MONASH University

Keeping Them in The Game: The Effects of Performance Targets on Effort Regulation and Retention in Tournaments

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Abstract

Tournament incentive schemes reward workers based upon their performance relative to other workers. Empirical research has shown that when a worker opens a significant lead in a tournament, the other workers may lose motivation (Backes-Gellner & Pull, 2013; Berger, Klassen, Libby, & Webb, 2013; Casas-Acre & Martinez-Jerez, 2009; Hannan, Krishnan, & Newman, 2008). I examine how assigned performance targets may be used as a secondary goal in firms where a tournament is the primary component of the firm's incentive system. Specifically, I examine whether performance targets can stabilise the effort of workers who fall behind as well as prevent workers from stopping work altogether on a tournament incentivised task.

I conduct two experiments to address these issues. The first experiment examines the effect of a target as a secondary goal on the effort exerted by workers who fall behind in a tournament. I find that an assigned target causes workers to exert less effort in a tournament. Rather than stabilising the effort exerted by workers, a target condones a lower performance standard and results in workers who fall behind exerting less effort. I find this effect even when the difficulty of the target is increased and whether or not workers are rewarded for achieving the target.

The second experiment examines the effect of a target on the retention of workers in a tournament. I find the effect of a target on retention (whether or not a worker quits working on a tournament incentivised task) is contingent on the availability of relative performance information. Specifically, when workers have access to performance information concerning other workers who have previously quit working on the task, an assigned target results in lower retention (more workers quit). Conversely, when workers do not have access to this type of information, targets result in higher retention (fewer workers quit).

Combined, the results of the two experiments provide guidance to practitioners operating in environments where a tournament is used to incentivise workers. The findings suggest that managers may be better off allowing a tournament to motivate workers who fall behind in a tournament rather than intervening by setting a performance target intended as a secondary goal. For managers concerned with the retention of workers, assigning a performance target can help improve retention but only if workers do not have access to the performance information related to workers who have already quit the tournament.

Declaration

This thesis is an original work of my research and contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

James Stewart Sewell

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Chapter 1 Introduction

1.1. Background and Motivation

Tournaments incentive systems are used in many leading US companies to assign rewards to workers (Berger et al., 2013; Grote, 2005; Kwoh, 2012; Newman & Tafkov, 2014). Tournament-based incentive systems often reserve larger bonuses for the top-performing workers; e.g., at General Electric, only employees ranked in the top twenty per cent were eligible for larger bonuses in 2000 (GE, 2000).

Tournaments received widespread attention when Jack Welch, the highly effective CEO of General Electric Inc (GE), extolled the benefits of evaluating the performance of employees relative to their peers. GE used tournament rankings to reward the top employees and as a justification for encouraging underperforming employees to leave (GE, 2000). Jack Welch claimed that such a system made the top performers feel valued, fostered a company culture based on meritocracy driven by competition that rewarded the top performers and was a driving force behind GE's continued success (GE, 2000; Welch et al., 2005).

Tournament-based incentive schemes evaluate and reward workers based upon their performance relative to their peers rather than to an absolute standard (Prendergast, 1999). Estimates range from twenty per cent to as much as sixty per cent of US companies use relative performance and tournament rankings of employees to assign financial rewards to high-performing employees and identify underperforming staff (Grote, 2005; Kwoh, 2012).

Despite Lazear & Rosen's (1981) work on tournament theory appearing over forty years ago and the pervasive adoption of tournaments as incentive schemes across a wide variety of industries, e.g., hotel chains (Berger et al., 2013); postal workers (Matsumura & Shin, 2006), insurance sales (Backes-Gellner & Pull, 2013); commodity trading (Casas-Acre

& Martinez-Jerez, 2009); mutual fund management (Kempf & Ruenzi, 2008); information technology (Jenkins, 2001) and agriculture (Knoeber & Thurman, 1994; Levy & Vukina, 2004), tournaments remain relatively unexamined in comparison to piece-rate, flat rate and budget-based incentives systems (Bonner, Hastie, Sprinkle, & Young, 2000; Bothner, Kang, & Stuart, 2007; Sprinkle & Williamson, 2007).

Tournament incentive schemes have been shown to effectively motivate workers to exert more effort to compete for prizes (Backes-Gellner & Pull, 2013; Berger et al., 2013; Casas-Acre & Martinez-Jerez, 2009; Matsumura & Shin, 2006). The practitioner literature, however, has questioned the value of employee rankings and the use of rankings to allocate rewards; highlighting fears of the destructive side effects by citing the failures at Enron (Brustein, 2013), the decision at Microsoft (Deloitte, 2014) and more recently even GE to abandon the practice (Nisen, 2015).

Klein & Schmutzler (2021) label the highest-ranked worker as a *leader* and the trailing workers as *laggards* in the context of a tournament. Empirical research has shown that when a *leader* opens a significant lead*,* the *leader* may become complacent, while other workers who fall behind (*laggards*) may give up competing and withhold effort (Backes-Gellner & Pull, 2013; Berger et al., 2013; Casas-Acre & Martinez-Jerez, 2009; Hannan et al., 2008; Lazear & Rosen, 1981; Prendergast, 1999). While *leaders* may exhibit complacency, I primarily focus on the effort and retention of the potentially larger group, the *laggard*s, who are prone to reducing effort and potentially quitting once the primary goal of winning a tournament appears too difficult.

An option a manager may consider in addressing the problem of *laggards* reducing effort or quitting after falling behind is introducing a performance target. The tournament incentive scheme provides a primary goal for workers, while a performance target sets a

secondary goal for *laggards* who fall behind in the tournament. Prior research has identified that managers may use performance targets as an alternative to tournaments to motivate workers (Merchant, 1985, 1989; Merchant & Manzoni, 1989; Merchant & Van der Stede, 2017) but has not evaluated the effectiveness of performance targets within a context where a tournament is a primary component of a firm's incentive system.

I examine the effect of a manager setting a performance target in combination with a tournament incentive scheme rather than as an alternative to a tournament-incentive scheme. Within this context, a tournament incentive provides a primary goal for all workers, while a performance target can provide a secondary goal for *laggard* workers unable to effectively compete for the tournament-based reward. A combination of a tournament incentive scheme and an assigned performance target may motivate effort and retention of *laggards* who fall behind.

Prior research has confirmed that performance targets used as an alternative to a tournament incentive can effectively motivate improved performance if perceived by workers as achievable (Latham & Yukl, 1976; Locke & Latham, 1990, 2002, 2006; Merchant & Van der Stede, 2017). Workers usually adopt the target set by their manager as a goal because they perceive managers usually set targets based on what workers should be able to achieve (Latham & Lee, 1986; Locke & Latham, 1990). If workers perceive the target to be reasonable, workers commit to the goal and then exert effort in an attempt to meet the standard required to achieve the goal (Bol & Lill, 2015; Carver & Scheier, 2001; Dekker, Groot, & Schoute, 2012; Locke & Latham, 2002; Merchant & Van der Stede, 2017).

If managers assign performance targets, calibrating the difficulty of performance targets to motivate and engage *laggards* is a challenging task. Accurately calibrated performance targets guide employees on how much effort they should allocate toward

different tasks (Bol, Keune, Matsumura, & Shin, 2010; Dekker et al., 2012; Merchant & Van der Stede, 2017).

If a tournament is the primary component of a firm's incentive system, a well-calibrated performance target can provide a secondary goal for *laggards* who have given up trying to achieve the primary goal of winning a tournament. After receiving feedback indicating they have fallen behind the tournament *leader*, *laggards* may perceive the target set by their manager as a more realistic goal and avoid feeling pressured to perform well against peers. The performance target sets a floor for acceptable performance and motivates *laggard* workers to exert sufficient effort to meet the manager's expectations.

A performance target that is too easy or too hard may have a counterproductive effect on the effort of *laggards* in a tournament. If a manager makes the target too easy, the manager may be condoning *laggards* reducing the effort they exert. If, however, a manager makes the performance target too difficult, *laggards* may reject the target as a secondary goal. While workers usually try to meet the expectations set by their manager, workers do not commit to assigned goals that are perceived as unrealistically difficult (Carver & Scheier, 2001; Locke & Latham, 1990, 2006). For a performance target to provide an effective secondary goal for *laggards* who have fallen behind and perceive the primary goal of winning the tournament as too difficult, the target should be set at a difficulty level achievable by *laggards*.

When a tournament is not the primary component of an incentive system, prior research suggests that attaching a financial reward to a performance target can increase the importance of and commitment workers display toward targets (Awasthi & Pratt, 1990; Bonner & Sprinke, 2002; Locke & Latham, 1990, 2002, 2006; Vroom, 1964). However, despite the ubiquitous use of financial incentives, there is limited research that directly

examines how the incentives interact with the difficulty of performance targets (Chow, 1983; Fatseas & Hirst, 1992; Lee, Locke, & Phan, 1997; Locke & Latham, 1990; Mowen, Middlemist, & Luther, 1981). Of the limited research examining this interaction, there is no research that I am aware of that examines the effect of incentivising targets intended as secondary goals when a tournament is the primary component of a firm's incentive system.

I also address the potential for performance targets to affect the retention of workers in a firm where a tournament is a primary component of the incentive system. While prior research has identified that *laggards* may lose motivation and withhold effort (e.g., Backes-Gellner & Pull, 2013; Berger et al., 2013; Casas-Acre & Martinez-Jerez, 2009); a problem that is relevant to practice that has been largely overlooked is workers quitting work task altogether that are incentivised by a tournament (Fershtman & Gneezy, 2011). Indeed, by assigning a secondary goal, performance targets may be an effective strategy for managers to improve the retention of workers. In line with the definition used by Wrosch, Scheier, Carver, et al. (2003) and Wrosch, Miller, Scheier & De Pontet (2007), I define quitting as the conscious decision to disengage from the tournament task altogether rather than only reducing effort while continuing to work on the task. In line with this definition, the fewer workers that quit working on a task incentivised by a tournament, the higher the retention of a tournament.

While some firms, e.g., GE (GE, 2000; Welch et al., 2005), encouraged low-ranked workers to leave the firm, firms that use tournaments may prefer to retain workers and focus on developing workers' capacity. Critics of tournaments suggest that rankings can create fear and anxiety amongst *laggards* and damage the culture within a company (Hazels & Sasse, 2008; Steinhage, Cable, & Wardley, 2017). Firms seeking to retain and develop their workers

need to stabilise the morale of this group of workers to ensure the costs associated with employee turnover do not escalate.

Employee retention, in general, is an issue for firms across all industries. Firms strive to prevent excessive employee turnover to avoid the high costs of recruiting and training replacement employees (Autrey, Bauer, Jackson, & Klevsky, 2019). In addition to the direct costs of recruiting and training replacement employees, firms incur indirect costs. Indirect costs include lost institutional knowledge, damaged morale, and increased stress on employees who may be required to take on additional work until a vacancy is filled with a new hire. A Center for American Progress report highlights the potential cost to firms from employee turnover (Boushey & Glynn, 2012). They estimate that the direct cost of recruiting a new employee ranges from twenty per cent of annual salary costs for the average employee to as much as 213% of annual salary costs for high skilled specialist roles such as physicians and company executives (Boushey & Glynn, 2012).

In 2018, a study of Linkedin members reported that 10.9% left their employer within a twelve-month period (Booz, 2018). The global pandemic has further exacerbated the costs of employee turnover. Microsoft's (2021) Work Trend Survey of more than 30,000 employees reported that 40% of employees surveyed considered leaving their employer in 2021. Gartner HR's (2021) research identified that the problem is particularly acute for female employees. Their research found that 65% of women surveyed (n = 3515) say the pandemic had made them question the place work should have in their lives.

Across different firms, employees have different levels of access to information about their peers' past performance and efforts (Ferrazzi, 2014; Loughry & Tosi, 2008; Thomas & Thornock, 2021). Workers may have access to relative performance disclosed by the firm or through their direct observation of peers. I examine how a combination of assigned

performance targets and access to relative performance information (RPI) related to workers who have already quit a tournament affects the retention of remaining workers. Specifically, I examine whether access to RPI alters the effectiveness of targets as secondary goals to retain workers when a tournament is the primary component of a firm's incentive system.

1.2. Research Issues Addressed in this thesis

The first issue I address within this thesis is whether a performance target, serving as a secondary goal, affects *laggards'* effort when a tournament is a primary component of the incentive system. I examine performance targets: (a) of varying difficulty levels and (b) incentivised and non-incentivised targets.

The second issue I address is whether performance targets can prevent workers from quitting work on a tournament incentivised task. I examine whether the retention of workers is affected by: (a) the difficulty of performance targets and (b) workers' access to performance information about other workers who have previously quit the task.

1.3. Aim and Research Questions

The aim of this thesis is to gain an understanding of the effect of control mechanisms on effort and retention in a context where a tournament is the primary component of a firm's incentive system. Specifically, the aim is to examine the following control mechanisms: performance targets set as secondary goals; the difficulty of targets; whether or not targets are incentivised; and access to performance information about workers who have previously quit the tournament incentivised task.

The previous discussion has centred on the effect of assigned performance targets in contexts where a tournament is the primary component of an incentive system. Accordingly, I address a series of research questions concerned with the effect of assigned performance

targets on workers' effort and retention in tournaments. More specifically, I examine three research questions concerning the effect of assigned targets on the effort exerted by *laggards* in tournaments. I then examine a research question concerning the effect of assigned targets and the availability of performance information on the retention of workers on a tournament incentivised task.

My first research question aims to test the effect of assigned performance targets upon the effort exerted by *laggards* when a tournament is the primary component of a firm's incentive system. Specifically**, research question 1** asks: **Do performance targets increase or decrease the effort exerted by laggards in a tournament?** Results from Experiment 1 indicate that assigned performance targets reduced the effort exerted by *laggards* in tournaments.

My second research question deals with the difficulty of assigned performance targets upon the effort exerted by *laggards* incentivised by a tournament. Specifically, **research question 2** asks: **In a tournament with an assigned performance target, does the difficulty of the performance target affect the effort exerted by *laggards*?** Results from Experiment 1 do not show a significant difference in effort exerted by *laggards* assigned easy targets compared to more demanding targets.

My third research question is related to the effect of performance targets upon the effort exerted by workers in tournaments and is concerned with the provision of rewards for achieving the target. Specifically, **research question 3** asks: **In a tournament with an assigned performance target, does paying workers a bonus for exceeding a target increase the effort exerted by *laggards*?** Experiment 1 results show that *laggards* exert more effort in tournaments with incentivised performance targets than *laggards* in tournaments where targets are not rewarded.

Research questions 1-3 concentrate on the effect of assigned performance targets upon effort. The fourth research question shifts the focus to the effect of performance targets on the retention of workers in a tournament. The fourth research question concerns whether the availability of past performance information of workers who have already quit the tournament alters the effect of targets on retaining workers in tournaments. Specifically, **research question 4** asks: **is the retention of workers in tournaments affected by a combination of assigned performance targets and whether or not workers are informed of the past performance of workers who have quit**? Results from Experiment 2 show that the effect of performance targets on retention in tournaments is contingent upon whether workers are informed of the performance of workers who have already quit the tournament.

The four research questions are tested empirically by running two separate experiments. Experiment 1 examines research questions 1-3. Within the first experiment, I manipulate the assignment of performance targets, the difficulty of assigned targets, and if the participant is rewarded for achieving the target. Research question 4 is investigated in Experiment 2, where performance targets, target difficulty, and whether or not RPI included historical performance data from participants who quit is disseminated to participants who remain in the tournament.

1.4. Contributions of the Thesis

In addressing the research questions outlined in the previous section, I make theoretical contributions regarding the effect of assigned performance targets on the effort and retention of workers in tournaments. In addition, I make notable two methodological contributions by describing experimental design features to facilitate a high rate of quitting within the controlled laboratory setting. I also recorded and analysed the electrodermal activity of participants in one experiment. As a direct result, I demonstrate the application of

electrodermal activity as a direct biological index of stress and how accounting researchers may use this tool to develop a more nuanced understanding of the mechanisms underlying the decision-making process associated with quitting a tournament incentivised task. Finally, the findings have practical implications for managers setting performance targets for workers in environments that utilise tournament incentive schemes.

1.5. Structure of the Thesis

In order to address the issues raised above, in the next chapter, I overview the background literature on tournaments as well as goal setting and goal recalibration. A chapter developing the hypotheses follows, concerning the effect of targets, target difficulty, and rewards on the effort exerted by *laggards* in tournaments, and the effect of targets, target difficulty and availability of performance information on the retention of workers in tournaments. Chapter 4 describes the task selection process, followed by the methods used in the two experiments documented in Chapter 5. Chapter 6 presents the results from both experiments. In the final chapter, I summarise the findings, discuss the limitations of the thesis, and outline the implications for future research and practice.

Chapter 2 Literature Review

2.1. Introduction

In this chapter, I examine the literature concerned with the motivation and retention of workers in tournaments. I focus the review on the literature concerning the motivation of *laggards* (workers who fall behind in tournaments) toward tasks incentivised by tournaments and the retention of workers by firms who use tournaments as a primary component of their incentive scheme. I also draw from the accounting, economics, and psychology literature related to tournaments and goals.

