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The psychology of task management: The smaller tasks trap

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Abstract

When people are confronted with multiple tasks, how do they decide which task to do first? Normatively, priority should be given to the most efficient task (i.e., the task with the best cost/benefit ratio). However, we hypothesize that people consistently choose to address smaller (involving less work) tasks first, and continue to focus on smaller tasks, even when this strategy emerges as less efficient, a phenomenon we term the "smaller tasks trap". We also hypothesize that the preference for the smaller tasks is negatively related to individual differences in the tendency for rational thinking. To test these hypotheses, we developed a novel paradigm consisting of an incentive-compatible task management game, in which participants are saddled with multiple tasks and have to decide how to handle them. The results lend weight to the smaller tasks trap and indicate that individual differences in rational thinking predict susceptibility to this trap. That is, participants low in rational thinking preferred to start with a smaller (vs. larger) task and focused more on the smaller tasks regardless of their efficiency. Consequently, their overall performance in the task management game was significantly lower. We discuss the theoretical and practical implications of these findings and suggest possible interventions that may help people improve their task management.

Keywords: tasks management, goals pursuit, cognitive style, heuristics and biases

1 Introduction

In modern life, individuals are swamped with tasks. To cope with this overload, people must handle multiple tasks efficiently (Neal, Ballard & Vancouver, 2017). Nevertheless, a large body of evidence in behavioral economics indicates that people manage their tasks in suboptimal ways (e.g., Ariely & Wertenbroch, 2002; O'Donoghue & Rabin, 2000; Rabin, Fogel & Nutter-Upham, 2011; Steel, 2007), and that this behavior has fundamental implications for both work settings and daily life (e.g., Steel, Brothen & Wambach, 2001; Tice & Baumeister, 1997). Many of us are familiar with suboptimal task management. Take for instance researchers who reserve time to handle an important task (e.g., writing a research proposal for an important grant), which are essential for their career but instead end up wasting a great deal of valuable time on marginal less important tasks. These situations are not confined to academic settings, but are also prevalent in business, among managers and other workers (De Meza, Irlenbusch & Reyniers, 2008; Steel, 2007).

The current research examined the role of task size (smaller vs. larger) and individual differences in cognitive style (rational and intuitive) in shaping task management decisions. We juxtaposed normative (cost/benefit) considerations against the preference to avoid effort and prioritize smaller tasks over larger tasks. The discussion puts forward ways to help people prioritize tasks, by suggesting that different perspectives on effort evaluation may lead to differential behavioral patterns.

1.1 Normative considerations for prioritizing smaller tasks

When confronted with multiple tasks (or multiple goals), the normative approach is to rely on a cost/benefit analysis, and to schedule tasks according to their relative utility to maximize the overall expected utility (e.g., von Neumann, Morgenstern & Kuhn, 2007). For example, if the target is to maximize the monetary return within a given timeframe, a normative approach would be to start with the task that yields the highest monetary return per unit of time. When this task is completed, the next step would be to move to the task with the next highest ratio of return, and so on. In other words, individuals are expected to prioritize the tasks with the highest rewards and postpone others. In line with these assertions, descriptive models of multiple goal pursuit generally assume that people direct resources toward the goal with the highest expected utility (Ballard, Vancouver & Neal, 2018; Klein, Austin & Cooper, 2008; Kanfer, Chen & Pritchard, 2008; Neal et al., 2017; Schmidt & DeShon, 2007; Shenhav et al., 2017; Vancouver, Gullekson, Morse & Warren, 2014; Vancouver, Weinhardt & Schmidt, 2010).

Although the immediate cost/benefit ratio of a task is the obvious normative criterion for utility maximization in the short term, people may also employ strategies that are more sophisticated in order to increase utility over time. One ap-

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proach may direct individuals to start with a task that yields a lower immediate benefit, but has some advantages to the overall benefit. Ample research lends credence to the benefits of starting with smaller tasks (proximal sub-goals). The main rationale is that smaller tasks enable the activation of thinking capacities (i.e., warm up), and lead to a higher level of efficiency before approaching more demanding tasks (Anshel & Wrisberg, 1993; Kahol, Satava, Ferrara & Smith, 2009; Shellock & Prentice, 1985). Smaller tasks can serve as a vehicle for facilitating self-efficacy and motivation (e.g., Bandura, 1982, 1986; Bandura & Locke, 2003; Hull, 1932; Kivetz, Urminsky & Zheng, 2006; Kozlowski & Bell, 2006; Latham & Seijts, 1999; Manderlink & Harackiewicz, 1984; Louro, Pieters & Zeelenberg, 2007; Nunes & Drèze, 2006; Seijts, 1998). In addition, smaller tasks can provide temporal feedback, which might encourage effective task learning, and consequently increase the likelihood of success (Northcraft, Schmidt & Ashford, 2011; Schmidt & Dolis, 2009). Finally, starting with smaller tasks might help minimize the number of pending tasks, and "clear the deck" so as to better concentrate on larger tasks. Pending tasks might be perceived as background noise or distractions, which increase stress and reduce the attention span (Baron, 1986), and hence, may impair performance on larger tasks that involve more information processing (Speier, Vessey & Valacich, 2003).

These works suggest that in certain situations, a thorough normative consideration of task scheduling could encourage people to start with smaller tasks to enhance their overall performance. According to this approach, a rational agent would thus be expected to start with smaller tasks whenever it is more effective, compared to the other tasks at hand in terms of cost/benefit ratio, or when the smaller tasks help to increase utility in the long term. In both cases, rational agents would be expected to attend to their pending tasks in a way that would maximize their overall utility.

