*, man-eating: *anthropo-*, anthropo-+ *-phagos*, -phagous.] **-anthropophagic**, **anthropophagous** *adj.*, **anthropophagy** *n.*

Unformatted text:

anthropophagus n pl gi a cannibal lat anthropophagus gk anthropophagos maneating anthropo anthropo phagos phagous anthropophagic anthropophagous adj anthropophagy n