Firstly, I review the theoretical foundations for using tournaments as incentive schemes developed by the economics literature. Following this, I review the management accounting literature to examine how the features of tournaments influence the workers' behaviour in tournaments. Specifically, I focus on the literature that addresses how the design of tournaments impacts *laggard* workers.

Secondly, I draw from the psychology literature examining goal setting and how manager assigned goals interact with financial incentives. Specifically, I review the literature on goal setting, goal difficulty, and multiple goals.

Finally, I examine how Carver & Scheier's (1990, 2000, 2001) goal recalibration model can be used as a lens to interpret the findings from management accounting research that identifies the tendency for *laggards* to reduce effort in tournaments. This discussion also addresses why workers may quit working on tasks incentivised by tournaments.

2.2. Incentives

Firms use incentive systems to align the interests of workers with organisational goals (Horngren, Datar, Foster, Rajan, & Ittner, 2009; Merchant & Van der Stede, 2017; Prendergast, 1999). There is a broad literature examining the motivational effects of incentive systems, including piece-rates (e.g. Chow, 1983), budget-based targets (e.g. Fisher, Frederickson, & Peffer, 2000), group-based incentives (e.g. London & Oldham, 1977), flat-wage (e.g. Sprinkle, 2000), employee shares and share options (e.g. Prendergast, 1999) and tournaments (e.g. Bull, Schotter, & Weigelt, 1987). In this thesis, I focus on tournaments and specifically on a context where a tournament is the primary component of a firm's incentive system.

2.2.1. Tournament Incentive Systems

Tournament incentive schemes evaluate and reward workers based upon performance relative to peers rather than to an absolute standard (Lazear & Rosen, 1981; Prendergast, 1999). Relative performance information (RPI) compares workers' performance relative to the performance of other workers. Tournaments use relative performance information to assess the performance of workers relative to other workers in the same tournament (Lazear & Rosen, 1981).

Tournaments provide two benefits to firms: motivation and selection effects (Lazear & Rosen, 1981; Prendergast, 1999). I focus on the retention of workers and the motivational effect of tournaments on current workers (motivation effect) rather than on which type of worker is attracted to the firm (selection effect).

Tournament incentive systems are commonly used to incentivise workers in many industries, e.g., hotel chains (Berger et al., 2013); postal workers (Matsumura & Shin, 2006), insurance sales (Backes-Gellner & Pull, 2013); commodity trading (Casas-Acre & Martinez-

Jerez, 2009); mutual fund management (Kempf & Ruenzi, 2008); information technology (Jenkins, 2001) and agriculture (Knoeber & Thurman, 1994; Levy & Vukina, 2004). Estimates are that up to sixty per cent of US companies use some form of tournament-based compensation to allocate bonus payments to employees (Grote, 2005; Kwoh, 2012).

2.2.2. Tournament Theory

The theoretical foundation of tournament incentive schemes as optimal labour contracts was developed over forty years ago by Lazear & Rosen (1981). While tournaments are popular in practice, review studies of the accounting literature have highlighted that until recently, management accounting research has paid less attention to tournament-based compensation systems compared to piece-rate and budget-based targets (Bonner et al., 2000; Bonner & Sprinke, 2002; Bothner et al., 2007; Sprinkle & Williamson, 2007).

Lazear & Rosen (1981) argued that tournament incentive schemes address the problem of workers potentially shirking effort. When it is not feasible to monitor worker input accurately, output-based incentive schemes (e.g., tournaments, budget-based targets, and piece rates) are preferred to paying workers based on input (e.g., time). This is because employees can shirk effort, and if it is not possible to detect shirking, this creates a moral hazard (Akerlof, 1976). Output-based incentive structures, such as budget-based targets and piece rates, are not always optimal because output may be affected by factors other than time and effort, some beyond a worker's control (Lazear & Rosen, 1981).

Tournaments protect workers against common risks that could affect the performance of all workers (Frederickson, 1992; Lazear & Rosen, 1981). Alternative incentives such as a budget target or piece rate expose workers to events beyond their control that may impede performance against a pre-determined standard. As tournaments use relative performance information to rank workers, each worker's relative performance is not harmed if the event

affects all workers. Examples from practice include Knoeber & Thurman's (1994) study of the US broiler chicken production industry, where tournament incentives prevent producers' performance is being affected by the outbreak of industry-wide disease amongst flocks. Likewise, Matsumara & Shin (2006) found that high levels of common uncertainty combined with a tournament-style incentive scheme led to improved financial performance in their study of Korean postal service providers.

2.2.3. Motivation in Tournaments

Tournaments motivate workers to exert effort to improve their chance of winning a prize (Lazear & Rosen, 1981; Prendergast, 1999). However, Bonner & Sprinkle (2002) noted that it remains unclear how these benefits compare to other incentive systems like budget-based targets and piece-rate systems.

Firstly, tournaments motivate workers to exert more effort for economic and psychological reasons (Frederickson, 1992). Workers have an economic incentive to exert more effort, to increase their chance of claiming a prize (Lazear & Rosen, 1981; Prendergast, 1999). As the performance of other workers is usually not fully known until the dissemination of relative performance information, workers have an incentive to exert close to their maximum potential. Any level of effort below this point may not be sufficient to win the tournament.

Tournaments can also motivate effort by triggering competitive instincts to appear successful in front of peers (Hannan et al., 2008; Hannan, McPhee, Newman, & Tafkov, 2013). Social comparison theory predicts that top performers in tournaments derive intrinsic motivation to exert more effort to gain and, in turn, retain their status as the tournament winner (Greenberg, Ashton-James, & Ashkanasy, 2007). For example, in an experimental

setting, Hannan et al. (2013) found that publicising participants' relative performance rankings enabled social comparisons and motivated participants to exert more effort.

Expectancy theory predicts that workers are motivated to exert effort to improve their chance of obtaining a favourable outcome (Vroom, 1964). From this theoretical perspective, workers are motivated to exert effort in a tournament because the more they exert, the greater the chance they can win the tournament. Winning the tournament motivates effort because the worker is entitled to the monetary prize for winning the tournament and enjoys the psychological benefits of outperforming their peers. Expectancy theory, however, also suggests that *laggards* (workers who fall behind) who believe that increased effort will not be sufficient to win the tournament may not be motivated by a tournament. If exerting effort will not bring the *laggard* worker closer to obtaining a valued reward from the tournament, a *laggard* is not incentivised to exert their maximum effort.

2.2.4. Tournament Designs

There are many design variations for tournament incentive schemes. However, all tournaments involve workers or teams performing a comparable task and then ranking their performance against each other. Tournaments use RPI to rank each worker. At the end of a tournament, based upon RPI, each worker is ranked to determine which worker receives a tournament prize. When workers have access to RPI during the tournament, workers can use RPI to assess their chances of winning a tournament.

Tournaments may be informal, whereby the rules and procedures are not disclosed to workers. For example, a retiring manager subjectively ranks workers to recommend who should fill their role once they leave. However, my focus in this thesis is on formal

tournaments with an objective, pre-determined basis for evaluating the performance of tournament participants.

Firms must decide which individual workers or teams will participate, the task, the basis upon which performance ranks are determined, and the prize or prizes for the best performers. Prizes may be cash, non-cash tangible rewards (Kelly, Presslee, & Webb, 2017), public acknowledgment, or promotion to a higher status position within the firm (Backes-Gellner & Pull, 2013). Firms may elect to hold a single tournament, often referred to as a grand tournament design, or restart the tournament (a repeated tournament design), e.g., a monthly sales contest (Choi, Newman, & Tafkov, 2016). My focus in this thesis is on tournaments that offer a monetary prize based on the final ranking within a single tournament (a grand tournament).

2.2.5. Tournaments – Potential Issues

Despite several compelling advantages of tournament incentive systems, the design and implementation of tournaments can pose a range of potential problems for firms. Tournament theory predicts that workers will increase or decrease their effort based on their perceived chance of winning the tournament or claiming a prize (Backes-Gellner & Pull, 2013; Berger et al., 2013; Casas-Acre & Martinez-Jerez, 2009; Fershtman & Gneezy, 2011; Frederickson, 1992; Lazear & Rosen, 1981; Libby & Lipe, 1992; Prendergast, 1999). When only one winner receives a prize, and the remaining workers miss out, tournaments are not uniformly effective at motivating workers (Backes-Gellner & Pull, 2013). The *threshold group* are workers that perceive they have a reasonable chance of winning the tournament but only if they exert their maximum effort (Backes-Gellner & Pull, 2013). Theory and empirical research have demonstrated that the *threshold group* is motivated to increase effort while

other workers reduce effort (Backes-Gellner & Pull, 2013; Berger et al., 2013; Hannan et al., 2008; Lazear & Rosen, 1981; Prendergast, 1999).

While the *threshold group* remains engaged in trying to win a prize, other workers may not be effectively motivated. Tournament *leaders* may exhibit complacency when they perceive they are likely to win a tournament (Berger et al., 2013; Casas-Acre & Martinez-Jerez, 2009). Complacency manifests as less effort exerted in later stages of a tournament and subsequent tournaments under the belief that the worker will win even if they withhold some effort (Backes-Gellner & Pull, 2013; Berger et al., 2013; Casas-Acre & Martinez-Jerez, 2009; Hannan et al., 2008). For this worker, there is a low marginal return on the effort exerted, as they are likely to claim the prize without the need to exercise a high level of effort.

Berger et al.'s (2013) case study of the performance of hotel reservation clerks who were a part of a repeated tournament found evidence of complacency. After winning earlier tournaments, top performers decreased their effort in subsequent tournaments. Casas-Acre & Martinez-Jerez (2009) also identified complacency from leading participants within sales contests organised by the commodities company they examined. The complacency effects observed were restricted to a small group of employees who outperform their peers (Backes-Gellner & Pull, 2013; Berger et al., 2013; Casas-Acre & Martinez-Jerez, 2009; Hannan et al., 2008).

While *leaders* may exhibit complacency, my focus in this thesis is on *laggards* (workers who fall behind in tournaments). Prior research has identified that *laggards* are prone to giving up or quitting when the goal of winning the tournament is perceived to be unobtainable (Backes-Gellner & Pull, 2013; Berger et al., 2013; Casas-Acre & Martinez-Jerez, 2009). From an economic perspective, these workers have a low marginal return on their effort, as increasing effort is unlikely to garner a prize through winning the tournament

(Bonner et al., 2000; Bull et al., 1987). From a psychology perspective, *laggards* who fall behind may experience a loss of self-efficacy toward the task and abandon the goal of winning the tournament (Bandura, 1997; Carver & Scheier, 2000, 2001; Wrosch, Scheier, Carver, et al., 2003; Wrosch, Scheier, Miller, Schulz, & Carver, 2003).

Laggards may seek alternative strategies and test the effectiveness of alternative strategies before reducing effort (Berger et al., 2013; Casas-Acre & Martinez-Jerez, 2009; Hannan et al., 2008). While searching for a new strategy may uncover an effective tool for increasing competitiveness in some cases, this can prove problematic (Hannan et al., 2008; Kempf & Ruenzi, 2008). The search for alternative strategies can be associated with inefficient time and effort and ultimately can direct focus away from the task (Hannan et al., 2008)

Falling behind and searching for alternative strategies in the hope of regaining lost ground in the tournament can also lead *laggard* workers to take on riskier strategies that may be detrimental to the firm's interest (Kempf & Ruenzi, 2008; Knoeber & Thurman, 1994; Rankin & Sayre, 2011; Steinhage, Cable, & Wardley, 2015; Steinhage et al., 2017). In addition, tournament incentive schemes can inadvertently trigger undesirable incentives not to cooperate or help others (Harbring & Irlenbusch, 2008; Lazear, 1989; Prendergast, 1999; Steinhage et al., 2015, 2017). The lack of cooperation can manifest as a reluctance to help co-workers, to more extreme behaviours such as collusion (Bandiera, Barankay, & Rasul, 2005; Hannan, Towry, & Zhang, 2013) and sabotaging co-workers (Harbring & Irlenbusch, 2008; Steinhage et al., 2015, 2017; Wang, 2017). For example, Harbring & Irlenbusch (2008) provided participants in a tournament with an option to engage in productive and destructive actions. They found that participants frequently chose to sabotage the other participants even

when the cost of engaging in harmful activities was higher than the cost of productive activities[1].

2.2.6. Variations to Tournament Structures to Motivate Laggards

Variations in the design of tournaments can reduce the motivational problems faced by *laggards* in tournaments described in the previous section. Several studies have identified that firms can use the structure of tournament prizes to engage *laggards* that have fallen behind. Backes-Gellner & Pull (2013), Orrison et al. (2004), and Knauer, Sommer, and Wohrman (2017) show that by manipulating the range of prizes offered, it is possible to increase the number of workers that fall into the *threshold group* that remain engaged in the pursuit of prizes. By increasing the percentage of workers who win a prize, a greater proportion of workers remain engaged in pursuing a prize rather than giving up. Similarly, Newman & Tafkov (2014) found that imposing a penalty for the bottom-ranked worker in a tournament effectively engaged *laggards*. Avoiding the penalty provided an alternative goal to engage *laggards*.

2.3. Goals

2.3.1. Goal-Setting Theory

A key aim of control systems is to encourage workers to pursue actions that will further organisational goals and avoid actions that may harm the organisation's interests (Emmanuel, Otley, & Merchant, 1990; Merchant, 1985; Merchant & Van der Stede, 2017). Performance targets are a component of management control systems because they address specific goals set by managers for workers (Locke & Latham, 1990, 2002).

[1] Additional problems include collusion (Bandiera et al., 2005), discouraging innovation (Gibbons & Murphy, 1990), increased firm litigation risk (Shi, Connelly, & Sanders, 2016) and encouraging gamesmanship (Jensen, 2001)

Goal-setting theory predicts that when specific and clearly stated, challenging goals will result in greater effort exertion and performance than easy goals, moderate difficulty goals, and loosely defined goals (Locke & Latham, 1990, 2002, 2006). Assuming goals are accepted, timely feedback is available, and there are no competing goals, there is a linear relationship between goal difficulty and task performance until ability limits are reached, and goal commitment begins to wane (Locke & Latham, 1990).

Goals motivate by creating discrepancies between a worker's current and expected performance, inspiring greater effort to reduce the discrepancy (Locke & Latham, 2006). When workers perform below the goal, they usually try to increase effort or find a new strategy to increase the likelihood of achieving the goal as long as they remain committed to the goal (Locke & Latham, 2002).

Workers usually commit to goals assigned by their employer as their personal goals (Latham & Lee, 1986; Locke & Latham, 1990) because workers perceive that managers set goals based on what they believe workers can achieve (Salancik, 1977). Personal goals are an accurate indicator of the effort a person will commit to a task (Locke & Latham, 1990, 2006).

2.3.2. Goal Difficulty

A higher standard of performance is required by challenging goals before the individual can feel satisfied with their performance and, therefore, motivate them to exert more effort towards the goal (Locke & Latham, 1990, 2002, 2006). If the criteria for achieving the goal are not specified, the individual can give themselves the benefit of the doubt in assessing their performance relative to the goal (Locke & Latham, 1990). Therefore, a wide range of performance levels to be interpreted as meeting the goal.

Managers commonly set performance targets as goals to motivate, evaluate, and reward performance (Merchant & Van der Stede, 2017; Murphy, 2000). Challenging targets elicit higher effort than more easily attained targets (Hirst & Yetton, 1999; Locke & Latham, 1990, 2002, 2006). Archival studies, however, document that many organisations use readily attainable, rather than challenging, targets to evaluate and reward employees (Merchant & Manzoni, 1989; Merchant, Stringer, & Shantapriyan, 2018; Van der Stede, 2000).

Correctly calibrating the goal difficulty of assigned targets to motivate workers requires substantial knowledge of workers' capabilities (Jensen & Meckling, 1995). Targets set too hard may undermine workers' commitment to achieving the target (Jensen & Meckling, 1995; Locke & Latham, 1990, 2002, 2006). On the other hand, too easy targets do not require high levels of effort and can result in poor performance outcomes (Locke & Latham, 1990).

2.3.3. Multiple Goals

Most goal-related research has concentrated on the effect of a single goal, such as a budget-based target, on workers' behaviour (Unsworth, Yeo, & Beck, 2014). In this thesis, I focus on a context in which a tournament is a primary component of a firm's incentive system, and a manager also sets a performance target. Workers in this scenario have two assigned goals they could pursue. Firstly, winning the tournament and secondly, achieving the performance target.

When a worker is assigned multiple goals, the worker will determine a hierarchy of goals (Austin & Vancouver, 1996). Workers often prioritise goals based on the positive affect associated with each goal (Custers & Aarts, 2007; Van Eerde & Thierry, 1996). If the primary goal becomes too difficult, workers may recalibrate their ambitions to focus on a secondary, often easier and related goal (Wrosch, Scheier, Miller, et al., 2003).