1.2 Irrational considerations for prioritizing smaller tasks

The heuristic and bias approach provides a wide range of examples in which limited cognitive capacities, intuitions and emotions lead individuals to rely on rules of thumb, which under certain conditions can lead to cognitive biases and suboptimal behavior (e.g., Ariely, 2008; Kahneman & Tversky, 2013; Tversky & Kahneman, 1974). Cognitive biases may also impair individuals' task prioritization strategies. One putative antecedent that could encourage people to start with smaller tasks might be an attempt to avoid cognitive load. People treat cognitive effort as aversive and costly, and hence may endeavor to avoid or procrastinate what they perceived as effortful processing (Allport, Clark & Pettigrew, 1954; Gigerenzer & Goldstein, 1996; Simon, 1956). Studies utilizing a variety of methods have identified these types of behavioral tendencies that often lead to biases. For example, Kool, McGuire, Rosen and Botvinick (2010) reported that participants preferred a less demanding course of action (operationalized as the lower likelihood of a task switch), even when they thought that their choice would result in a longer session. Similarly, Westbrook, Kester and Braver (2013) found that participants preferred to relinquish rewards in order to avoid a high-effort task. The central premise of these studies was that mental effort entails subjective costs that could be dissociated from objective task costs, as quantified by indirect measures such as "time on task" and actual error rates.

Even when people want to behave rationally and adhere to normative considerations, they may fail to make efficient use of internal and external cues to determine when to attend to a task (Kool & Botvinick, 2013, 2014; Rabin et al., 2011). Recently, Dunn and Risko (2016) suggested that individuals' estimations of task effort are based on metacognition (Dunn, Lutes & Risko, 2016; Dunn & Risko, 2016), and as such, are largely inferential and are sensitive to preconceived biases, beliefs, and intuitive theories (Koriat, 2006). In a similar vein, Gray, Sims, Fu and Schoelles, (2006) argued that given the wide range of possible variations in natural and artificial environments, individuals carry out actions in an interactive manner. Instead of choosing an optimal strategy to achieve their global goal, they rely on local cues from the environment, and choose the least effort micro-strategies to accomplish sub-goals. These researchers suggested that patterns of behavior chosen to optimize efficiency and effectiveness at the local level do not necessarily lead to optimal performance at the global level (Fu & Gray, 2004; Gray et al., 2006; Gray & Fu, 2004). Although Gray and colleagues referred to low order cognitive activities such as perceptual-motor activities and memory retrieval, the same logic may also apply to higher order cognitive processes, such as judgment and decision making. In particular, people who make recurring choices on which sub-goal to address may base their evaluations on information pertaining to each proximal local sub-goal (single choice) rather than on information relating to the global goal. This strategy is likely to focus individuals on achieving the proximal sub-goals instead of attaining the objectives of the global goal.

People are motivated not only to minimize the cognitive effort needed to achieve task objectives, but also to minimize the "time on task" (Bogacz, Brown, Moehlis, Holmes & Cohen, 2006; Gray et al., 2006). Here as well, a "local" focus on the choices between a small and a large task may lead to a preference for smaller tasks over larger tasks, which require more time. In line with this notion, Amar, Ariely, Ayal, Cryder and Rick (2011) found that people saddled with multiple monetary debts are primarily motivated to pay off small debts first, regardless of their interest rate. This tendency was also evident in situations in which "closing the small debts first" led to sub-optimal performance in reducing the total debt. Achieving sub goals may provide an illusion of control and a sense of tangible progress toward the goal (e.g., Hull, 1932; Kivetz et al., 2006; Nunes & Drèze, 2006), but may actually diminish people's ability to pursue superordinate goals (e.g., Amir & Ariely, 2008; Fishbach & Dhar, 2005; Fishbach, Dhar & Zhang, 2006; Heath, Larrick & Wu, 1999).

These studies suggest that when pursuing multiple goals, flawed evaluations of task information might yield a suboptimal preference for smaller tasks. In particular, focusing on the local (rather than on the global) level of the goal might foster a tendency to start with the smaller tasks and stick with them, even when this strategy turns out to be less rewarding than prioritizing the larger tasks.

1.3 Individual differences in rational thinking and the "smaller tasks trap"

A large body of research has shown that individual differences in thinking style measured by the Rational Experiential Inventory (REI) (Epstein, Pacini, Denes-Raj & Heier, 1996) have a crucial effect on choice behavior (Bruine de Bruin, Parker & Fischhoff, 2007, 2012; Lauriola, Panno, Levin & Lejuez, 2014; Soane & Nicholson, 2008; Yechiam, Busemeyer Stout & Bechara, 2005; Zakay, 1990), judgmental biases (e.g., Ayal, Hochman & Zakay, 2011; Ayal, Rusou, Zakay & Hochman, 2015) and task management (Cacioppo, Petty, Feinstein & Jarvis, 1996; Kool et al., 2010; Westbrook et al., 2013). Specifically, research has indicated that the value of cognitive effort is likely to vary across individuals (Kool et al., 2010; Westbrook et al., 2013). Individuals high in the "need for cognition" personality trait are more likely to engage in effortful information-processing activities, while individuals low in "need for cognition" are more likely to avoid effort (Cacioppo et al., 1996; Kool et al., 2010; Westbrook et al., 2013), and are less task oriented (Witkin & Goodenough, 1977).

Findings also show that individuals low in rational thinking tend to rely more on heuristics and simplifying strategies that can lead to biased decision making (e.g., Ayal, Zakay & Hochman, 2012; Banks & Oldfield, 2007; Pacini & Epstein, 1999), while people with a higher tendency for rational thinking are more likely to seek diagnostic information (Cacioppo et al., 1996). These differences in information seeking and processing might lead to differences in reliance on a local vs. a global perspective when evaluating information for task prioritization. Reliance on simplifying strategies may encourage a focus on local information cues, whereas a tendency to seek information may draw attention to the global picture. Importantly, however, findings consistently indicate no statistical association between the Rational Thinking Scale and the Experiential Thinking Scale of the REI (e.g., Ayal et al., 2012; Epstein et al., 1996; Pacini & Epstein, 1999). In fact, in contrast to the rational thinking style, the experiential (intuitive) thinking style was not found to be a good predictor of biased decisions (for a review see Ayal et al., 2012; Ayal et al., 2015).