In the context I examine in this thesis, the goal of winning a tournament is a primary goal because the extrinsic and intrinsic rewards for winning a tournament are greater than for achieving a performance target. The performance target acts as a secondary goal for *laggards* that replaces the goal of winning the tournament once they fall too far behind the tournament *leader* and the primary goal of winning the tournament is too difficult.

2.3.4. Goal Interaction with Incentive Systems

The relationship between goals and performance is most effective when people remain committed to the goal, especially when goals are challenging (Locke & Latham, 1990, 2002, 2006). Increasing the importance of the outcomes of goals is thought to increase goal commitment (Locke & Latham, 1990, 2002, 2006; Van Eerde & Thierry, 1996; Vroom, 1964).

While the goal-setting literature shows that specific and difficult goals are effective, how goals interact with financial incentives remains unclear (Locke & Latham, 1990). Monetary incentives are thought to make a goal more attractive to workers (Locke & Latham, 1990). Despite the interaction between goal difficulty and the provision of financial incentives being a critical issue in the design of control systems, little attention has been paid to this issue.

Four notable accounting studies have examined the interaction between goal difficulty and monetary incentives as part of flat-pay, budget-target, and piece-rate systems, Fatseas & Hirst (1992), Chow (1983), Lee, Locke, and Pham (1997), Mowen et al. (1981) found conflicting results.

Fatseas & Hirst (1992) found that the type of incentive system did not significantly affect performance for moderate and higher goal difficulty conditions. When goals were low

or impossible, financial incentives had a significant influence. When goal difficulty was set low, performance-contingent (piece-rate and budget-target) systems motivated higher performance levels than flat-pay rate systems. At impossible goal difficulty levels, a budget-target incentive system contributed to poorer outcomes than the piece-rate and flat-pay rate system.

Chow (1983) found that goals and the type of financial incentive had independent additive effects. More difficult goals increased participants' performance, as did having a budget-target incentive compared to a flat-pay rate system. However, he acknowledged that the experimental design might have allowed learning effects to reduce goal difficulty because every participant performed better in the main experiment than in pre-testing. Finally, Lee et al. (1997) and Mowen et al. (1981) report that participants in both studies performed poorer under a budget-target system than under a piece-rate system when faced with difficult goals.

The studies from Chow (1983), Fatseas & Hirst (1992), Lee et al. (1997), and Mowen et al. (1981) highlight the importance of goal difficulty as a moderating variable between incentive systems and performance outcomes. I contribute to this literature by examining the interaction between performance target difficulty and incentives when targets are a secondary goal, and a tournament is the primary component of the incentive scheme.

2.3.5. Goal Recalibration

Tournament incentive systems provide workers with a primary goal of outperforming their peers. A feature of tournaments is that because performance is assessed relative to other workers, every worker cannot win the tournament, no matter how much effort they direct towards the goal. Workers incentivised by a tournament are aware of this fact. As not everyone can win, tournaments make the possibility of failure more salient compared to other types of incentive systems.

While monetary incentives can increase goal commitment, they are only effective if a goal is perceived as obtainable (Locke & Latham, 1990). If feedback shows that the person is not on track toward achieving the goal, this can motivate an increased effort to reduce the discrepancy between the current performance and the performance required to achieve the goal (Carver & Scheier, 2001; Locke & Latham, 1990, 2002). However, if the effort required to achieve the goal is perceived as unrealistically demanding or beyond the person's reach, the person may abandon the goal (Bandura, 1997; Carver & Scheier, 2000, 2001).

Donovan & Williams (2003) and Tolli & Schmidt (2008) provide evidence that when faced with a discrepancy between current performance and the performance required to achieve a goal, people either increase their effort to try to achieve the goal or adjust their goal to match their current performance. Donovan & Williams (2003) and Tolli & Schmidt (2008) suggested that people may abandon goals beyond their capability and replace them with personally set goals they can more realistically achieve. A problem with tournaments is that when a *laggard* falls behind the tournament *leader*, there is a risk that they abandon the goal of winning the tournament, and they reduce effort (Berger et al., 2013; Casas-Acre & Martinez-Jerez, 2009).

When a goal becomes too difficult, people recalibrate their goal toward a more achievable goal (Carver & Scheier, 1990, 2000, 2001; Carver, Scheier, & Weintraub, 1989; Locke & Latham, 1990; Wrosch, Scheier, Carver, et al., 2003; Wrosch, Scheier, Miller, et al., 2003). Prior research indicates that goal recalibration may occur when an alternative goal of winning the tournament is present (Backes-Gellner & Pull, 2013; Berger, Libby, & Webb, 2018; Harbring & Irlenbusch, 2008; Knauer et al., 2017; Newman & Tafkov, 2014).

Newman & Tafkov (2014) show that providing an alternate goal to winning the tournament can result in *laggards* continuing to exert effort. In one experimental condition,

Newman & Tafkov (2014) imposed a financial penalty for the last-placed participant in the tournament. Their results suggest that *laggards* continued to exert effort to avoid receiving the penalty. Their findings imply that either *laggards* adopted the goal of not finishing last from the beginning of the tournament, or they recalibrated their goal from winning to avoiding the penalty after falling behind.

Studies of tournaments with multiple prizes infer a similar conclusion (Backes-Gellner & Pull, 2013; Berger et al., 2018; Harbring & Irlenbusch, 2008; Knauer et al., 2017). In contrast to a tournament with only one prize, a *laggard* in this type of tournament has the opportunity to recalibrate their goal as they develop a clearer perception of the difficulty of winning the tournament. A *laggard* may initially adopt a goal to win the largest tournament prize and subsequently recalibrate their goal to an easier ambition by targeting a lesser prize.

What is not clear from the Newman & Tafkov (2014) and the studies involving tournaments with multiple prizes[2] (Backes-Gellner & Pull, 2013; Berger et al., 2018; Harbring & Irlenbusch, 2008; Knauer et al., 2017) is whether *laggards* were only motivated to exert effort because of a potential financial reward or penalty. *Laggards* who were unlikely to win the tournament may have been motivated not only because a financial reward was at stake but simply because a secondary goal (to perform well enough to qualify for a consolation prize or avoid a penalty) was available. *Laggards* in tournaments provided a secondary goal for their performance may be motivated more than *laggards* left to define their own standard for performance. I examine the potential for secondary goals in the form of assigned rewarded performance targets and unrewarded targets to affect the effort exerted

[2] Berger et al. (2018) and Harbring & Irlenbusch (2008) both examined tournaments with 20% and 50% of participants winning a prize; Knauer et al. (2017) 16.7%, 50%, and 83.3%' and Backes-Gellner & Pull's (2013) archival study compared a range of tournament prize spreads from 25.4% to as high as 96.8%.

by *laggards* in tournaments. Rewarded or unrewarded targets provide a realistic secondary goal for *laggards*. A rewarded target, however, is the more attractive goal. It is also unknown how assigned goals for acceptable performance impact the propensity for workers to quit working on a task incentivised by a tournament.

2.4. Carver & Scheier's Goal Recalibration Model (1990, 2000, 2001)

Carver & Scheier's (1990, 2000, 2001) theory of self-regulation and goal recalibration, as depicted in Figure 2.1., provides a framework for understanding the goal recalibration process for *laggards* who fall behind in a tournament. Carver & Scheier's (1990, 2000, 2001) model explains the process whereby a discrepancy between current performance and a primary goal may result in a person recalibrating their ambition towards a more realistic secondary goal.

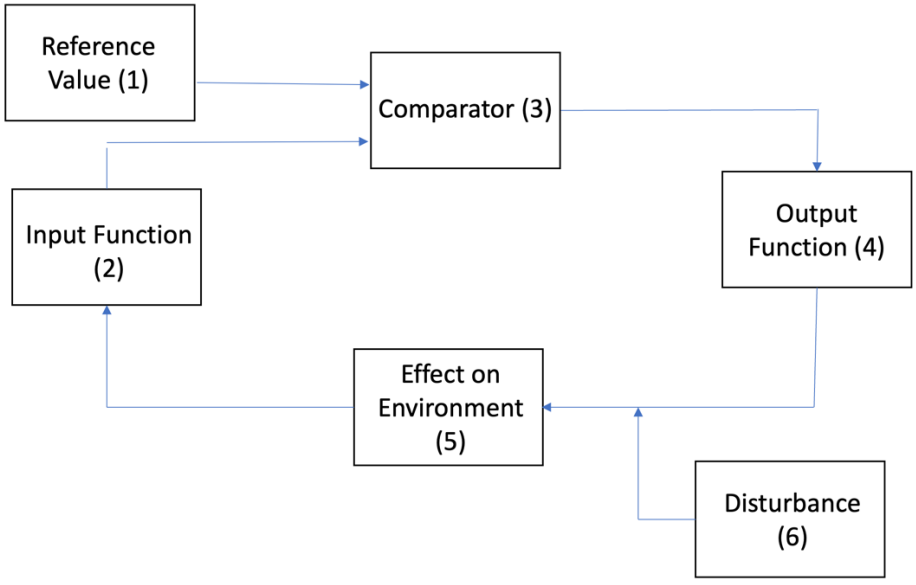


Figure 2.1. Discrepancy Reducing Feedback Loop (Carver & Scheier, 1990, 2000, 2001; MacKay, 1965; Miller, Galanter, & Pribram, 1960; Powers, 1973)

People use a discrepancy-reducing feedback loop to reduce the discrepancy between how they act and their intended actions (Carver & Scheier, 1990, 2001). A discrepancy

reducing feedback loop comprises four main elements: a reference value (1), an input function (2), a comparator (3), and an output value (4) (Carver & Scheier, 2000, 2001; MacKay, 1965; Miller et al., 1960; Powers, 1973). A reference value (1) is the desired action or goal. The input function (2) is the person's perception of their current situation. The comparator (3) compares the person's perception of their input function (2) and their reference value (1). The output function (4) is the person's actions that affect their environment or current situation (5).

The person's actions affect the person's environment; however, external disturbances (6) can moderate the effect (Carver & Scheier, 1990, 2000, 2001). In a tournament, a worker exerts effort to improve their performance ranking; however, the performance of other workers (disturbances) moderates the relationship between the worker's effort (output function) and their ranking (effect on their environment).

A well-functioning discrepancy functioning feedback loop minimises the discrepancy between the goal (reference value) and the current situation (input function) (Carver & Scheier, 1990, 2000, 2001). This process results in behaviour (output function) regulation to approach or attain the goal (reference value). If the comparator reveals no discrepancy between the current and desired states, no change in behaviour is warranted. However, if the comparator indicates a positive or negative discrepancy, the person's behaviour should be adjusted to reduce the discrepancy (Carver & Scheier, 2001). In either case, a discrepancy-reducing system tries to continuously make reality match the goal.

In a tournament, if the worker is on course to achieve their goal, e.g., winning the tournament, the worker is likely to continue to act as they have been doing up to that point. A *laggard* worker that has fallen behind (negative discrepancy) will attempt to reduce the discrepancy by either increasing their effort (input function) or recalibrating their goal

(changing the reference value to match the current status). A tournament *laggard* may abandon winning the tournament as their goal and recalibrate their goal to a more realistic standard.

2.5. Quitting a Tournament Incentivised Task

A potential problem with tournaments that has been largely overlooked is the retention of participants in tournaments (Fershtman & Gneezy, 2011). Management accounting research has to date, focused on tournaments where the financial or social costs are prohibitively high for participants to quit working on the tournament incentivised task. Berger et al. (2013) and Casas-Acre & Martinez-Jerez (2009) identified that *laggard* workers reduced effort but did not quit the task after falling behind in tournaments.

A person who abandons a goal may mentally disengage and reduce effort directed toward the pursuit of the goal but may continue to perform the behaviour if it is too costly to stop the behaviour overtly (Carver et al., 1993; Carver & Scheier, 1990, 2000, 2001; Carver et al., 1989; Wrosch, Scheier, Carver, et al., 2003; Wrosch, Scheier, Miller, et al., 2003). The participants in the Berger et al. (2013) and Casas-Acre & Martinez-Jerez (2009) studies competed in the tournament as part of their employment. For workers to overtly quit may have been perceived as extremely costly, potentially risking sanction or termination of their employment.

Quitting may not occur because social norms generally associate quitting with a lack of courage, lack of dedication, and a lack of perseverance (Carver & Scheier, 1990). These are undesirable traits to display publicly and may outweigh the personal feelings of shame and embarrassment from persisting on a task that the person knows they are not good at. People will tend to mentally disengage from a task rather than overtly quit when high social costs are associated with quitting (Carver & Scheier, 1990, 2000, 2001).

For some workers, rather than directing effort toward a fruitless or inevitable failure, it may be better (for the worker and the firm) to quit a task incentivised by a tournament and redirect their efforts towards a task that the worker is better suited. In this thesis, however, I focus on a setting where the manager wants to retain and develop the capabilities of workers who work in an environment where a tournament is the primary component of the firm's incentive system. Specifically, I examine the potential for a secondary goal in the form of a performance target to reduce the number of workers who quit a tournament. A performance target may encourage workers to refocus on achieving an assigned target if winning the target is too difficult.

2.6. Conclusion

In this chapter, I have examined the management accounting literature focused on tournament incentive schemes. The literature reviewed focused on the challenge for managers to motivate *laggard* workers to exert effort and continue to work on a task incentivised by a tournament. I also examined the literature related to goal-setting, the interaction between goals and incentives, multiple goals, goal-recalibration and quitting in tournaments.

Chapter 3 Hypotheses Development

3.1. Effort in Tournaments

3.1.1. Giving Up in Tournaments

Tournaments incentivise workers to exert effort to increase their chances of winning a monetary prize, such as a promotion or bonus, as well as for social status (Frederickson, 1992; Greenberg et al., 2007; Hannan et al., 2008; Hannan, McPhee, et al., 2013; Lazear & Rosen, 1981). Theory and empirical evidence suggest that workers increase or decrease their effort based on their perceived chance of winning the tournament or claiming a prize (Backes-Gellner & Pull, 2013; Berger et al., 2013; Casas-Acre & Martinez-Jerez, 2009; Frederickson, 1992; Lazear & Rosen, 1981; Prendergast, 1999).

As the gap between *leaders* and *laggards* increases, the odds of a *laggard* catching up in a tournament becomes smaller. Once effort alone is unlikely to be sufficient for a *laggard* to catch up, they will no longer be motivated by the goal of winning a tournament. *Laggards* will then exert less effort.

3.1.2. Assigned Performance Targets in Tournaments

When a tournament is the primary component of a firm's incentive system, the possibility of failure is more salient to a worker than in alternative incentive systems. *Laggards* who fall behind in tournaments become likely candidates to lose motivation and withhold effort. For *laggards* who trail in tournaments, the goal of winning the tournament can appear increasingly unobtainable. When goals are perceived as unrealistically demanding or beyond the person's reach, goals are likely to be abandoned by individuals who can redirect their effort to a more attainable goal (Bandura, 1997; Carver & Scheier, 2000, 2001;

Locke & Latham, 2002).

It is a commonplace for managers to set performance targets rather than allow workers to set work goals for themselves (Merchant, 1985, 1989; Merchant & Manzoni, 1989; Murphy, 2000). Performance targets are assigned goals that serve as an alternative to self-set performance goals.

Where a tournament is a primary component of a firm's incentive system, the goal of winning the tournament and the available tournament prize is an attractive primary goal for workers. As *laggards* fall behind in a tournament, the pursuit of the goal of winning the tournament may appear too difficult. *Laggards* may adopt an assigned performance target as a secondary goal. An assigned performance target encourages *laggards* who have given up trying to win a tournament to redirect their focus to achieving the performance target. A performance target sets a floor for what is a satisfactory performance level. For *laggards* who have fallen behind in tournaments, an assigned performance target provides a secondary goal to pursue, thereby limiting the deterioration in their effort.

However, managers signalling their expectations by assigning a performance target may undermine the motivational benefit of a tournament. By signalling expectations, a manager may be condoning *laggards* not trying to win the tournament. For *laggards* who have fallen behind in the tournament rather than striving to perform well in the tournament, they may instead focus on only meeting the manager set target.

Achieving the target may insulate *laggards* from the embarrassment of performing poorly against peers in the tournament. *Laggards* opting not to compete against peers are insulated from the social stigma of performing poorly and may perceive that meeting the assigned target is an acceptable benchmark for performance. The lower standard may

undermine *laggards*' motivation to continue exerting their maximum effort. In other words, the manager set target may constrain *laggards*' aspirations to the set performance target.

I predict that while performance targets may undermine the motivation of some *laggards*, a performance target will be an effective secondary goal for *laggards* that have fallen behind. Therefore, the first hypothesis is:

> **H1:** *Laggards* in tournaments with an assigned performance target exert more effort than *laggards* in tournaments without an assigned performance target.

3.1.3. Assigned Performance Target Difficulty

In a grand tournament with a single prize, only one worker can win a tournament, and all other workers fail to win. *Laggards* fearing that winning a tournament is too difficult will redirect their effort to an easier goal. Rather than feeling demoralised from falling behind, *laggards* can recalibrate their goal toward achieving a performance target. A performance target provides a secondary goal for *laggards* to strive towards and may shield them from negative feelings triggered by failing to compete in a tournament effectively.

When performance targets are the only goal assigned to workers, clearly stated challenging targets elicit more effort and better performance outcomes than easy targets (Hirst & Yetton, 1999; Locke & Latham, 1990, 2002, 2006; Locke, Saari, Shaw, & Latham, 1981). However, in the context of a tournament, challenging performance targets may not engage *laggards*.

Having already abandoned the primary goal of winning the tournament*, laggards* are likely to reject a target that is too difficult. In isolation, a challenging target that may have motivated workers to exert effort might be perceived as too difficult for *laggards* who have

already failed their primary goal of winning the tournament.

An easy target may provide a more realistic secondary goal for *laggards* than a harder target. A manager may opt to set a relatively easy target to avoid damaging the ego and morale of workers who could fail to achieve a difficult target (Merchant & Manzoni, 1989; Wrosch et al., 2007; Wrosch, Scheier, Carver, et al., 2003; Wrosch, Scheier, Miller, et al., 2003). A difficult target may reinforce a sense of failure if *laggards*, having already failed to win the tournament, also perceive they cannot achieve the performance target.

However, setting an easy target could signal that the manager condones mediocre performance and may lead to complacent behaviour from some *laggards* (Akerlof, 1982; Lawler III & Rhode, 1976). While an easy target could engender complacency from *laggards*, I expect an easy target is more likely to be accepted by *laggards* than a hard target. Therefore, where a tournament is the primary component of an incentive system, an easy target motivates more effort from *laggards* by setting a floor for acceptable performance than a hard target.

> **H2:** *Laggards* in tournaments with an assigned easy performance target exert more effort than *laggards* in tournaments with an assigned hard performance target.

3.1.4. Incentivised Assigned Performance Targets

Monetary incentives increase commitment and effort exerted on work tasks (Awasthi & Pratt, 1990; Bonner & Sprinke, 2002). Attaching a financial reward to a target increases the target's attractiveness as a goal (Vroom, 1964). Increasing the attractiveness of a performance target may, in turn, increase the effort exerted by workers striving to achieve the target. For *laggards*, the potential to receive a financial reward for achieving the target may

increase the commitment and effort they exert to reach the target. Therefore, I expect tournaments with paid targets to elicit more effort than tournaments with unpaid targets.

While I anticipate a paid target to elicit more effort than unpaid targets, it is conceivable that providing payment for achieving the performance target could undermine some of the motivational benefits of a tournament. By making the target more attractive by attaching a financial reward, a manager may be encouraging *laggards* only to exert effort sufficient to achieve the target. *Laggards* may, in effect, abandon the primary goal of winning the tournament faster if an attractive paid target is used rather than a less attractive unrewarded target.

Despite the risk that paid targets may encourage *laggards* to focus on achieving the target, I expect that paid targets will be more effective at eliciting effort from *laggards.* Paid targets are more likely to set a floor for *laggards'* effort and maintain their commitment to exerting a satisfactory level of effort than unpaid targets.

Stated more formally, H3 is:

H3: *Laggards* in tournaments with an assigned paid performance target exert more effort than *laggards* in tournaments with an assigned unpaid performance target.

3.2. Retention in Tournaments

Tournament rankings identify which workers are underperforming relative to their peers, which can cause fear and anxiety amongst lower-ranked workers and may contribute to higher levels of worker turnover for firms (Hazels & Sasse, 2008; Steinhage et al., 2017). Some firms may encourage lower-ranked workers to quit to free up resources and replace those workers (Scullen, Bergey, & Aiman-Smith, 2005; Welch et al., 2005). If a worker is

sufficiently demotivated that they quit, the manager not only loses a valuable worker, but the firm also incurs costs to hire and train a replacement worker (Li, Lourie, Nekrasov, & Shevlin, 2021).

3.2.1. Performance Targets, Goal-recalibration and Quitting

At the beginning of a tournament, when workers are unaware of the relative ability of their fellow workers, they are likely to adopt winning the tournament as their personal goal. During the tournament, access to relative performance information allows workers to compare their current performance levels to assess the probability of winning the tournament (Casas-Acre & Martinez-Jerez, 2009; Tafkov, 2013). For *laggards*, the discrepancy between their performance and the performance of others will signal that current effort and performance will be insufficient to meet the goal of winning the tournament.

When the worker is confident that winning the tournament remains attainable, they are likely to continue to compete in the tournament. If the perceived probability of achieving the goal of winning the tournament is low, the worker may disengage from the goal (Carver & Scheier, 1990, 2000, 2001; Klinger, 1975; Kukla, 1972). Mental disengagement from the goal indicates the worker is no longer emotionally invested in the tournament's outcome (Carver & Scheier, 2000).

Rather than quit or disengage entirely from a goal, people often recalibrate their goal to adopt a lesser standard (Carver & Scheier, 1990, 2000, 2001). For *laggards*, a manager-set target provides a secondary goal that may prevent workers who fall behind in tournaments from quitting the task incentivised by a tournament.

Hence, if the primary goal of winning the tournament is not attainable, engagement with a new, related goal can shield workers from thoughts of failure and negative emotions

related to failing to achieve their primary goal (Carver & Scheier, 1990, 2000, 2001; Wrosch, Scheier, Miller, et al., 2003). I, therefore, predict that a performance target can reduce the likelihood that a worker will seek to exit a tournament. The fourth hypothesis is, therefore:

H4: In tournaments with an assigned target (without an assigned target) retention will be higher (lower).

3.2.2. Quitting Visibility in Tournaments

The extent to which information about peer behaviour, effort, and performance is available varies across workplaces (Arnold, Hannan, & Tafkov, 2020; Ferrazzi, 2014; Thomas & Thornock, 2021; Yatsenko, 2021). For example, in open-plan office settings, workers can directly observe peers' behaviour, whereas, in remote working environments, workers only know outcomes that the employer discloses. Workers may be provided or have access through their observations with performance information about other workers in the tournament who have previously quit. Access to this type of information may influence a worker's decision to quit.

Observing other workers of similar ability failing to complete a task may lower a worker's assessment of their chance of completing the task (Bandura & Jourden, 1991; Turkat & Guise, 1983; Turkat, Guise, & Carter, 1983). If workers have access to performance information related to another worker who has quit a tournament, workers can infer the quitting worker's ability. A worker whose own performance is similar to a worker who quit may conclude that competing in the tournament is too difficult for workers like themselves. The worker may respond to this realisation by disengaging or potentially quitting the tournament.

If, however, performance information related to other workers who have quit is not available, this type of social comparison is not possible. The remaining workers may be aware that another worker quit the tournament but cannot easily assess the relative ability of those that quit and are less likely to be influenced by their actions.

Hence, I hypothesise that access to performance information related to other workers who have quit results in fewer workers being retained in a tournament. Stated formally:

H5: In tournaments where workers are informed (not informed) of the performance of workers who have quit, retention will be lower (higher).

A manager may set a performance target to provide a secondary goal for workers; however, access to performance information related to workers who have quit the tournament may alter the perceived difficulty of the assigned target. The performance information informs the remaining workers whether those that quit the tournament also failed to achieve the manager set performance target. For workers who are performing at a similar level to the worker who quit, knowing that a co-worker quit and failed to meet the target may increase the perceived difficulty of the target. The worker may conclude that the target is not a realistic secondary goal for a worker of their ability. If a worker perceives the target is too difficult, it may induce the worker to stop trying to achieve the secondary goal and quit the tournament. Stated more formally:

H6: In tournaments, the retention resulting from the provision of a target, compared to no target, will be smaller (greater) when the workers are (not) informed of the performance of the workers who have quit.

When a manager assigns a performance target, the target implies the manager has confidence that a worker can achieve the target, improving worker self-confidence (Salancik, 1977). Difficult goals generally cause workers to persist for longer on a task than easier goals, as long as the goal is accepted and the worker remains committed to achieving the goal (Locke & Latham, 1990; Locke et al., 1981).

When a worker quits a tournament, the remaining workers learn that the goal of winning the tournament was too difficult for one of their co-workers. Without access to performance information related to the worker who quit, the remaining workers do not know whether the worker who quit achieved the performance target or not.

Witnessing a co-worker quit the tournament without achieving an assigned target signals that both winning the tournament and achieving the target were too difficult. If workers perceive both the tournament and the target are too difficult, there is an increased likelihood that they will quit the tournament.

The chance that worker witnesses a co-worker quit without achieving a target increases as the difficulty of the target increases. Workers performing at a similar level as the worker who quit may conclude that quitting the tournament is a rational decision even if they have not achieved the target.

Therefore, I hypothesise that when a worker does not have access to performance information about other workers who have quit, tournaments with hard targets retain more workers than tournaments with easy targets or no targets. However, if workers have access to performance information related to other workers who have quit, harder targets have the opposite effect. Observing that another worker was unable to achieve the target may increase the perceived difficulty of the hard target. Workers may reject harder targets, resulting in

hard target tournaments retaining fewer workers than tournaments with easier targets. Stated formally:

H7: In tournaments, the retention resulting from the provision of a hard target, compared to an easy target, will be smaller (greater) when the workers are (not) informed of the performance of the workers who have quit.

3.3. Conclusion

The current chapter has focused on the effects of assigned performance targets on the effort and retention of workers in tournaments. I hypothesise that performance targets, target difficulty, and incentivising targets affect *laggard*' effort in tournaments. I also predict that performance targets and target difficulty interact with the availability of performance data of workers who had quit the tournament to affect retention in tournaments. In this chapter, I developed seven hypotheses that are empirically tested in two separate experiments discussed in Chapter 5.

Chapter 4 Task Selection

4.1. Introduction

In this chapter I describe two systematic reviews of the effort-sensitive tasks used in the management accounting literature. The reviews aim to identify a task suitable for testing the hypotheses laid out in the previous chapter. I have undertaken this thesis on a part-time basis over an eight-year period. Due to the extended duration of this project, two reviews are presented. The first review covered January 2010 to July 2016 to inform the design of two separate experiments described in the next chapter. The second review covers the period from July 2016 to December 2021 to provide an updated literature review. I describe the review process and how the task adapted for Experiments 1 and 2 was chosen.

The first experiment focuses on the effort of *laggards* in tournaments. In the first review I sought to identify an effort-sensitive task for which performance can be used as a proxy for the effort exerted by participants.

4.2. Review of Management Accounting Effort Sensitive Tasks January 2010 to July 2016

There are a plethora of tasks that vary in complexity used by researchers to investigate the effects of incentives on workers' performance. Some tasks test the association between effort and performance more directly than others. Some tasks require participants to trade off short-term task performance against redirecting effort towards strategy development and skill acquisition. Factors like this make it difficult to observe and measure the effort exerted by participants directly. In order to test the hypotheses developed in the previous chapter, a task either needs to measure effort directly or use performance as a proxy for effort.

This section presents the findings from the first review of the effort sensitive tasks used in management accounting themed papers published from January 2010 to July 2016 in the following journals: *The Accounting Review; Accounting, Organizations & Society; Journal of Accounting Research; Journal of Accounting & Economics; and Contemporary Accounting Research*. The journals are the highest-rated journals that regularly publish management accounting themed papers using laboratory experiments based on the Scimago Journal Rank indicator (SJR). The SJR ranks each journal based on its impact, influence, prestige and citations on the 2015 Scimago Journal Ranking List[3]. The review was conducted in early 2017.

The review aims to help identify an effort-sensitive task with a strong association between observable effort and performance. The intended outcome of the first review is to identify a task that was suited to testing the hypothesised relationships between assigned goals, incentives, and the regulation of effort in tournaments.

I identified two main categories of tasks: stated effort tasks and real effort tasks outlined below. Stated effort tasks (also commonly referred to as effort allocation tasks or induced value effort tasks), commonly utilized in Economics, generally assume effort to be a rational choice (Charness, Gneezy, & Henderson, 2018). On the other hand, real effort tasks require participants to exert cognitive or physical effort towards an experimental task.

4.3. Stated Effort Tasks

Stated effort tasks require participants to choose, rather than exert, an effort level to allocate towards the task or project (e.g. Brown, Martin, Moser, & Weber 2015; Cardinaels,

[3] The archived 2015 Scimago Journal Ranking list is accessible from: https://www.scimagojr.com/journalrank.php?category=1402&year=2015

Chen, & Yin, 2017; Cardinaels & Yin, 2015; Choi, 2014; Douthit & Stevens, 2015; Hales & Williamson, 2010; Kuang & Moser, 2011; Maas, Van Rinsum, & Towry, 2012). In the reviewed stated effort tasks, participants earn rewards based on individual performance (e.g. Hannan, et al. 2013), group performance (e.g. Maas et al. 2012), a set wage (e.g. Brown et al. 2015), or other factors such as budgetary slack (e.g. Douthit & Stevens 2015).

Stated effort tasks provide participants with an effort function often displayed as an effort-performance payoff table. Table 4.1. displays an example of an effort allocation payoff table adapted from Hannan et al. (2013). Stated effort tasks require a participant to nominate an effort level. Classical economics assumes that people are effort averse and only exert effort at work because they are financially compensated (Spencer, 2008). The disutility for effort is operationalized, within stated effort tasks, by imposing a cost that increases as the level of effort selected increases. Without imposing a cost upon effort within a stated effort task, there would be no reason for participants not to select the maximum effort.

Table 4.1. Adapted from Hannan et al. (2013)

Cost of Effort [a]

Effort	Cost (points)	Effort	Cost (points)	Effort	Cost (points)	Effort	Cost (points)
1	0.1	11	17.3	21	63.0	31	137.3
2	0.6	12	20.6	22	69.1	32	146.3
3	1.3	13	24.1	23	75.6	33	155.6
4	2.3	14	28.0	24	82	34	165.1
5	3.6	15	32.1	25	89.3	35	175.0
6	5.1	16	36.6	26	96.6	36	185.1
7	7.0	17	41.3	27	103.1	37	195.6
8	9.1	18	46.3	28	112.0	38	206.3
9	11.6	19	51.6	29	120.1	39	217.3
10	14.3	20	57.1	30	128.6	40	228.6

[a] Effort is chosen by participants, with a range of between 1 and 40. The cost of effort increases with the level chosen, and the expected performance increases in effort. In this example adapted from Hannan et al. (2013), participants could exchange their remaining points for a monetary payment of $1 for every ten points at the conclusion of the experiment.

An advantage of stated effort tasks over real effort tasks is that they allow the experimenter to hold constant the performance outcome for each level of effort across participants (Charness et al., 2018). For example, by using the same cost of effort equation for all participants, variations in skill will not affect performance. In other words, a stated effort task can be designed to have a direct correlation between stated effort and performance.

While stated effort tasks have a high degree of internal validity, this comes at the expense of lower external validity than real effort tasks. Performance on real effort tasks is subject to factors that impact performance in the real world, which are absent in stated effort tasks (Brüggen & Strobel, 2007; Cardinaels, 2016; Cardinaels et al., 2017; Cardinaels & Yin, 2015; Charness et al., 2018; Lezzi, Fleming, & Zizzo, 2015). Stated effort tasks also represent effort as a decision at a point in time. In contrast, real effort tasks represent effort as a dynamic process whereby the effort exerted may change while the participant performs the task (Charness et al., 2018).

The evidence from the few studies that directly compare stated versus effort exerted is inconclusive. Brüggen & Stobel (2007) found no significant difference in effort between participants solving multiplication problems (real effort) and participants asked to choose an effort level (stated effort). Lezzi, Fleming & Zizzo (2015) observed differences in reported anxiety, risk aversion, and performance induced by real effort tasks and a stated effort task. Lezzi et al. (2015) did not record a baseline measure of ability for the real effort tasks nor a direct measure of effort. While Lezzi et al. (2015) could not draw conclusions about the effort exertion on real effort compared to stated effort tasks, their results indicate that task selection could affect effort. For example, as Lezzi et al. (2015) observed in their real effort tasks, elevated anxiety which is often associated with increased effort to avoid poor performance outcomes (Eysenck & Calvo, 1992).

4.4. Real Effort Tasks

Real effort tasks require participants to exert either physical or cognitive effort on the task. Real effort tasks are usually more complex and cognitively demanding than stated effort tasks and have a more uncertain relationship between the effort expended and performance (Bonner et al., 2000; Bonner & Sprinke, 2002). Complex tasks generally increase the number of subtasks that must be undertaken and coordinated to perform the task (Wood, 1986).

When a real-effort task is used, the researcher should attempt to control for individual differences, including variations in participants' skill (Bonner & Sprinke, 2002), initial strategy selection (Bonner & Sprinke, 2002), rate of learning (Choi, Clark, & Presslee, 2019), fatigue (Choi et al., 2019), biological factors, e.g., sex (Lezzi et al., 2015), self-efficacy (Bandura, 1997), as well as psychological factors such as anxiety (Lezzi et al., 2015). As part of this review, I categorised the real effort tasks identified by the strength of the association between observable effort and performance for the task, i.e., the extent to which increased observable effort translates into improved performance. More complex tasks do not necessarily provide a sufficient variation in performance outcome to reflect the non-observable differences in effort exerted by participants. Therefore, I classify tasks into three categories: a weak association, moderate association, or strong association, between the observable effort and performance of participants assigned to the task. Table 4.2. summarises each task, how the task operationalises effort and the studies that utilize the task.