1.4 The current research

Taken together, the literature reviewed here suggests that when managing multiple tasks, individuals, and in particular those scoring low in rational thinking may be more likely to prioritize smaller tasks over the larger tasks. Yet, it remains unclear whether, in environments that involve repeated task sequencing, this choice pattern would persist even when approaching the smaller (vs. larger) tasks yields lower benefit. To better understand the considerations driving tasks' prioritization we developed a novel paradigm that consists of an incentive-compatible task management game for the laboratory.

1.4.1 Overview of the task management game

The task management game simulated a real-life multiple-tasks environment in a real estate company. Participants were presented with a work environment consisting of 30 tasks, each of which required the retrieval of information from the paper version of a price-list for apartments (see Appendix A). Participants were required to make repeated task scheduling choices within a fixed time interval of 15 minutes. During this timeframe, participants could earn points to enter lotteries for shopping coupons. The number of points earned was contingent on the number and type of task completed. The more points earned (relative to the other participants), the more lotteries they could take part in (see detailed information in Appendix B). Since participants were informed that they could not complete all the tasks within the allotted timeframe, their ultimate goal was to schedule the tasks in a way that would maximize the overall number of points earned.

The tasks varied only in size (number of data items to be retrieved) and profit (number of points awarded per unit of work). All other variables were kept constant. The amount of information retrieved in each task type, and the number of points awarded were designed to pit normative (cost-benefit) considerations against the smaller tasks trap. Fifteen out of the thirty tasks required the retrieval of 3 pieces of data, and were awarded 1 point (the smaller tasks) and fifteen tasks required the retrieval of 9 pieces of data, and were awarded 4 points (the larger tasks). Deliberately, the larger tasks were more taxing, but also more profitable than the smaller tasks. A single larger task in our game required more units of work (the retrieval of 9 vs. 3 data items) and more time than a single smaller task, and therefore involved more effort. However, a single larger task yielded higher benefits than three smaller tasks (4 points instead of 3 points in total), although both required the same effort (the retrieval of 9 pieces of data). Therefore, the larger tasks resulted in a higher profit per unit of work. A pilot study confirmed that only some of the presented tasks could be completed within the allotted time frame of 15 minutes (the 10 participants in the pilot completed 4–15 smaller tasks or 1–6 larger tasks). Thus, normative considerations would dictate focusing on the larger tasks, whereas the "smaller tasks trap" would direct participants to focus more on the smaller tasks.

The game was carried out in an interactive mode. On each trial, the list of 30 apartments (30 tasks: 15 smaller tasks and 15 larger tasks) was presented (Figure 1A). Each task was displayed on a separate line, in a random order. The following information was displayed: task type (basic or extended) apartment address (city and street) and number of rooms, and the number of points assigned to the task (1 or 4). In order to facilitate the distinction between the two categories (small vs. large), different colors were used for the display of each category. The specific colors were counterbalanced across participants.

Participants were required to choose an apartment from the list, and retrieve data related to its pricing (e.g., the basic price of the apartment and the effect of various factors such as building age, apartment type, and parking facilities on the price). After a specific apartment had been chosen, a screen that contained the detailed information on that apartment was presented. The amount and nature of this information was contingent on the task category (smaller or larger, see Figure 1B and 1C). The game forced the participants to correct all mistaken retrieval errors before completing a task. When the participant completed the data retrieval for an apartment, or chose to exit the evaluation, this screen was closed, and the list of apartments for evaluation immediately appeared again. Apartments for which the data had already been retrieved were marked and became non-selectable.

1.4.2 Hypotheses and General Design

H1. Participants will tend to fall into the smaller task trap. That is, they will address smaller tasks first resulting in suboptimal total performance compared to participants who address larger tasks first

H2. Participants scoring low in rational thinking on the REI should be more prone to the smaller task trap than participants high in rational thinking. However, experiential (intuitive) thinking style should not affect task prioritization or total performance.

Two studies were conducted to test these hypotheses. Study 1 examined (1) whether participants were prone to the small tasks trap bias, and (2) whether the impact of starting with a smaller or a larger task on overall performance. Study 2 examined the relationship between the smaller task trap and individual differences in thinking style.

2 Study 1

2.1 Method

2.1.1 Participants

The sample was composed of 111 psychology undergraduate students from a university in central Israel, aged 20–37 (88 females, M= 25.24, SD=3.72) who participated in the study as part of their academic requirements. Since we lacked a clear estimation of the expected effect size, we did not conduct an a- priori power analysis, but instead aimed to recruit as many participants as possible during the course of a full academic semester.

2.1.2 Design

The study was made up of 3 conditions: (1) the "smaller tasks first" condition, in which participants were instructed to start with smaller tasks, (2) The "larger tasks first" condition, in which participants were instructed to start with larger tasks, and (3) the "free choice condition" in which participants were free to choose which tasks to perform. The "smaller tasks first" and the "larger tasks first" conditions examined the impact of (manipulated) prioritizing smaller vs. larger tasks on the total number of points earned. The free choice condition aimed at examining actual task management behavior.

2.1.3 Procedure

The study was described as an experiment on task management. First, participants were given a detailed explanation on the tasks and on the task management game, as well as an explanation on how to find information on the price list. A preliminary session was administered to make sure the participants had understood the explanation. In this preliminary session participants were given the address of a specific apartment and were asked to locate apartment's information in the price list. Then, participants were told that they would perform the tasks for a fixed period of 15 minutes, and that during that time they would be able to complete several tasks but not all of the tasks. They were explicitly informed that their goal was to maximize the number of points they earned, which would then allow them to participate in lotteries for shopping coupons, and that the number and types of lotteries were contingent on performance (the number of points accumulated), relative to the other participants.