Table 4.2. Real Effort Tasks identified within the scope of review

Task Name	Operationalisation of Effort	Studies that adopt the task
Tasks implying a weak association between effort and performance		
Rebus Problems Task	Use words or diagrams to represent common words or phrases	Kachelmeier & Williamson (2010)
Creative Classroom Task	Identify creative use for an abandoned house on campus	Chen, Williamson, & Zhou (2012)
Spore Creature Creation Task	Design a creature to become the dominant creature in a computer game.	Choi, Hecht, & Tayler (2012, 2013)
Webb's Letter Search with Shortcuts Task	Identify the frequency in which a letter appears within a set. Participants are told that there are potential shortcuts.	Webb, Williamson, & Zhang (2013)
Tasks implying a moderate association between effort and performance		
General Knowledge Questions	Participants answer general knowledge questions (Maas & Van Rinsum, 2013) or SAT-style questions (Chen, Rennekamp, & Zhou, 2015).	Chen, Rennekamp, & Zhou (2015) and Mass & Van Rinsum (2013)
Anagram Puzzles	Participants solve anagrams	Hannan, McPhee, Newman, & Tafkov (2013)
Letter Decoding Tasks	Decode numbers or letters sequences	Arnold (2015), Arnold & Gillenkirch (2015), and Kelly, Webb, & Vance (2015)
Multiplication Problems	Solve multiplication problems	Hannan, McPhee, Newman, & Tafkov (2013) and Tafkov (2013)
Data Entry Task	Participants	Christ, Emett, Summers, & Wood (2012) and Christ, Emett, Tayler, & Wood (2016)
Tasks implying a strong association between effort and performance		
No studies were identified within the scope of the review		

4.4.1. Tasks with a Weak Association Between Observable Effort and Performance

I classify tasks that require problem-solving or strategy development as having a weak association between observable effort and performance. Each task of this type imposes higher cognitive demands because they generally provide less clarity and direction to participants on how to use effort to improve their performance. Participants need to work smarter rather than just work harder to perform well. In a review of tasks based on task complexity attributes, Bonner et al. (2000) rate problem-solving tasks as the most complex type of task used in accounting experiments because they typically require novel solutions rather than just the integration of available information. As the structure of a task decreases, the number of cognitive processing increases (Campbell, 1988; Wood, 1986), and performance on the task is not necessarily correlated with effort.

Tasks that involve strategy development imply a weak association between effort and performance, like problem-solving, because the optimal strategy is not always initially clear to all participants. A participant must evaluate all the task-specific information, potentially access information from their short-term and long-term memory, and judge the most effective strategy. Participants may need to exert effort toward trialling and evaluating different strategies. Some participants may direct effort toward systematically evaluating many strategies, while others may stick with their initial strategy. The different approaches available to participants weaken the association between effort and performance on this type of task. Some tasks add further complication by requiring the participant to trade off available time between working on the task (short-term performance) and developing a strategy (long-term performance) e.g., Webb et al. (2013). Performance on tasks with multiple potential approaches could be affected by finding a more effective strategy rather than only effort expended directly on the task (Locke & Latham, 1990).

Four types of problem-solving and strategy development tasks are identified within the scope of the first review. The following section profiles each of the tasks.

4.4.1.1. Rebus Problems Task

I classify Rebus Problems and other tasks that require creative problem solving as having a weak association between effort and performance. Kachelmeier & Williamson (2010) use a creative problem-solving task involving rebus puzzles. The task requires participants to create a rebus puzzle using a combination of words and pictures to describe an assigned word or phrase. Figure 4.1. is an example of a rebus puzzle.

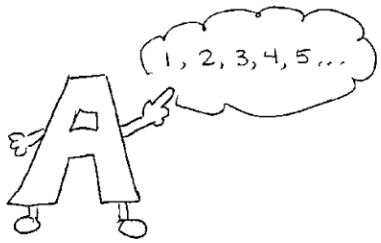


Figure 4.1. Accounting rebus puzzle
An example of a Rebus puzzle adapted from Kachelmeier & Williamson (2010). The solution to this puzzle is 'accounting.'

Rebus puzzles have a weak association between effort and performance because there are many potential rebus puzzles for each word or phrase. Participants must break the assigned word or phrase down into components and think laterally to form a creative solution. A participant may exert a lot of effort, trialling different approaches to the puzzle. This effort may not consistently translate into a higher quality when quality is the observed performance measure. The same person might create a high-quality rebus puzzle for a different phrase with minimal effort.

4.4.1.2. The Creative Classroom Task (Idea Generation Task)

The same characteristics as the Rebus Problems Task are present in Chen et al.'s (2012) Creative Classroom Task. The Creative Classroom Task requires participants to develop original, innovative, and realistic uses for an empty building located on a university campus. In addition to generating ideas, participants must coordinate their ideas with members of a group. The participant is uncertain about the cost of effort and what constitutes an ideal solution. Uncertainty outside the control of participants reduces the strength of the association between effort and performance.

4.4.1.3. Creature Creation Task

Choi et al. (2012, 2013) use a Creature Creation Task. The task requires participants to design a dominant creature within the ecosystem of a computer game. The participants must allocate points toward different attributes of their creature. The decisions made by participants impact the effectiveness of their strategy.

The Creature Creation Task has high cognitive demands. Participants must develop a strategy and then make decisions aligned with a strategy. The task incorporates significant learning opportunities for participants when experimenting with different combinations of creature attributes.

4.4.1.4. Letter Search with Shortcuts Task

Finally, Webb et al.'s (2013) Letter Search with Shortcuts Task requires participants to identify the frequency in which a letter appears within a seemingly random set of 126 letters. After completing a set, the participant is presented with a new set of letters and a new letter to search for. The revelation of an alternative approach encourages participants to trade off two potential strategies.

I classify this task as having a weak association between observable effort and performance because participants are informed that there are two potential approaches to the task: a 'conventional approach' and a 'production efficiency' approach. The 'production efficiency' refers to hidden shortcuts (patterns) participants can use to increase their efficiency. The authors equate the search for shortcuts requiring similar cognitive processes to more generally identifying production efficiencies. Combining the cognitive demands to identify patterns and the trade-off participant must make between searching for letters versus hidden patterns reduces the strength of the association between observable effort and performance.

4.4.2. Tasks with a Moderate Association Between Observable Effort and Performance

I identified five tasks with a moderately strong association between observable effort and performance during the first review period. The tasks identified require various forms of cognitive effort, including memory search, pattern matching, basic problem solving, mathematical computations, and coordination of cognitive and physical effort. These tasks, however, generally provide clearer direction to participants about how to approach the task, involve less strategic decision-making, and participants can accurately gauge the effort required to perform the task more easily than the tasks profiled in the previous section. These tasks have a stronger association between effort and performance than those profiled in the previous section.

4.4.2.1. General Knowledge Questions

Maas & Van Rinsum (2013) and Chen et al. (2015) develop a task that requires participants to answer a series of knowledge-based questions. Maas & Van Rinsum (2013) use general knowledge trivia-style questions (history, geography, sports, literature, language,

and math), while Chen et al. (2015) use SAT-style questions that require participants to answer English, math, grammar and logic themed questions. Both tasks require participants to access memory search and retrieval. Some categories require additional information processing to identify the correct solution, e.g., math-based questions. The tasks do not require participants to determine a strategy, and the correct answers are not ambiguous. It is difficult to identify the effort exerted by participants to answer each question. The difference in performance may be attributable to the less cognitive effort, shorter memory search, skill differences, or genuine mistakes by participants.

4.4.2.2. Letter Decoding Task

Within the scope of my review, variants of Chow's (1983) Letter Decoding Task are used by Arnold (2015), Arnold & Gillenkirch (2015), and Kelly, Webb, & Vance (2015). In the version used by Arnold (2015) and Arnold & Gillenkirch (2015), participants decode two-digit numbers into a single letter using a decoding key. In the version used by Kelly et al. (2015), the difficulty of the decodes varied during the experiment by incorporating single letter and double letter decodes. I classify the decoding task as having a moderately strong association between effort and performance because participants must hold the decoding key in their working memory while scanning the number array to identify matching sequences. There are no strategic choices required to perform the task effectively. While every decode will take a variable effort depending upon where the participant directs their attention, the average effort required per decode is constant.

4.4.2.3. Multiplication Problems

Hannan et al. (2013) and Tafkov (2013) ask participants to solve multiplication problems. The task requires memory recall of multiplication tables and computational effort.

In both studies, participants cannot use aids (calculator, pen and paper, etc.). The lack of tools to assist participants increases the cognitive skill required to solve each problem.

I classify this task as having a moderately strong association between observable effort and performance. An argument could be made, however, that the version of the task used by Hannan et al. (2013) and Tafkov (2013) has a weak association between observable effort and performance because the experiment facilitators tell participants that they can use problem-solving to identify hidden shortcuts to solve the problems faster. Participants may direct effort towards identifying the hidden shortcuts or direct effort towards short term performance on the task, similar to the Letter Search with Shortcuts Task (Webb et al., 2013). Improved performance on the multiplication problems task maybe because the participant found a shortcut rather than effort exertion.

4.4.2.4. Anagrams

In addition to multiplication problems, Hannan et al. (2013) assign a task that requires participants to solve anagrams. The anagrams consist of four, five, six, or seven-letter sequences. As with the multiplication problems, no tools, e.g., pen and paper, are provided to participants. This task requires a participant to recognise letter patterns and engage in a memory search for words fitting the letter sequence. The association between effort and performance is unclear as each anagram requires testing an unknown number of letter combinations to find the correct solution. I classify the task as possessing a moderately strong association between effort and performance because there is a clear, correct answer. While the effort required per problem is inconsistent, the average effort can be accurately gauged.

4.4.2.5. Data Entry Task

Christ, Emett, Summer, & Wood (2012) and Christ, Emett, Tayler, & Wood (2016) use a data entry task. The task involves participants typing a copy of a written script.

Participants' performance is judged based on each participant's typing speed and accuracy. While typing is a skill that most college students are proficient in, accurate typing is not directly correlated with effort because effort is expended to look for and correct errors (van Weerdenburg, Tesselhof, & van der Meijden, 2019). Bonner & Sprinkle (2000) describe clerical production tasks as more complex than vigilance and memory-based tasks because clerical tasks, such as typing, require the coordination of cognitive tasks (reading and error detection) with physical tasks (typing). For these reasons, I classify the data entry task as having a moderately strong association between effort and performance.

Each task profiled in this section is sensitive to effort; however, the association between effort and performance is only moderate. None of the tasks profiled provides a sufficiently strong association between observable effort and performance required for accurate testing of the hypotheses outlined in Chapter 3.

4.4.3. Tasks with a Strong Association Between Observable Effort and Performance

Tasks implying a strong association between observable effort and performance generally require no or little prior knowledge and have no or little learning effects. The relationship between effort and performance is both unambiguous and deterministic. I did not classify any effort-sensitive papers identified in my initial 2010-2016 review as having a strong association between effort and performance. In order to identify a task suited to Experiment 1, I broadened my search to include the economics and psychology literature, identifying five examples of potential tasks with a strong association between effort and performance. Each of these tasks is summarised in Table 4.3. and described below.

4.4.3.1. Counting Grid

The Counting Grid Task requires the participant to count the frequency in which a specified number or letter appears within a set of random numbers or letters (Abeler, Falk, Goette, & Huffman, 2011; Lezzi et al., 2015; Mohnen, Pokorny, & Sliwka, 2008). This task requires participants to search a grid of numbers or letters while maintaining a mental record of the frequency. Unlike Chow's Letter Decoding Task (1983), participants are not required to translate letters into numbers. They only count the frequency with which the number or letter appears. I classify the counting grid task as having a strong relationship between observable effort and performance.

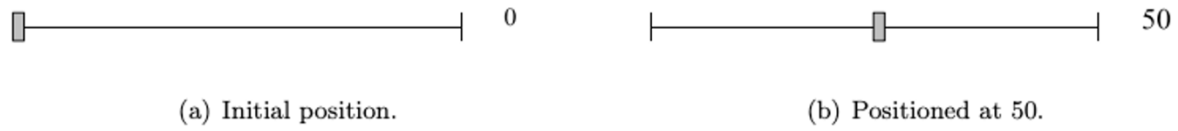
Table 4.3. Tasks implying a strong association between effort and performance

Task Name	Operationalization of Effort	Studies that adopt the task
Finger Tapping Task	Participants repeatedly tap a counter or computer mouse with their index fingers.	Camera et al. (2000) Strauss et al. (2006)
Sliders Task	Participants are presented with "sliders," which they must click and drag to the centre of a bar.	Gill & Prowse (2012)
Grid Counting Task	Participants are given a block of random numbers or letters and are required to count the frequency in which a number or letter appears, e.g., 0s (Abeler et al., 2011), 1s (Lezzi et al., 2015), 7s (Mohnen et al., 2008).	Abler, Falk, Goette, & Huffman (2011); Lezzi, Fleming, & Zizzo (2015); Mohnen, Pokorny, & Sliwka (2008)
Clicking on a Target Task	Participants must click on the centre of a target within 8 seconds while random perturbations move the mouse pointer.	Houy, Nicolai, & Villeval (2016)
Dragging a Ball Task	Participants drag a ball across a screen, at which point it disappears, and a new ball appears. Repeat as many times as possible.	Heyman & Ariely (2004)

4.4.3.2. Slider Task

A Slider Task requires participants to click and drag a slider to the centre of a bar (Abeler et al., 2011). Figure 4.2. illustrates a Slider Task. To complete the slider, participants

must drag from the initial position, figure (a), to the centre position, figure (b). The initial position of the slider is varied across each slider.



(a) Initial position. (b) Positioned at 50.

Figure 4.2. Slider Task

The Slider Task is a good example of a task with a strong association between effort and performance. The task requires hand-eye coordination and attention from the participant to position the slider correctly and physical effort to move the slider. At the time of the first review period, covering the period January 2010 to July 2016, the Slider Task had not appeared in the management accounting literature. Subsequent to the initial review, the Slider Task has been used in several management accounting themed papers, e.g., Akinyele, Arnold, & Sutton (2022), Chan (2018), Choi et al. (2019) and Mitchell, Preslee, Schulz & Webb (2022).

4.4.3.3. Clicking on a Target

The Clicking on the Target Task, developed by Houy et al. (2016), requires participants to click the mouse pointer close to the centre of a target displayed on their computer monitor. The task difficulty can be enhanced by increasing the mouse pointer perturbation. I classify the Clicking on the Target Task as having a strong association between effort and performance. The task requires hand-eye coordination and concentration to accurately judge the mouse pointer position relative to the target. At the time of the first review, the Clicking on the Target Task had not appeared in the management accounting literature.

4.4.3.4. Dragging a Ball Task

The Dragging a Ball Task is used by Heyman & Ariely (2004). Participants drag a computerized ball across a screen to a designated position in this task. The aim is to drag as many of these balls as possible within a specified time. The Dragging the Ball Task properties are similar to the Sliders Task. There were no examples of the Dragging the Ball Task identified within the scope of my first review. The task requires hand-eye coordination to click accurately and drag the ball to the target. There are no strategic choices, the task is easy to understand, and participants can accurately judge the effort required to perform the task. Therefore, this task implies a strong association between observable effort and performance.

4.4.3.5. Finger Tapping Test

The Finger Tapping Test (FTT) is a component task of the Halstead-Reitan battery of tests used to assess the extent of brain injuries. Participants are asked to tap their index finger as quickly as possible using a mechanical tapper, and the number of taps is recorded (Strauss et al., 2006). The cognitive demand to perform the task is minimal. Participants only need to be attentive to the signal to begin tapping their finger and then physically tap the counter for the round duration. The simple nature of the task has meant that neuro-psychologists can use the task with participants who have significant brain injuries (Camara et al., 2000; Strauss et al., 2006). Neuropsychologists have found that performance on the finger tapping test is highly correlated with effort (Constantinou, Bauer, Ashendorf, Fisher, & McCaffrey, 2005; Green, 2007).

All five of the tasks profiled with a strong association between observable effort and performance are appropriate tasks for use in Experiment 1. None of these tasks were

published in the accounting journals reviewed before I designed Experiment 1. Performance on each of these tasks is likely to be highly correlated with effort

4.5. Review of Management Accounting Effort Sensitive Tasks July 2016 to December 2021

The initial review covers the period from January 2010 to June 2016, when Experiment 1 was designed. To provide an updated account of the effort-sensitive tasks used in management accounting-themed papers, that included tasks published after I designed Experiment 1, I updated my systematic review to cover a second period from July 2016 to December 2021 from the same set of journals: *The Accounting Review; Accounting, Organizations & Society; Journal of Accounting Research; Journal of Accounting & Economics; and Contemporary Accounting Research*. This set of journals remained the highest-rated that regularly publish management accounting themed papers based on the 2020 Scimago Journal Rankings.[4]. Table 4.4 summarises the new task identified within the second review period.

Table 4.4. Tasks identified from July 2016 to December 2021

Task Name	Operationalization of Effort	Studies that adopt the task
Tasks Implying a Weak Association Between Effort and Performance		
Maze Search Task	Number of mazes solved	Thornock (2016)
Tasks Implying a Weak Association Between Effort and Performance		
Letter Scramble Task	Participants have 60 seconds to form words from a set of 12 letters. Each word is scored based on the number of letters used, e.g., cat = 3 points, horse = 5 points.	Loftus & Tanlu (2018)
Sandwich Task	Effort is inferred based on the quantity and quality (number of errors) of sandwich orders filled.	Choi et al. (2016) and Farrell et al. (2017)

[4] The archived 2020 Scimago Journal Ranking list is accessible from: https://www.scimagojr.com/journalrank.php?category=1402&year=2020

The updated review identified two of the tasks from the 2010-2016 review, with a strong association between effort and performance, appeared in the second reviewed period, 2016-2021. The Slider Task was utilized by Chan (2018) and has since been used in several management accounting themed papers (e.g. Akinyele, Arnold, & Sutton 2022; Choi et al., 2019; Mitchell et al., 2022). A variant of the Grid Search Task is used by Douthit & Majerczyk (2019). Participants count the frequency that a particular letter appeared within a 10 x 10 grid in their task version.

The majority of tasks identified are variants on the task identified within the 2010-2016 review, e.g., stated effort tasks (Arnold et al., 2020; Christ & Vance, 2018; Gonzalez, Hoffman, & Moser, 2020); Letter Decoding Task (Arnold & Tafkov, 2019; Berger et al., 2018; Brüggen, Feichter, & Williamson, 2018; Newman, Tafkov, & Zhou, 2020), math problems (Hannan, McPhee, Newman, Tafkov, & Kachelmeier, 2019; Knauer, Sommer, & Wöhrmann, 2021; Newman et al., 2020), anagrams (Chan, Kachelmeier, & Zhang, 2021; Hannan et al., 2019), rebus problems (Kachelmeier, Wang, & Williamson, 2019), creative idea generation (Brüggen et al., 2018)[5] and the problem-solving and general knowledge questions (Hecht, Hobson, & Wang, 2020; Nichol, 2019). I identified three new effort-sensitive tasks in the 2016-2021 review that were not profiled in the 2010-2016 review.

4.5.1. Tasks with a Weak Association Between Observable Effort and Performance

4.5.1.1. Maze Search Task

Thornock (2016) used a Maze Search Task. Participants were required to navigate a maze to reach a treasure room. The maze consists of a series of rooms with four doors. Upon

[5] Brüggen et al. (2018) Idea Generation Task required participants to design an effort-sensitive task. Chen et al.'s (2012) Creative Classroom Task identified in the 2010-2016 review is similar because both tasks require participants to generate creative solutions to a problem. I consider Brüggen et al. (2018) Idea Generation Task as having a weak association between observable effort and performance for the same reasons as stated for Chen et al.'s (2012) Creative Classroom Task.

entering a room, the participant must decide which of the three doors they wish to use to progress in the maze. Within each room, there are visual cues, e.g., an item of furniture. Participants are told that some items will only appear on the incorrect path. By studying the incorrect paths, participants can learn which visual cue designates they are on the wrong path.

I classify the Maze Search Task as implying a weak association between observable effort and performance. The task is complex and requires participants to recognize patterns and store and retrieve pattern combinations from their working memory. Moreover, participants must strategically allocate time and cognitive resources towards short-term goals (quickly progressing through the current maze) and long-term goals (developing mental maps of each maze to aid in solving future mazes).

4.5.2. Tasks with a Moderate Association Between Observable Effort and Performance

4.5.2.1. Letter Scramble Task

Loftus & Tanlu (2018) use a Letter Scramble Task that requires participants to form words from a set of letters. In their version of the task, participants are set 12 letters, and each word must contain at least three letters. I classify this task as implying a moderate association between observable effort and performance. Like anagrams, the task requires participants to recognise letter combinations and search their memory for matching words within their vocabulary. The task increases in difficulty with each word identified. For most participants, early in the task, the effort required per word identified is relatively stable. After the participant exhausts easy to identify words, the effort to identify more obscure words becomes less deterministic. I classify the Letter Scramble Task as moderate, reducing to a weak association between observable effort and performance when searching for obscure words.

4.5.2.2. Sandwich Task

Choi et al. (2016) and Farrell et al. (2017) use the Sandwich Task. The task screen from Choi et al. (2016) is reproduced in Figure 4.3. Participants fill customer orders for sandwiches. Each type of sandwich has five ingredients and requires the participant to select the correct combination to be constructed. If a participant includes four or more incorrect ingredients, they must remake the sandwich. Effort is inferred from the accuracy and quantity of orders completed. Farrell et al. (2017) also use a second version of the same task where participants assemble a product out of components.

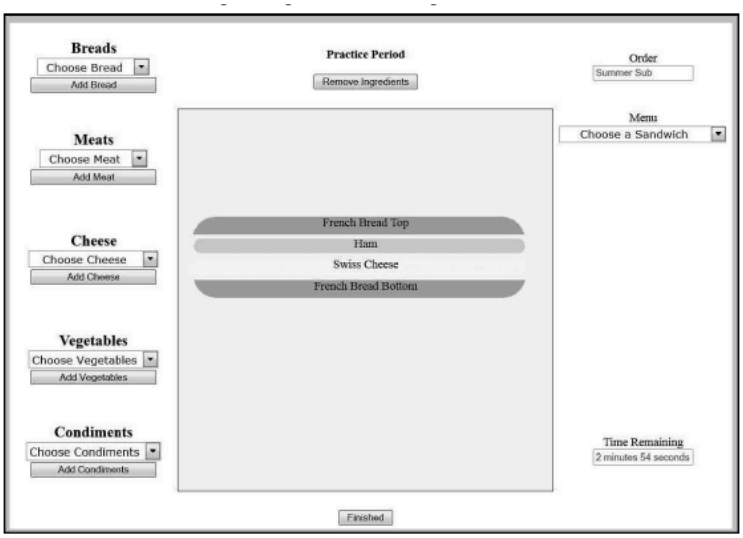


Figure 4.3. Sandwich Task participant screen adapted from Choi et al. (2016).

I classify the Sandwich Task as having a moderate association between observable effort and performance. Participants must access working memory to quickly select the right ingredients based on the customer orders. Participants should self-monitor and adjust their approach based on feedback. Participants making errors may need to adjust their strategy by either slowing down their selection of ingredients or checking the completed order before submitting. Participants making few errors may need to adjust their approach to increase

order fulfilment speed. There is a correlation between effort and performance on the task. However, I classify the Sandwich Task as implying a moderate association between observable effort and performance because participants may need to adjust their approach to the task based on their real-time assessment of the quantity versus quality of their performance.

4.6. Task Selection

Experiment 1 was designed in 2016. After conducting the 2010-2016 review, I concluded that the Finger Tapping Test was the task best suited to test the hypotheses outlined in Chapter 3. The Finger Tapping Test is highly sensitive to effort and implies a strong association between observable effort and performance.

The Sliders Task and Dragging a Ball tasks were also considered. When designing Experiment 1, the Slider Task had not yet appeared in the management accounting literature. The Slider Task and Dragging the Ball tasks are highly sensitive to effort, with a strong association between observable effort and performance. However, both tasks are more complex than the Finger Tapping Test. Participants must judge how quickly to move the slider or ball and make fine adjustments to position the slider or ball correctly. The Finger Tapping Test imposes minimal requirements on participants. Participants only need to tap their index finger for a specified time. It is an established task, extensively evaluated for use within both laboratory and clinical settings, and has been shown to be highly sensitive to effort (Camara et al., 2000; Strauss et al., 2006).

4.7. Conclusion

In this chapter, I reviewed the existing effort-sensitive task used in the management accounting literature. Based on the first review, I selected the Finger Tapping Test (FTT) as

the best fit to test the hypotheses developed in Chapter 3. In the next chapter, I describe two separate experiments that used modified versions of the FTT to empirically test the seven hypotheses.

Chapter 5 Research Method

5.1 Introduction

In order to test the seven hypotheses discussed in Chapter 3, I conducted two separate experiments. Experiment 1 focused on the effort of *laggards* in a tournament. I developed a task based upon the FTT for Experiment 1. In order to adapt the FTT for Experiment 1, I made several significant alterations to the task as it is used in clinical settings to make it suit my experimental setting. Experiment 2 concentrates on the retention of workers in a tournament. Further alternations were made to the task to increase the likelihood that participants would quit the tournament incentivised task.

The remainder of this chapter commences with a discussion of the task development and pilot phase for Experiment 1. Then an outline of the participants, research design, and procedures used for Experiment 1 is presented. A discussion of the participants, amendments to the task design, research design, and procedures used for Experiment 2 follows. Finally, I present a discussion of electrodermal activity measurement and the procedures used to collect electrodermal activity data from participants in Experiment 2.

5.2. Experiment 1 Pilot

5.2.1. Adapting the Finger Tapping Task for the Experiment 1 Pilot

The clinical FTT procedures outlined by Strauss et al. (2006) are as follows. A practice period is used before the first trial to allow the participant to familiarise themselves with the apparatus used. The participant firstly places their preferred hand palm down, with fingers extended and the index finger placed on the designated tapping key. The participant is directed to tap their index finger repeatedly as quickly as possible. The facilitator using a stopwatch directs the participant to stop at the end of each ten-second trial. Five trials are

conducted with the preferred hand. The test is repeated with the non-preferred hand. Fatigue can affect performance, and as such, a brief rest period is recommended after each trial (Strauss et al., 2006).

Different procedures and alterations to the FTT clinical procedures were required to adapt the task for Experiment 1. I developed a new set of procedures and a new version of the task as part of a pilot study for Experiment 1. The hypotheses, H1 to H3, developed in Chapter 3, relate to the effort of *laggards* in tournaments. Each tournament round requires relative performance information (RPI) to be collated and feedback provided to participants. The clinical procedures use a manual tapping counter and stopwatch. This approach has significant practical limitations.

Firstly, the performance of each participant in a tournament must be assessed. Using a single manual tapping counter requires each participant's performance to be sequentially assessed. The first participant's performance for the round would need to be measured. Given the use of the single manual tapping counter, after the first participant was assessed, only then can the second participant's performance be measured, and so on until each participant has been assessed. After all participants have been assessed relative performance data can be collated and distributed. This approach would have substantially extended the duration of each session.

Alternatively, each participant could be assigned a different research assistant and a manual tapping counter. Using a tapping counter for each participant allows all participants to complete each round synchronously and for the research assistants to record each participant's score. This approach, however, considerably increases the cost of administering each session. Research assistants would need to be paid, and multiple approved Halstead-

Reitan finger tapping devices would be purchased[6], adding considerably to the cost of collecting data from Experiment 1. To overcome these limitations, and improve the useability of the FTT for Experiment 1, a computerised version of the finger tapping task was programmed using VBA code in Microsoft Excel.

The FTT used in clinical settings requires both hands to be tested. I amended the task procedures to only test the dominant hand of each participant. I was not testing participants' cognitive function, and therefore alternating hands would unnecessarily complicate the task. If I had required participants to alternate hands, I would have needed to observe each participant to ensure this directive was followed. If a participant accidentally or intentionally overlooked this requirement, the data from affected sessions would be compromised.

The FTT used in a clinical setting includes a 5-second rest period between trials and a longer rest period each time five trials are completed (Strauss et al., 2006). I excluded the rest period between trials in the Experiment 1 Pilot instrument. The experiment design allowed sufficient time for participants to rest between rounds while relative performance information was collated and distributed. Table 5.1. summarises the alterations to the FTT used for the Experiment 1 Pilot.

[6] A kit containing one counter is priced at USD 299 from NeuroPsych as at 5th April 2021 https://neuropsych.com/product/finger-tapping-test-adults-older-children/

Table 5.1. Alternations to the Administration of the Finger Tapping Task for Experiment 1

	Finger Tapping Test	Experiment 1 Pilot
Apparatus	Physical tapping counter	Computer mouse
Timing	Administrator using a stopwatch.	Microsoft Excel VBA coded macro counted clicks and stopped each trial after 10 seconds.
Rest Period	Standardised rest periods between trials	No standardised rest periods
Handedness	Participant changes hands from right to left hand after five trials	Dominant hand only

5.2.2. Experiment 1 Pilot Research Design

I developed a pilot study to test the computerised finger-tapping task based on the finger tapping test and a pilot version of the research instrument designed for Experiment 1. Specifically, the pilot aimed to ensure the instructions were interpreted correctly by participants, that there were no programming errors, and to gather performance data to calibrate the performance target difficulty.

The Experiment 1 Pilot utilised a 1 x 3 between-participant design. Participants completed a training round followed by five rounds of the modified finger-tapping task. The dependent variable was performance, measured as the number of taps recorded by the participant during each round. The independent variable was the performance targets (Tournaments with No Target, Tournaments with an Easy Target or Tournaments with a Hard Target). After finishing the pilot task, participants completed an exit survey. The exit survey asked participants about their: gender, age, country of birth, years lived in Australia,

work experience, use of social media, math ability, frequency of playing computer games, and self-assessed effort expended on the task. A description of how the pilot was administered, the Experiment 1 Pilot exit survey, and variables are discussed in Appendix B.

After receiving ethics approval for the Experiment 1 Pilot (Appendix A), four sessions were conducted in which students from a large public university were recruited for voluntary participation. Twenty participants took part, 14 women whose mean age was 21.1 years (SD = 1.66) and 6 men whose mean age was 21.7 years (SD = 2.40).

5.2.3. Target Difficulty

I manipulated performance target difficulty at two levels; Easy and Hard. The Easy Target was set so that participants should have reached the target twenty per cent of the time, while the Hard Target was set to be reached by eighty per cent of participants. My definitions of easy and hard were similar to those used in prior literature. Fatseas & Hirst (1992) set easy targets as achievable eighty per cent of the time and hard targets as achievable twenty per cent of the time. Webb et al. (2013) set easy targets at a level that almost everyone could achieve, and challenging targets were set at a level that could be achieved about 25% of the time. Merchant & Van der Stede (2012) argue that optimal performance targets are achieved as infrequently as twenty-five per cent and as frequently as ninety per cent.

The initial design for the Experiment 1 Pilot determined the performance targets difficulty by calculating expected scores based on Ruff & Parker (1993). Ruff & Parker (1993) reported that for an average, healthy adult population in a clinical setting, standard FTT scores using the approved Halstead-Reitan counter for the dominant hand are 52.9 per trial (SD = 5.1) for males aged 16-24 and 49.5 per trial (SD = 5.1) for females aged 16-24.

To account for the changes to the task and the competitive experiment setting, I decided to update the target difficulty based on the data from Experiment 1 Pilot Session 1. The performance data from this session was used to recalibrate the performance target for the remaining pilot sessions. The recalibration was done because the pilot study task and setting were significantly different from the clinical setting used by Ruff & Parker (1993).

Experiment 1 Pilot Session 1 used a Tournaments with No Target condition. The Tournaments with No Target condition had a prize for the participant with the highest score in the session but did not have an assigned performance target. The Easy Target (63 clicks per trial) was set at the clicks per trial achieved eighty per cent of the time by participants in the Tournaments with No Target condition. The Hard Target (90 clicks per trial) was set at the level of the clicks per trial achieved twenty per cent of the time by participants in the Tournaments with No Target condition.

The performance targets used for the Tournaments with an Easy Target and Tournaments with a Hard Target conditions for the remaining pilot sessions were, therefore:

Tournaments with an Easy Target = 63 clicks per trial x 5 trials = 315 clicks per round
Tournaments with a Hard Target = 90 clicks per trial x 5 trials = 450 clicks per round

5.2.4. Post Pilot Interviews

After the pilot, post-pilot interviews with participants were conducted. The purpose of the post-pilot interviews was to determine whether the participants interpreted the instructions as I had intended, identify potential improvements to the wording of the instrument, and gain an insight into the participants' motivation during the session.

The last question of the pilot instrument exit survey asked participants whether they agreed to be contacted via email about participating in an interview to learn more about their

experience taking part in the pilot study. The participants who consented to be interviewed received an email inviting them to discuss their experience during the pilot. Five out of the twenty participants agreed to be interviewed. Two participants could not attend an interview, leaving a final sample of three participants interviewed. I conducted the interviews separately for each participant. Interviews ranged from twenty to sixty minutes.

The interviews consisted of two types of questions; firstly, about the clarity of the pilot study instructions, and secondly, about the participant's recollection of their motivation and experience undertaking the experiment task. Interviewees were provided with printed screenshots of the instrument to help guide the discussion.