Then, the participants were randomly assigned to one of three experimental conditions. Participants in the "smaller/larger tasks first" conditions were instructed to start with smaller/larger tasks, respectively. In both these conditions, they were told that "afterward they were free to choose which tasks to address". Participants in the "free choice condition" were told that they should "feel free to choose which

(A)

	Points	Rooms	Street	City	Evaluation type
Press to evaluate	4	3	Alumot	Savion	Extended Evaluation
Press to evaluate	4	4	Bdolach	Modiin	Extended Evaluation
Press to evaluate	1	2	Etrog	Bat Yam	Basic Evaluation
Press to evaluate	1	5	Hanita	Kfar Saba	Basic Evaluation
Press to evaluate	4	4	Hakerem	Rehovot	Extended Evaluation
Press to evaluate	4	5	Hankin	Holon	Extended Evaluation
Press to evaluate	1	3	Hatapuach	Herzliya	Basic Evaluation
Press to evaluate	4	5	Weizman	Holon	Extended Evaluation
Press to evaluate	1	5	Gafnovitz	Hadera	Basic Evaluation
Press to evaluate	4	3	Herzl	Ramat Gan	Extended Evaluation
Press to evaluate	1	3	Borochov	Ashdodo	Basic Evaluation
Press to evaluate	1	4	Even Eziz	Eilat	Basic Evaluation
Press to evaluate	4	4	Givati	Ashkelon	Extended Evaluation
Press to evaluate	1	2	Hazait	Kiryat Gat	Basic Evaluation

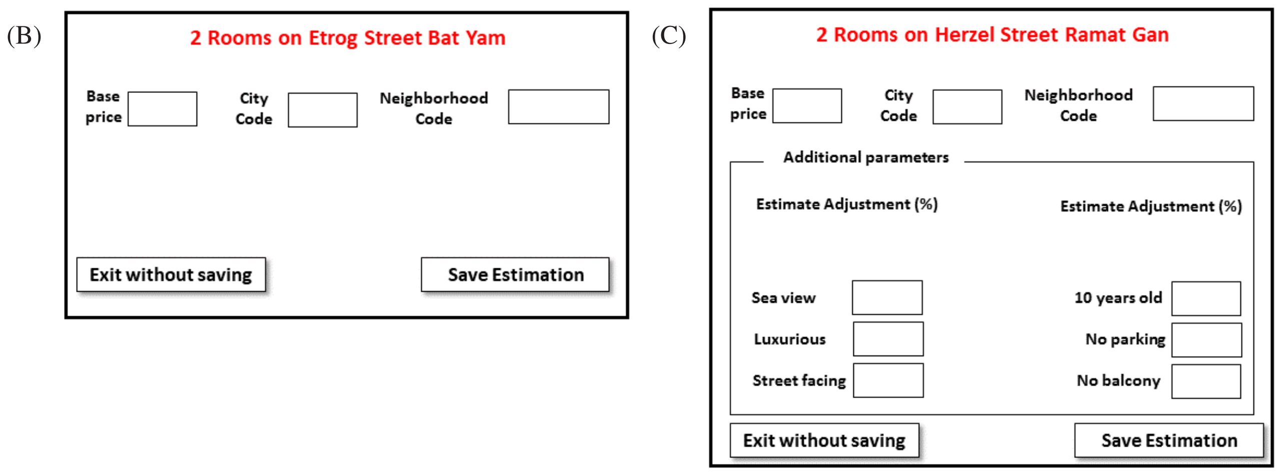

Figure 1: Task management game screens: (A) List of apartments for information retrieval, (B) Apartment data for the smaller task, (C) Apartment data for the larger task.

tasks to address". Then, participants in all three conditions engaged in the tasks for 15 minutes.

2.2 Results and Discussion

The number of tasks addressed, the number items retrieved and the number of points earned by the participants in each of the three experimental conditions is presented in Table 1.

First, in order to validate the task size manipulation, we compared the average amount of time it took to address a single task in the "smaller tasks first" vs. "the larger tasks first" conditions. The average amount of time was computed for each participant by dividing the session length (900 seconds) by the number of tasks completed. A one-way ANOVA yielded a significant effect for experimental condition ($F[2,108]=8.12$, $p=.001$, $\eta^2=0.13$). A planned contrast analysis confirmed that a single larger task required more time than a single smaller task. The mean duration of a task

Table 1: Number of tasks addressed, number of items retrieved and number of points earned by the participants in each of the three experimental conditions in Study 1. (SD in parentheses.

	Smaller tasks first	Larger tasks first	Free choice
Number of tasks	8.47 (4.33)	3.85 (2.08)	5.44 (3.04)
Items retrieved	26.08 (13.00)	34.15 (18.35)	28.90 (13.89)
Points	8.81 (4.37)	15.15 (8.14)	11.73 (6.12)

in the "larger tasks first" condition (*M*= 364.407 seconds, *SD*=288.55) was significantly longer than the mean duration of a task in the "smaller tasks first" condition (M= 178.79, SD=179.61, t(108)=3.83, p=.000, d=.77).

Next, to test the effect of experimental condition on the number of items retrieved and on the number of points earned, we ran two separate one-way ANOVAs. The analyses yielded a significant effect for experimental condition on the number of points earned (F[2,108]=8.73, p<.001, η^2=0.14), and a marginally significant effect for experimental condition on the number of items retrieved (F[2,108]=2.55, p=.083, η^2 =0.05).