The interviewees unanimously stated that the instructions were clear and that the task demonstration was clear. They all stated that they knew the prize was a real monetary prize instead of a hypothetical prize. Participants understood that only the tournament winner would receive the tournament prize, their performance target (if applicable), and interpreted the feedback tables as intended. These were the key instructions I wanted confirmation that participants understood. There were no issues with the instructions identified or suggestions on how to add clarity to them.

The interviewees were also asked for suggestions on improving the wording of the exit survey. I referenced an example from my honors project related to a work experience question to prompt the interviewees. Interviewees were told how a participant in that project mentioned that there is a requirement to undertake military service in Singapore. As a result, a change was made to the exit survey wording. I explained that the intent was to ensure that all potential participants would interpret the questions similarly. The interviewees made three useful suggestions.

Firstly, interviewees #1, #2, and #3 all commented that the 'hours spent playing games in a typical week' question would be easier to answer if participants had categories to select from rather than requiring participants to estimate the number of hours. Interviewee #2 also said that it was hard for her to conceptualise how many hours she spent playing games in a 'typical week' as her typical week during the semester was different from a typical week out of the semester. The exit survey computer game playing question was changed from asking how many hours were spent playing games per week to a 5-point scale from (1) never play; to (5) once per day or more.

Secondly, interviewee #2 referenced the how many minutes spent on social media question and commented that it might be easier to answer if the question was about how frequently social media is checked rather than time spent on social media. When prompted, interviewee #3 agreed that this would be a better phrasing of the question. Interviewee #1 commented that the social media question asked for a per day estimation and that this was easier to answer than the games played that required a one-week estimation. Interviewee #2 agreed that per day was easier to recall. Interviewee #3 thought there was no difference. Interviewee #3 was from China and confirmed that the examples of social media cited in the question represent the social media platforms used by Chinese students. From the interviewees' comments, the exit survey item related to social media use was changed from asking ‘how many minutes spent on social media per day’ to ‘how frequently do you check social media’ on a 5-point scale from (1) never use to (5) 5 or more times per day.

Finally, concerning the work experience question, interviewee #3 suggested clarification as to whether unpaid voluntary work would count towards work experience. This suggestion was used to clarify the question, 'How many months of paid work experience (including military service) (full-time, part-time, or casual) do you have?'

After questions related to the clarity of the instructions and exit survey were concluded, the interviews focused on the participants' experience during the task. Interviewees #1 & #2 both won the prize for the highest score in their session. Both indicated that they were motivated by the monetary prize.

Interviewee #2 indicated that the monetary prize was the real motivator but that she would have been competitive even if there was no prize. Interviewee #1 was motivated by the money rather than beating the other competitors. *'I wanted to win because of the cash money. Without money, I would have been more chilled...I wouldn't tell my friends that I was the best clicker. If it was playing basketball, I would be proud.'* (Interviewee #1)

Tafkov (2013) argued that using a mathematics-based task is likely to encourage competition in laboratory-based experiments because people only compete when doing well on a task is important to them. Questions about the tapping task compared to math or language-based tasks were asked to probe whether the modified FTT was considered too trivial for participants to compete.

When asked whether a task based on math or language compared to the finger-tapping task would make the interviewee more competitive, Interviewee #1 thought it would make a difference. He indicated he would care more about winning a math-based task than a finger tapping task, but there would be no difference between the finger-tapping task and a language-based task. Interviewee #3 had a similar view. *'Society values mathematic skill'* (Interviewee #3)

Interviewee #2, however, indicated that the finger-tapping task made her more competitive than a math-based task because: *'maths is more logical. I don't think I'm that bright, so I wouldn't be competitive'* (Interviewee #2)

Interviewee #3 said she was more motivated by pride than the monetary prize. When she fell behind the other participants, she felt frustrated, but this did not influence her effort, although she commented that once she was losing, she did not pressure to win; *'there was less pressure because I was not winning'* (Interviewee #3)

The conflicting responses from interviewees supported the idea that perceptions of self-efficacy are important to trigger competitive behaviour. Interviewees #1 and #2 both recalled being competitive and maintaining high levels of effort. When prompted, both said they would have redoubled their effort if the second-placed competitor had been closer to their score. These responses are consistent with the complacency effect described in Chapter 2. Interviewee #3 response, from a participant who fell behind, seems consistent with the pressure to win being most intense when a competitor is winning by only a small margin or is close to the leading competitor. Interviewee #2 recalled that in one round, another participant had a higher score, *'one guy beat me in one round then I was motivated to beat him'* (Interviewee #2)

Interviewees #1 and #2 both paid attention to the performance target and thought the target was relatively easy (both were in the Tournaments with an Easy Target condition) to achieve so long as they tried their best. *'At the beginning, I thought I probably couldn't do it [beat the target]. I changed after one or two rounds. Then I thought it [the target] was achievable and easy.'* (Interviewee #2)

Both commented that they checked whether they met the target at the end of the round and wanted to beat the target each time. The interviewees commented that they also looked at their previous round score and wanted to maintain at least the same level even though they got tired towards the later rounds. Interviewee #3 was in the Tournaments with No Target

condition. As with the other interviewees, she looked at the previous round's scores as a benchmark.

The interviews led to changes to the wording of some questions on the exit survey. The social media and game-playing questions were changed to a frequency checked (social media) and played (games) with categories to choose from. An additional question was added to elicit participants' assessment of their mathematics ability. The responses from participants confirmed that the experiment task was interpreted as designed. No significant changes to the task were considered necessary based on feedback from participants.

5.2.5. Technical Issues Encountered

Several technical issues attributable to coding errors in the underlying program arose during the first pilot session. Firstly, the pilot instrument contained two comprehension check questions that were not correctly accounted for in the formula used to calculate the scores for the previous round displayed to participants at the end of each round. The scores displayed were lagged by two trials, e.g., at the end of Round 2, the formula displayed scores based on Round 1 trials 4 & 5 plus Round 2 trials 1 to 3, rather than Round 2 trials 1 to 5. This issue was fixed by removing the comprehension check from the computerised instrument. Instead, a pen and paper-based comprehension check quiz was used that I manually checked for each participant. This change was implemented before the second pilot session.

Secondly, the hidden table that collated scores could capture up to 2,400 clicks. High-scoring participants, once they surpassed 2,400 clicks, had their scores collected in the hidden table but not displayed on their feedback screen at the end of each round. This issue was fixed before the second pilot session by extending the table to 4,000 rows.

Third, after the instrument was extended to 4,000 rows, if the mouse was clicked exceptionally quickly, in rare instances, the computers in the experiment laboratory could not perform the necessary calculation fast enough to update the counter displayed on the participants' screens. Before the last pilot session, the counter that updated with every click recorded was removed from the task screen. Removing the counter meant that the computer was only required to perform this computation between trials and prevented the counter from presenting misleading feedback to participants, reduced the risk of the program crashing, and did not detract from the instrument design.

Fourth, some participants clicked on unprotected cells on the feedback screens. In some instances, this caused the feedback screen to display the underlying formula rather than the correct feedback. I attempted to rectify this by protecting the cells in the Excel file sheet. However, this fix caused a 'runtime error bug' to halt the program. I asked participants not to click in the affected cells during the subsequent pilot sessions. Despite this warning, two participants clicked on the unprotected cells. In each of these instances, I manually fixed the table between rounds. The coding error was rectified before Experiment 1 data collection. The feedback table cells were protected, and the VBA code was rewritten to prevent the run time error bug from occurring.

The final technical error discovered during the first session was that one participant did not stop to report scores at the end of the first round. A password was added to the instrument. Participants were required to enter the password after scores were collated before beginning the next round. The importance of stopping to report scores was emphasised for the remaining pilot sessions. There were no instances of participants not stopping at the correct times to report scores in the remaining pilot sessions.

5.2.6. Experiment 1 Pilot Study Results

Table 5.2. displays the performance of participants in each condition. Participants' performance in the Tournaments with an Easy Target and Tournaments with No Target conditions improved from round one to round two and gradually worsened in the later rounds. Participants' performance in the Tournaments with a Hard Target condition declined rapidly from round three onwards. The decline in performance may indicate that *laggards* had given up, and the hard target was perceived as not achievable.

Table 5.2. Pilot Experiment 1 scores Rounds 1-5

	Round 1 M (SD)	Round 2 M (SD)	Round 3 M (SD)	Round 4 M (SD)	Round 5 M (SD)
Tournaments with an Easy Target n = 10	326.40 (51.58)	357.00 (59.29)	344.40 (60.45)	332.00 (52.70)	332.60 (41.61)
Tournaments with a Hard Target n = 5	361.80 (135.89)	342.60 (75.18)	353.00 (73.55)	317.40 (85.57)	311.00 (11.20)
Tournaments with No Target n = 5	361.10 (90.01)	372.75 (84.61)	358.25 (64.53)	336.90 (61.07)	335.70 (44.66)

5.3. Experiment 1

Experiment 1 was designed to investigate the effect of performance targets, target difficulty, and incentives on the effort of *laggard* workers in a tournament. This section details how Experiment 1 was administered to test the first three hypotheses described in Chapter 3.

Experiment 1 was a 2 x 2 + 1 between-participants experiment using an effort-sensitive finger-tapping task. I used an experimental design in which I varied (between subjects) the performance targets (No Target, Easy Target or Hard Target) and target incentives (Paid or Unpaid), resulting in five conditions as depicted in Table 5.3.

Table 5.3. Experiment Conditions: Target Payment (IV1) x Target (IV2)

	Target		
Target Payment	No Target	Easy Target	Hard Target
Not Paid	Cell 1: Tournaments with No Target Condition	Cell 2: Tournaments with an Unpaid Easy Target Condition	Cell 3: Tournaments with an Unpaid Hard Target Condition
Paid		Cell 4: Tournaments with a Paid Easy Target Condition	Cell 5: Tournaments with a Paid Hard Target Condition

Notes:
Target Payment (IV1) has two levels: Unpaid Target and Paid Target. Target (IV2) has three levels: No Target, Easy Target and Hard Target.

In the Tournaments with a Target conditions, participants were assigned a performance target. There was one condition without an assigned target (Tournaments with No Target). In the Tournaments with an Easy (Hard) Target conditions, the target was set at a score of 285 (420) per round. In the Tournaments with a Paid (Unpaid) Target conditions, participants received (did not receive) a round-based payment each time they exceeded the target.

5.3.1. Participants

Ethics approval was obtained for Experiment 1 from the large public university in Australia where the research study was conducted (Appendix A). Undergraduate students enrolled in the same accounting course from a large public university were recruited for voluntary participation in experimental sessions. An automated email was sent to the Department of Accounting student subject pool at the beginning of the university semester in 2017. The email contained information on the various research studies from which students could choose if they wanted to participate. Students who participated in Experiment 1 were awarded two bonus credit points toward the participating undergraduate accounting unit. In addition to credit points, participants were advised that they would have the opportunity to earn money, and the average payment would be $11.00. Using students as participants is appropriate for studies that use tasks that only require general cognitive ability and do not require knowledge of accounting or investing (Libby, Bloomfield, & Nelson, 2002; Liyanarachchi & Milne, 2005). Undergraduate students were considered appropriate participants for Experiment 1 because the task used required no specialised knowledge or experience to complete.

Two hundred and two students registered to particate. Thirty-two participants did not attend their scheduled session. During one session, the computer battery ran out during the session for a participant. This participant was paid the average payout for participating and was granted the course credit. The data collected for this participant was not saved, leaving a final sample of one hundred and sixty-nine participants. The sample consisted of 111 women whose mean age was 20.5 years (SD = 1.32) and 58 men whose mean age was 20.7 years (SD = 1.13).

There were forty-five sessions made available. Each session had a capacity for up to five participants. Sessions with less than four participants were cancelled, and participants from these sessions were given the option to sign up for another session of their choice. After cancellations, thirty-eight sessions were completed. Twenty-two sessions had a four-person tournament, fifteen sessions had a five-person tournament, and one session had a six-person tournament.

5.3.2. Research Design

5.3.2.1. Tournament Size and Prizes

Increasing the tournament size can affect participants' effort (List, Van Soest, Stoop, & Zhou, 2020). Tournament theory predicts that the size of the tournament can influence participants' behaviour in a tournament setting but that this can be negated by adjusting the size or number of prizes on offer (Lazear & Rosen, 1981). For example, a participant has an equal chance of claiming a prize in a two-person tournament with one prize as they do in a four-person tournament with two prizes. However, the evidence that tournament size makes a significant difference is not conclusive. Harbring & Irlenbusch (2008) did not find a significant difference in individual effort when they compared tournament size by manipulating the size of the tournament (two-person, four-person, and eight-person) and the fraction of participants that won a large prize (0.25, 0.5 and 0.75). Likewise, Orrison et al. (2004) did not find tournament size a significant driver of participants' effort in tournaments. However, Knauer et al. (2017) and Berger et al. (2018) report that when more prizes were offered, the performance of tournament participants increased.

Large variations in the size of each tournament were avoided by restricting the capacity of each session to five participants[7]. One tournament was run in each session. There was a $30.00[8] monetary prize for winning each tournament for the participant with the highest cumulative total score for the tournament (a grand tournament design). The tournament prize was restricted to a single prize because the hypotheses tested were concerned with the effort of *laggards* who had fallen behind a tournament. Restricting the number of participants in each session was done to ensure that the probability of winning a tournament was comparable across sessions (25% probability for sessions with four participants, 20% probability for sessions with five participants, 17% for the session with six participants).

5.3.2.2. Experiment Conditions

There were five experimental conditions based on manipulating two independent variables: performance targets (No Target, Easy Target or Hard Target) and target payment (Paid or Unpaid).

5.3.2.3. Target Present Manipulation

In four conditions, participants were assigned a performance target (Tournaments with a Target). In one condition, there was no performance target (Tournaments with No Target).

[7] In the final session, one unregistered participant attended. I allowed the student to participate as no further research studies were scheduled for the semester. This resulted in one session with six participants. The probability of winning for participants in this session was 17% compared to 20% for five-person and 25% for four-person tournaments.

[8] 1 AUD = 0.72 USD at 25th February 2022

5.3.2.4. Target Difficulty Manipulation

The target difficulty was manipulated in the conditions with an assigned performance target. The Easy Target was set so that participants should have reached the target twenty per cent of the time, while the Hard Target was set to be reached by eighty per cent of participants. The definition of an Easy Target and a Hard target is similar to definitions used in prior research (e.g., Fatseas & Hirst, 1992; Huber, 1985; Webb et al., 2013). The target difficulty was set based on participants' performance in the Experiment 1 Pilot Study. Participants were assigned a target of at least 285 clicks per round (Tournaments with an Easy Target) or 420 clicks per round (Tournaments with a Hard Target).

5.3.2.5. Target Payment Manipulation

In two conditions, participants earned a bonus for each round they exceeded the target (Tournaments with a Paid Target conditions). The target payment was set at $1.25 for participants in the Tournaments with a Paid Easy Target and $5.00 in the Tournaments with a Paid Hard Target.

In the conditions where there was no bonus for exceeding the target (Tournaments with an Unpaid Target and the Tournaments with No Target), participants received an additional $5.00 payment as a flat wage. As displayed in Table 5.4., varying the size of the payments ensured the expected earnings for participants were consistent across all conditions.

Table 5.4. – Expected Additional Payments (excluding tournament prize) for Each Condition for a Five Person Tournament

Condition	Probability of Achieving Target	Target Payment	Expected Payment per Round	Total Expect Payment (5 Rounds)	Flat Wage	Expected Additional Payment
Target Paid						
Easy Target	0.8	$1.25	$1.00	$5.00	$0	$5.00
Hard Target	0.2	$5	$1.00	$5.00	$0	$5.00
Target Not Paid						
Easy Target	0.8	$0	$0	$0	$5.00	$5.00
Hard Target	0.2	$0	$0	$0	$5.00	$5.00
No Target	0	$0	$0	$0	$5.00	$5.00

Notes:
In addition to the flat wage or bonus for achieving the target, the participant with the highest score in each session won a $30.00 tournament prize. Therefore, the total expected payout for each participant was approximately $11.00 ($5.00 from flat wage or achieving targets plus 0.2 x $30.00 = $6.00 for winning the tournament).

5.3.3. Procedures and Timeline

5.3.3.1. Pre-task stage

Each session was held within the same behavioural research laboratory at a large public university. The setup for this experiment is pictured in Figure 5.1. Upon entering the laboratory, each participant was seated at a computer terminal obscured by a partition from other participants and was asked to read an explanatory statement and sign a consent form. All completed consent forms were removed and filed in a separate locked cupboard before the experiment began.