2.2.1 Impact of starting with smaller vs. larger tasks

To test whether it was more beneficial to start with the smaller or the larger tasks, we conducted a planned contrast analysis on the number of items retrieved and the number of points earned to compare the two conditions in which participants were explicitly directed to selectively start with a specific task type. The mean number of items retrieved in the "larger task first" condition was significantly higher than the mean number of items retrieved in the "smaller tasks first" condition (t(108)=2.23, p=0.03, d=0.51). Similarly, the mean number of points earned in the "larger task first" condition was significantly higher than the mean number of points earned in the "smaller tasks first" condition (t(108)=4.18, p<0.001, d=0.97). Hence, it was more beneficial for participants to start with the larger tasks, both in terms of the number of items retrieved and in terms of the number of points earned.

2.2.2 The "free choice" condition

Participants in the free choice condition were not given specific instructions. Hence, they could freely decide to prioritize either smaller or larger tasks. Planned contrasts showed that overall, the number of points earned in the free choice condition was significantly higher than the number of points in the "smaller tasks first" condition (t(108)=2.02, p=0.046, d=0.55) but significantly lower than in the "larger task first" condition (t(108)=2.32, p=0.02, d=0.47). The number of items retrieved in the free choice condition was higher than in the "smaller tasks first" condition and smaller than in the "larger task first" condition, but the differences between the free choice condition and the other two conditions did not reach significance.

Next, to probe these differences, we compared the performance of participants who chose to start with a smaller task and participants who chose to start with a larger task. Table 2 presents the total performance as a function of the choice of which task to do first in the free choice condition.

Taken together, although it was clearly more profitable to focus on the larger tasks, 54% of participants (22 out of 41) in the free choice condition chose to start with a smaller task

Table 2: Tasks' handling patterns and performance (items retrieved and points earned) in the free choice condition in Study 1, according to the first type of task addressed. (SD in parentheses.)

	Smaller tasks first	Larger tasks first
Number of participants	22	19
Num of Tasks	6.32 (3.46)	4.42 (2.14)
Percentage of smaller tasks	76.08 (26.51)	21.88(29.71)
Items retrieved	26.32 (14.46)	31.89 (12.93)
Points	10.00 (6.09)	13.74 (5.65)

(χ^2(1, n=42) = 0.22, *n.s.*). Importantly, the participants who started with a smaller task also tended to continue throughout the experiment with smaller tasks to a greater extent than participants who started with a larger task (t(39)=6.18, p<.001, d =1.93, 95% CI=[36.45,71.96]), and earned fewer points (t(39)=2.03, p=.05, d =.64, 95% CI=[−7.47,−.005]). No significant difference was found for the number of items retrieved (t(39)=1.29, p=.20). The correlation between the percentage of smaller tasks and the number of points earned was negative and significant (r=−.42, p=.007), but the correlation between the percentage of the smaller tasks and the number of items retrieved did not reach significance (r=−.26, p=.11).

This pattern of smaller tasks trap behavior emerged although the relative benefit of the tasks was highlighted by displaying the number of points associated with each task. Importantly, participants exhibited this behavior even though they were given a detailed explanation of the tasks and even though it was clear to them that both tasks involved the same type of activity (retrieving data from a price-list for apartments), and that they would perform the task for a fixed time interval.

However, the mechanism underlying the choices made in the free choice condition remains unclear. Specifically, although the larger tasks were more beneficial, only 46% of the participants in the free choice condition have started with a larger task, whereas 54% started with a smaller task. One possible explanation for this pattern, is that this behavior reflected a random selection of the first task. However, we assumed that the pattern of task selection was not random, but rather reflected systematic individual differences in the evaluation and prioritization of the smaller vs. larger tasks. Specifically, we assumed that individual differences in cognitive thinking style would predict the susceptibility to the smaller tasks trap. People who score low in rational thinking style would be more likely to adopt a local perspective and prefer to address the smaller tasks first, while people scoring high in rational thinking style would be more likely to adopt a global perspective and prefer the larger and more profitable tasks. That is, participants low in rational thinking style would be more prone to the smaller tasks trap. This assumption was examined in Study 2.

3 Study 2

Study 2 aimed at further exploring the smaller tasks trap by examining its relationship to individual differences in thinking style. In addition, the experiment served as a direct replication of the free choice condition in Study 1. In line with our theoretical claim that the smaller tasks trap is the outcome of irrational considerations, we predicted a negative relationship between the tendency to think rationally and the preference for the smaller (rather than the larger) tasks. Specifically, we hypothesized that participants who score higher on the rational thinking scale would be less susceptible to the smaller tasks trap than those who score lower on the rational thinking scale, and consequently would address larger tasks more and earn more points. Based on previous findings (Ayal et al., 2012, 2015), we also predicted that differences on the experiential (intuitive) thinking scale would not be related to task management strategies.

3.1 Method

3.1.1 Participants

Sample size was determined a-priori, using G*Power (Faul, Erdfelder, Lang & Buchner, 2009). Our calculation relied on the effect size of the total points earned in the 'free choice' condition (Study 1), with an α of .05 (one-tailed) and a power of .80. This calculation yielded a minimum target sample size of 120 participants. Hence, the actual sample was composed of 136 undergraduate students (83 females) from a private college in Israel, aged 18–46, M= 25.92, SD=4.93 who participated in the experiment as part of their academic requirements.

3.1.2 Materials

The 24-item Rational Experiential Inventory (REI) questionnaire (Epstein et al., 1996; Pacini & Epstein, 1999). The REI is a self-report inventory that assesses individuals' tendencies to rely on rational or intuitive considerations. It consists of two unipolar scales (12 items each). One scale measure rational information processing style (e.g., "I have a logical mind"). The other scale measures intuitive processing style (e.g., "When it comes to trusting people, I can usually rely on my gut feelings"). Participants are required to state how true each statement is for them, on a scale from 1 (Definitely False) to 5 (Definitely True). As predicted by the dual system approach, the internal reliability of the REI questionnaire was high for both the rational (Cronbach's α=0.862) and the intuitive (Cronbach's α=0.871) thinking scales. The correlation between the rational and the intuitive scales was small and negligible (r =.085, p=.329). This pattern is consistent with previous findings of this inventory (Ayal et al., 2011; Pacini & Epstein, 1999).

Table 3: Tasks' handling patterns and performance (items retrieved and points earnt) in Study 2, as a function of first type of task addressed. (SD in parentheses.)

	Smaller tasks first	Larger tasks first
Number of participants	89	47
Number of tasks addressed	5.36 (3.25)	3.47 (1.61)
Percentage of smaller tasks	83.51 (24.56)	21.30 (26.24)
Items retrieved	20.80 (13.22)	26.11 (12.53)
Points	7.72 (5.40)	11.32 (5.56)

3.1.3 Procedure

The experimental procedure was similar to the free choice condition in Experiment 1 with one additional phase; namely, after completing the task management game, participants were administered the 24-item Rational Experiential Inventory (REI) questionnaire (Pacini & Epstein, 1999).

3.2 Results and Discussion

The main patterns that emerged in Study 2 closely paralleled the patterns in the free choice condition in Study 1 (Table 3).

Sixty-five percent of the participants (89 out of 136) in Study 2 chose to start with a smaller task. This choice ratio significantly deviated from chance (χ^2(1, n=136)=12.97, *p*=.000). Participants who started with a smaller task tended to continue with smaller tasks throughout the experiment to a greater extent than participants who started with a larger task (t(134)=13.72, p=0.000, CI-Lower=53.24, CI-Upper=71.18, d=2.45), retrieved fewer items (t(134)=2.27, p=0.025, CI-Lower=.68, CI-Upper= 9.94, d=0.41) and earned fewer points (t(134) = 3.66, p=0.000, CI-Lower=1.65, CI-Upper=5.55, d=0.66).

In order to explore the relationships between participants' thinking style and the tendency to fall into the smaller tasks trap, we calculated the correlations between rational/intuitive thinking styles, the percentage of smaller tasks addressed by the participants, number of items retrieved, and number of points earned. The correlation matrix is presented in Table 4.

In line with previous research (e.g., Ayal et al., 2011 ,2015), participants' strategies and performance were related to their rational thinking style, but not to their intuitive think-

Table 4: The correlations between rational and intuitive thinking styles (REI), the percentage of smaller tasks addressed, number of items retrieved and number of points earned by participants. (**, $p < .01$.)

	Rational Thinking	Intuitive Thinking	Percentage of smaller tasks	Items retrieved	Points
Rational Thinking	1	.085	−.240**	.343**	.356**
Intuitive Thinking	.085	1	−.165	.083	.108
Percentage of smaller tasks	−.24**	−.165	1	−.363**	−.503**
Items retrieved	.343**	.083	−.363**	1	.982**
Points	.356**	.108	−.503**	.982**	1

ing style, and there was no interaction between the rational thinking and intuitive thinking styles.

Based on the above findings, in the following analyses we focused exclusively on the rational scale, and ran two separate modifications of the Sobel tests using bootstrapping (5000 samples, implemented with the PROCESS macro Version 3 from Hayes, 2017), to test mediation models with the rational thinking as an independent variable, the percentage of small tasks as a mediator and number of items retrieved and total points and as the dependent variables.

The mediation analysis indicated that the task management strategy, specifically the percentage of smaller tasks, mediated the effect of Rational Thinking on both the number of items retrieved and the number of points earned. The indirect effect of Rational Thinking on both the number of items retrieved and the number of points earned, through the smaller task percentage, was positive and significant (path a×b=−1.41, z=−2.16, p<.05; a×b=−.99, z=2.64, p<.01); respectively). Rational Thinking had a significant effect on the smaller task percentage (a=14.11, t=−2.85, p<.01). Both the number of items retrieved and the number of points, in turn, increased as a function of smaller task percentage (with Rational Thinking in the model; b=−.10, t=−3.77, p<.00; b=.07, t=−6.01, p<.00; respectively). Further, the total effect of Rational Thinking on both the number of items retrieved and the number of points earned was positive and significant (c=6.86, t=4.22, p<.01; c=3.08, t=4.39, p<.01, respectively). When the indirect effect was accounted for, the direct effect remained significant for both the number of items retrieved and the number of points earned (c’=5.41, t=3.39, p=.0009; c’=2.15, t=3.35, p=.001; respectively). Further, a bootstrap analysis with 5,000 resamples revealed that the 95% confidence intervals for the significant indirect effect excluded zero for both the number of items retrieved and the number of points earned (from .36 to 2.87; from .29 to 1.66; respectively).

These results are consistent with the mediational hypothesis. Thus overall, these results show that the pattern of task selection was not random, but rather reflected systematic individual differences in the evaluation and prioritization of tasks. Low rational participants tended to address the smaller tasks first, more than high rational participants, and handled more smaller tasks throughout the experiment. Consequently, their overall performance was hampered. This pattern suggests that they were more susceptible to the “smaller task trap” than the high rational participants.

4 General Discussion

The simultaneous pursuit of multiple tasks appears to be the norm in everyday life (Louro et al., 2007) and the implications of scheduling tasks effectively, or failing to do so, are considerable. The current research examined the role of task size (smaller vs. larger), and individual differences in cognitive style (lower vs. higher rationality), in shaping task management strategies. We developed a novel paradigm in which participants faced multiple tasks and had to make repeated choices of which task to address. Our paradigm juxtaposed normative (cost/benefit) considerations against the suboptimal preference for smaller tasks.

The results of Study 1 showed that the overall performance of the participants who were instructed to start with the larger tasks were much better than the overall performance of the participants who were instructed to start with smaller tasks, both in terms of the number of items retrieved and the number of points earned. However, 54% of the participants in the free choice condition in Study 1 and 65% of the participants in Study 2 selected to start with and continued to address more smaller tasks, and thus were prone to the “smaller tasks trap” bias. In fact, when given free choice, the majority of the participants cued themselves into the bias, and intuitively behaved more similarly to participants who were directed to start with a smaller task.

The findings clearly indicate that the preference for the smaller tasks was not the outcome of comprehensive normative (rational) considerations and cannot be explained by random exploration. Support for this notion comes from several independent patterns that emerged in the data. First, normative considerations are expected to lead to the maximization of overall utility. In contrast, our data clearly show that starting with a smaller task impaired performance rather than improved it. Second, participants who started with a smaller task tended to persevere with the smaller tasks throughout the experiment, and ended up with a much higher percentage of smaller tasks, compared to the participants who started with a larger task. Hence, starting with a smaller task does not appear to be the outcome of a planned strategic move aimed at increasing the total utility in the long run (e.g., by warming up and enhancing the ability to address the larger and more beneficial tasks). Finally, if starting with a smaller task were the outcome of normative considerations, we would expect that participants higher in rational thinking would tend to start with a smaller task much more often than participants low in rational thinking. However, the findings of study 2 exhibited the opposite trend. Participants lower in rational thinking presented a stronger bias toward the smaller tasks. They started and persevered on the smaller tasks more than participants high in rational thinking, and consequently earned fewer points. That is, the positive correlation between rational thinking and the percentage of larger tasks addressed suggests that the patterns of task selection were not random, but rather reflected systematic differences in thinking style.

It remains unclear why the low-rational thinkers persevered on the smaller (rather than on the larger) tasks, even though the two courses of action involved the same activity and this choice disrupted their overall performance. In the following sections, we discuss several motivational factors that may account for this strategy and speculate on the processes that could underlie this decision.

4.1 Motivational factors for "the smaller tasks trap"

The picture that emerges from the data may have been driven by several different motivational factors. Two potential sources for the mishandling of pending tasks are demand avoidance (e.g., Gold, Kool, Botvinick, Hubzin, August & Waltz, 2015; Kool et al, 2010; Westbrook & Braver, 2015) and a desire to minimize the time needed to achieve task objectives (Bogacz et al., 2006; Gray et al., 2004, 2006). The patterns of behavior, that emerged in the current study are consistent with previous findings showing that when individuals are given a choice, they willingly avoid lines of action associated with more effort or more time. In the current studies, participants made repeated choices between smaller and larger tasks. Since each smaller task involved fewer units of work, and required less time, it is reasonable to assume that the smaller tasks were perceived as less effortful than the larger tasks (Dunn, Inzlicht & Risko, 2019). The negative correlation between individual differences in the tendency for rational thinking and the tendency to prioritize the smaller tasks is consistent with the well-established association in the literature between individual differences on "need for cognition" trait and demand avoidance (e.g., Kool et al., 2010; Westbrook et al., 2013).

Another potential source for the relationship between individual differences in rational thinking style and the tendency to handle smaller (rather than larger) tasks might be a greater tendency of low rational thinkers to use the number of tasks addressed as a proxy for efficient performance (Amar et al., 2011). Difficult-to-evaluate attributes tend to receive less weight in decision-making and may be replaced by proxies (Denes-Raj & Epstein 1994; Gigerenzer & Hoffrage, 1995; Hsee, 1996; Pacini & Epstein 1999). People low in rational thinking are more predisposed to employing heuristics and adopting simplifying strategies than people high in rational thinking (Ayal et al., 2011, 2015). Since the cost/benefit ratio for each specific task (1/3 vs. 4/9) may have been hard to evaluate, participants low in rational thinking may simply have endeavored to count tasks and focused on completing quantitatively more tasks, rather than resolve the cost/benefit tradeoff of the smaller vs. larger tasks (Amar et al., 2011). This could account for the higher number of smaller tasks, which could give a semblance of tangible progress and control.

4.2 Some insights into the mechanism governing task selection

Both the demand avoidance account and time minimization account suggest that the cost of engaging in the larger tasks was evaluated as higher than the cost of engaging in the smaller tasks. This difference in evaluation seems reasonable from a local perspective centered on a single proximal choice of a particular (smaller vs. larger) task. A single larger task in the game involved more units of work than a single smaller task (the retrieval of 9 vs. 3 pieces of data), and required more time. Hence, the larger tasks may have been evaluated as more taxing, and this evaluation may have guided the choice to do smaller tasks. However, from a global perspective that focuses on the entire session all the tasks involved the same type of activity (retrieving data), and the participants knew that they would perform the tasks for a fixed period of time. Thus, there is no reason to evaluate a strategy of engaging in the larger tasks as more taxing than a strategy of engaging in the smaller tasks. Thus, the current finding strengthens and extends Gray's et al. (2004, 2006) claim that irrational individuals tend to base their action selections on local optimization and demonstrate suboptimal performance at the global level (e.g., Amar et al., 2011; Dunn & Risko, 2016; Gray et al., 2004, 2006). The data here imply that the same logic as suggested by Gray for low order cognition might also apply to higher order cognitive activities. Further investigation of the local and the global perspectives for the evaluation of task effort might provide a window into the mechanism underlying task prioritization.

4.3 Limitations and future research

The distinction between the local and the global perspectives of task prioritization suggests that the mechanisms governing task management are largely based on information at the sub-goal (task) level. However, we cannot draw conclusive conclusions as to the differential contribution of each attribute of the tasks to these evaluations, or as to the exact weight ascribed to each attribute. The (smaller and larger) tasks in the current study varied on a number of dimensions, which are related to both the costs incurred by the task and the benefit entailed. The data imply that the participants (at least those low in rationality) focused on the cost information much more than on the benefit information, since a focus on the benefit was expected to yield exactly the opposite pattern of behavior. Nevertheless, the tasks we used included at least two different dimensions of cost: (1) set size, and (2) time demands (duration), which are related to different explanations for the observed behavior (e.g., demand avoidance vs. minimization of time on task). Although Kool et al. (2010) reported that people preferred a less demanding course of action even when it involved an extended session length (and so ruled out the time minimization account), it is important to further explore this question in follow-up studies (for instance see Dunn et al., 2019).

Another related question for further investigation is what motivated the high rational thinkers in the current studies to attend to the larger tasks. The data revealed that, among the high rational thinking participants, 64% chose to start with a larger task and overall 61% of their tasks were large. Here also, we cannot pinpoint which specific task attributes guided their choices so that several explanations may apply. For example, individuals high in rational thinking are more likely to engage in effortful information-processing activity, and seek effort rather than avoid it (Cacioppo et al., 1996; Inzlicht, Shenhav & Olivola, 2018; Kool et al., 2010; Sandra & Otto, 2018; Westbrook et al., 2013). Another possible explanation is that people high in rational thinking have better numeracy abilities (Peters, 2012; Peters, Västfjäll, Slovic, Mertz, Mazzocco & Dickert 2006) and are more inclined to adhere to the normative guidelines of cost/benefit considerations (e.g., Ayal, et al., 2011, 2015), and hence, may have prioritized the larger tasks, which are more effective in maximizing the total benefit than the smaller tasks. This explanation is challenged by recent finding that large reward incentives decrease the amount of effort exerted by high-rational individuals (Sandra & Otto, 2018). A third explanation is that people high in rational thinking are more likely to rely on a global (rather than on a local) perspective of the goal. Ample evidence shows that individuals high in need for cognition seek more information on complex issues, and on a wide range of tasks than individuals low in need for cognition (Cacioppo et al., 1996). Consequently, these individuals might be more likely to employ a wider perspective for task management. In future research, it would be worthwhile manipulating the cost benefit ratio and the local-global dissociation in task efficiency to further explore these possible drivers.

Finally, our design involved only a behavioral measure of actual task choice. A direct measure of effort estimations might shed more light on the process underlying these choices. One possibility would be to use self-reports. Previous studies have found an association between self- reports of the subjective cost of effort and demand avoidance behavior (Westbrook et al., 2013). Yet, other studies showed that assessment of preferences by effort discounting better predicted individual differences in need for cognition than self-reports of subjective effort evaluations (Westbrook et al., 2013).

It is important to note that although our game simulated a real-life environment of multiple tasks, it constitutes a simplified version of reality. The paradigm was designed to capture specific components of task management to keep the data tractable and interpretable. Several complexities present outside the lab were not reflected in the game (e.g., a more diverse set of tasks). In addition, the cost/ benefit of the tasks was explicitly displayed. The fact that our participants fell prey to the smaller tasks trap even in this transparent setting implies that task management in the more complex and uncertain real world would be even less optimal.

4.4 Conclusion

The current study compared rational (cost/benefit) considerations to the initial decision to address smaller task first. We examined the role of task size (smaller vs. larger), and individual differences in cognitive style (rational and intuitive), in shaping task management behavior. The findings suggest that the "smaller tasks trap" can lead to the completion of local sub-goals, and produce a sense of tangible progress, but impede achieving the larger more beneficial goal.

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3 — TEL-AVIV		
Street name	Neighborhood code	Page number
AAA. . .	37	111
AAB. . .	25	108
AAC. . .	23	107

FIGURE 2: Structure of the street index.

3 — TEL AVIV				
1 – Ramat Aviv				
	2 rooms	3 rooms	4 room	5 room
Abrabanel	1450	1710	2180	
Alexander	1440	1670	2250	2540
Avtalion	1450	1940	2400	2820

FIGURE 3: The names of streets in a specific neighborhood in the city of Tel Aviv. Street names are listed in alphabetical order, with rough estimates of apartment prices. For example, a rough estimate for a 3-room apartment on Alexander St. is 1,670,000 Israeli shekels.

Appendix A — Structure of the Price List for Apartments in Israel

The paper version of the price list was taken from a publication by the Levi Izchak group published in Feb. 2016, which is considered the most popular price list in Israel. This price list is used both by real estate experts and by lay people to buy or sell apartments.

The first part of the price list is the street index. This section indicates the location of the apartments. All the streets in Israel are listed by city (town). Cities and towns are presented in alphabetical order. The city's zip code appears opposite its name. Under each city name, all the streets of the city are presented in alphabetical order. Opposite each street name, the zip-code for its neighborhood is displayed, as is the page number on the price list (where information pertaining to it can be found) (see Figure 2).

The second part of the price list contains comparative pricing information for apartments. This part is broken down by regions of Israel (from north to south). For each region, the data are presented by city (in alphabetical order), then neighborhood (by neighborhood zip-code) and street name (in alphabetical order). For each street, each row lists the street name and a rough estimate of the prices of apartments (in thousands of Israeli shekels), displayed according to the number of rooms in the apartment (see Figure 3).

For each neighborhood, other parameters influencing the price evaluation (e.g., age of the building, elevators, balconies, etc.) are listed below the list of street names (and the rough estimate of prices). Next to each parameter, the dif-

Table 5: Shopping voucher lotteries and the qualification criteria. Note that participants could qualify for multiple lotteries.

Lottery type	Qualification criteria
300 Israeli shekel voucher	performance in the highest quartile (more points than 75% of the participants)
150 Israeli shekel voucher	performance within the top half (more points than 50% of the participants)
75 Israeli shekel vouchers	more points than 25% of the participants

ference in price is displayed (for example: "Age of building under 10 years +10%").

Appendix B — Structure of the Lotteries

The number and types of lotteries that each participant was qualified to participate in were contingent on performance (the number of points accumulated), relative to the other participants. Table 5 presents the lotteries and the criteria for qualification.