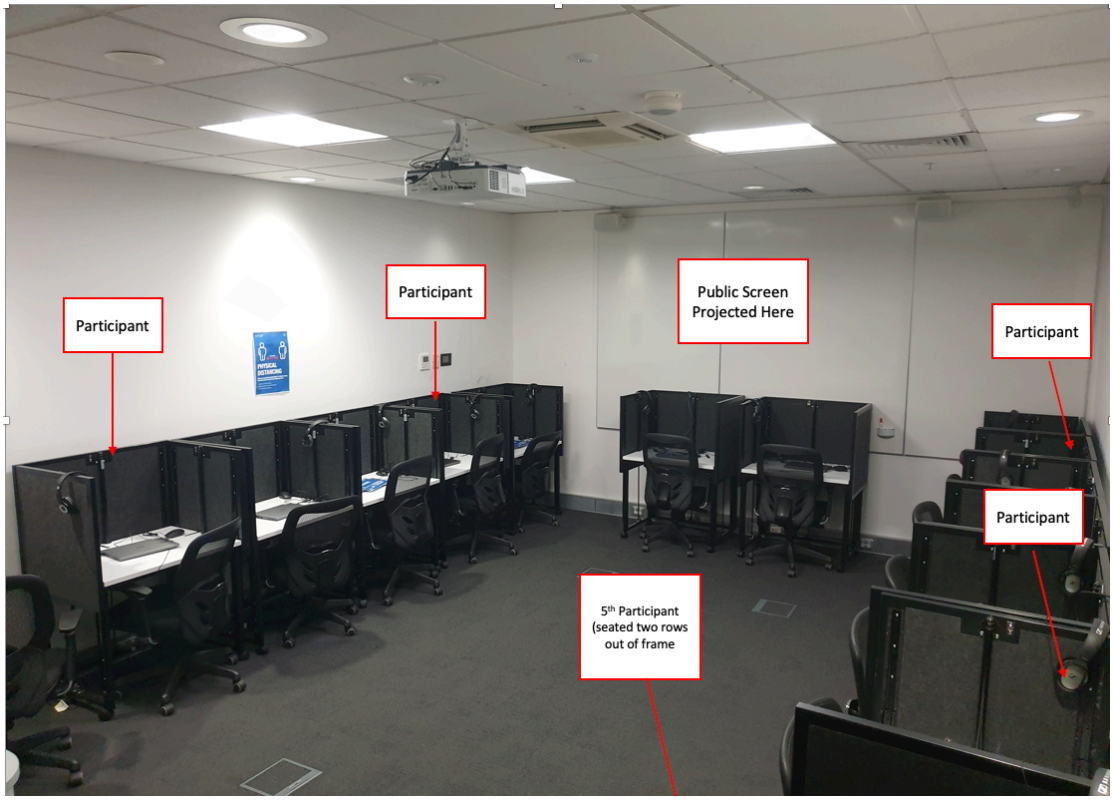


Figure 5.1. Research Laboratory Set-Up

Participants were seated in cubicles with partitions obscuring their view of the participants. Each participant was positioned at least two desks away from the nearest participant. A public screen was projected to the front of the room, viewable by all participants to demonstrate the task and display the tournament scorecard between rounds.

Each participant was seated at a laptop with the file displayed in full-screen mode and the sheet tabs hidden[9]. The task was the finger-tapping task developed during the pilot phase described earlier in this chapter.

Participants were required to click a computer mouse button, with their dominant hand, for ten seconds per trial. There were five trials per round. During each clicking trial, the computer screen displayed a large 'click here' button that recorded the number of clicks made by the participant. There were no defined rest periods; however, participants were permitted

[9] To exit the program required a deliberate attempt by the participant to do so. There were no incidents of this occurring.

to rest while interpreting the within-round and between-round feedback tables. Figure 5.2. displays the task screen.

Figure 5.2. Experiment 1 Task Screen

Note: Main task screen. Participants click on the button labelled 'CLICK HERE'. Each click is recorded in a hidden spreadsheet. No other objects were displayed on participants' screens during each clicking trial.

Participants completed a practice round and then received instructions before completing the main rounds of the experiment. After the main rounds, participants completed an exit survey. The timeline for the session is presented in Figure 5.3. Each of these stages is discussed in further detail in the following sections.

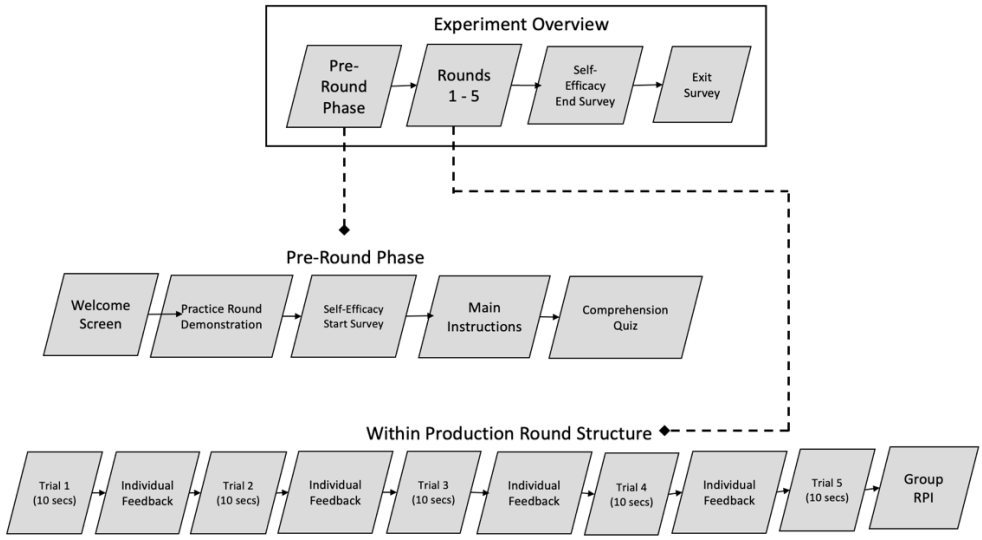


Figure 5.3. Experiment 1 Timeline

Notes: Each round consisted of five identical clicking trials of ten seconds duration. After each trial, participants received individual performance feedback. Group RPI is presented at the end of each round.

5.3.3.2. Practice Round

The practice round consisted of five trials. Each trial had a duration of ten seconds. The same task was used for the practice round and the main rounds. Before commencing the practice round, participants were asked to watch a demonstration of the task projected on a screen at the front of the laboratory. During the demonstration, three instructions were emphasised.

First, the task screen and mechanics were demonstrated. Participants were informed that the practice round would consist of five trials of ten seconds each. Their task was to click the button on their screen repeatedly. A feedback table would appear at the end of the ten-second trial with the number of clicks recorded displayed. As part of the demonstration, participants were directed to click the mouse button with the index finger of their dominant hand.

Second, participants were advised that all references to monetary payments were for real cash. To emphasise this point participants were shown where cash was stored for making payments.

Third, a feedback table displaying individual performance for the previous trial and cumulative score between each clicking trial was presented between trials. The next trial would commence when the participant clicked 'next trial'. Participants were advised to only rest for a few seconds between trials, as taking longer would extend the duration of the session. No participants rested for more than ten seconds in any trial.

Finally, participants completed the self-efficacy survey (reproduced in Appendix C). After completion of the survey, the practice round was finished.

5.3.3.3. Main Task Demonstration

Before the main rounds began, participants watched a demonstration of the main task. As part of the demonstration, examples of individual feedback tables and a tournament scoreboard were projected on a public screen visible to all participants. The demonstration served two purposes. First, participants were familiarised with the task before the first trial commenced. Second, the demonstration clarified how to interpret the feedback tables presented between trials and the tournament scorecard.

5.3.3.4. Main Task Instructions

Participants were presented with a set of instructions for the main rounds. The set of instructions for each condition is reproduced in Appendix C. Participants were advised that they had been assigned a performance target of at least 285 (420) clicks per round for participants in the Tournaments with an Easy (Hard) Target conditions. The target was also expressed as maintaining an average of at least 57 (84) clicks per trial (5 trials per round). This instruction was not present for Tournaments with No Target condition participants.

Participants in the Tournaments with a Paid Target conditions were told they could receive an additional $1.25 (Tournaments with a Paid Easy Target) or $5.00 (Tournaments with a Paid Hard Target) each round they achieved the target. Participants in the Tournaments with an Unpaid Target conditions and the Tournaments with No Target condition were informed that they would receive a flat wage of $5.00 for the session. The instructions then described the tournament. Participants in every condition were advised that the participant with the highest cumulative score at the end of the session would receive a cash prize of $30.00.

Next, participants were informed that they would receive group feedback at the end of each round. The feedback would summarise their score, whether they achieved the performance target and the other participants' scores.

Finally, participants completed a comprehension quiz to test their understanding of the instructions. The comprehension check question required participants to correctly identify (1) whether the tournament winner received a prize, (2) if they had been assigned a performance target, (3) how many clicks were required to achieve the target (if they had been assigned a target), and (4) whether they would receive a bonus for exceeding the target. I manually checked and, where necessary, explained the instructions individually to each participant before the participant was asked to attempt the comprehension quiz again. The main rounds did not begin until all participants had correctly answered each of the comprehension questions. The complete set of comprehension questions for each condition is reproduced in Appendix C.

5.3.3.5. Main Round Trials

The main task had five rounds, each consisting of five ten-second clicking trails. An individual performance feedback table was displayed on each participant's screen between each clicking trial. The individual feedback included the participant's score for the previous trial, cumulative score for the round and tournament, and whether they had achieved the performance target (no references to a performance targeted were displayed to participants in the Tournaments with No Target condition). Figure 5.4. shows a screenshot of the individual performance feedback table. After viewing the individual feedback, participants could begin the next trial by clicking a button labelled 'Continue' on their screen.

Score for previous ten second trial (you will need to average 84 for the round to achieve the performance target)	0	Clicks
Current score for this round	0	Clicks
Achieved Performance Target (Target 420 clicks by end of round)	NO	
Total for ALL rounds (this round and all previous rounds)	1574	Clicks

Figure 5.4. Within-Round (between trials) Individual Feedback Table

Notes:
Participants in the Tournaments with No Target condition had the 'Achieved Performance Target' row removed from their table, and references to the average number of clicks required to achieve the target were removed from the first row.
The individual feedback table was privately displayed on each participant's monitor between each trial. If a participant's score exceeded their assigned target, the achieved performance target cell displayed 'YES.'

The tournament scoreboard was updated at the end of each round. The scoreboard displayed the relative performance of each participant for the round, cumulative score, and current rank. Figure 5.5. displays an example tournament scorecard.

ID	Round 1	Round 2	Round 3	Round 4	Round 5	CURRENT SCORE	POSITION
501	280	290				570	5
502	290	300				590	4
503	300	310				610	3
504	310	320				630	2
505	320	330				650	1

Figure 5.5. Between-Round Tournament Scorecard

Notes:
The between round tournament scorecard was projected to a public screen that all participants in the session could view. The scoreboard was updated at the end of each round.

5.3.3.6. Exit Survey

At the end of the last round, participants completed a self-efficacy survey and an exit survey (See Appendix C for a summary of every exit survey question). The exit survey asked participants about their: gender, age, country of birth, years lived in Australia, work experience, use of social media, math ability, frequency of playing computer games, and self-assessed effort expended on the task. Participants were paid, and each participant signed a payment receipt. Final confirmation of each participant's name was checked against the session signup list to ensure students were correctly awarded the two-credit point bonus mark for participating in a research study.

5.3.4. Variables

5.3.4.1. Effort

Effort was measured as the total clicks recorded by the participant divided by the number of clicks recorded by the participant in Round 1 of the tournament. Total clicks were divided by Round 1 clicks to control for individual differences between participants (e.g. fine motor skills can affect performance on the FTT). The FTT rounds consist of very short duration trials (10-second each). During the training round some participants may have taken a portion of the training round to acclimatise to the task rendering the training round an unreliable baseline measure of individual differences in task aptitude. No participant was aware of their performance relative to other participants until after Round 1 had finished.

5.3.4.1. Additional Variables

The following variables were measured but not used for main hypothesis testing.

Perceived Effort was measured via the exit survey by asking participants to what extent they

agreed with the statement ‘I worked hard on the task’ on a scale anchored from strongly disagree (1) to strongly agree (7). *Perceived Effort* captures participants' subjective evaluation of their effort, including factors not captured by an objective proxy for effort (e.g., the participants' fatigue).

A ten-item survey measured self-efficacy[10]. *Years Lived in Australia*, *Country of Birth* and *Self-Efficacy* variables were collected for another project that is beyond the scope of this thesis.

5.4. Experiment 2

Experiment 2 investigated the retention of participants in a tournament. In this section I detail the administration of Experiment 2 used to test the H4 to H7 described in Chapter 3. The remainder of this section commences with a discussion of how quitting was facilitated within a laboratory experiment setting. Observations from Experiment 1 informed modifications trialled during a pilot study. The modifications were then incorporated into the Experiment 2 task. This section concludes with a description of the participants, the research design, and the procedures.

[10] The survey was developed specifically for the modified FTT using the guidelines from Bandura (2006), Moore (2007), and Pajares, Hartley & Valiante (2001). The self-efficacy scale was adapted to the FTT and used the format described by Bandura (2006). Following Bardura’s (2006) format, participants were asked to assess their confidence to perform the task when taking the survey rather than to assess their ability or potential ability. Following Moore's (2007) recommendation, the self-efficacy scale was anchored to absolute performance levels rather than verbally anchored scales that may increase the subjectivity of participants' interpretations. The scale used a 100-response format as Pajares et al. (2001) found a 100-point format better-predicted performance than a 5-response format.

Each participant was asked to rate their confidence (0-100) that they could achieve the target level of clicks within ten seconds of taking the survey. The target scores asked were: 30, 40, 50, 60, 70, 80, 90, 100, 110, and 120. A self-efficacy score was calculated as the mean confidence score recorded. Self-efficacy was measured before the main task began and as a component of the exit survey.

5.4.1. Task Development Stage

Experiment 1 results reported in Chapter 6 indicated that participants did not regulate their effort to the extent I anticipated. Contrary to my expectation, none of the participants in Experiment 1 dramatically withheld effort or explicitly quit working on the task. The lack of substantial effort regulation by *laggards* observed in Experiment 1 informed the design of Experiment 2. I ran eight pilot sessions with small groups of participants to trial modifications to the Experiment 2 task. I designed a task to test the retention of participants in tournaments. The task design needed to identify when participants quit.

Quitting is a coping mechanism people use in response to psychological distress, usually in the event of some downturn in the individual's circumstances (Carver & Scheier, 2001). People tend to mentally disengage from a task rather than overtly quit when high social costs are associated with quitting (Carver & Scheier, 1990, 2000, 2001).

As no participants overtly quit during Experiment 1, no participants observed someone else quitting the task. Observing peers in the same session persist in exerting effort even after falling behind the leader may have created a social norm in each session that quitting was not a reasonable action. Experiment 1 Pilot interviewees confirmed that not giving up was a source of pride, irrespective of their ranking in the tournament.

People tend to disengage rather than overtly quit when the costs associated with quitting a high (Carver & Scheier, 2001; Wrosch, Scheier, Carver, et al., 2003; Wrosch, Scheier, Miller, et al., 2003). Social norms generally associate quitting with a lack of courage, lack of dedication, and a lack of perseverance (Carver & Scheier, 1990). Participants may have thought overt quitting would not be condoned by peers. Participants who quit may have thought they would suffer reputational damage and be perceived as a "quitter" by the other participants. Quitting may also be internalised as personal character weakness and

failure (Carver & Scheier, 2001). These are undesirable traits to display publicly and may outweigh the personal feelings of frustration from persisting on the Experiment 1 task even though some participants knew they could not win the tournament.

Overtly quitting was also unlikely because participants are a captured audience within a laboratory setting. Participants often perceive the researcher as a figure of authority (Milgram, 2009). Participants may have been hesitant to quit, fearing sanction from the researcher. The researcher might be upset, berate the participant or withhold payment for participating.

It could also be that participants did not quit because there was no alternative but to work on the assigned task, and they did not want to be bored. For example, Wilson et al. (2014) ran a series of experiments that showed many participants chose to voluntarily self-administer painful electric shocks rather than be left with no external stimulus for as little as six minutes. Unless participants who quit had access to an external stimulus, e.g., their cell phone, they may have preferred to work on the task merely to relieve boredom.

Finally, the decision to quit had an economic cost. Quitting would have removed any chance of winning the tournament prize. In addition, participants may have feared the withdrawal of all payments for participating in the study.

Based upon the participants' behaviour in Experiment 1 and to address research question 4, which explicitly examined retention, it was necessary to create the conditions in which *laggards* who had mentally disengaged from the tournament felt safe to quit. Berger et al. (2013) and Casas-Acre & Martinez-Jerez (2009) found limited evidence of giving up in tournaments after participants had fallen a long way behind or repeatedly lost tournaments. In both these studies giving up was inferred from performance data rather than direct

observation that participants had given up. Both studies used data from employees in a workplace where the costs of overt quitting may have been severe, e.g., termination of employment.

By contrast, Fershtman & Gneezy's (2011) study of school children participating in running races observed actual giving up and quitting directly. In order to examine questions of retention, I sought to identify whether the conditions from Fershtman & Gneezy's (2011) setting where quitting was directly observable could be replicated in a laboratory setting with adult participants.

For three reasons, a direct measure of quitting was preferred over a proxy based on performance. Firstly, a proxy derived from performance cannot rule out fatigue as an alternate explanation for the deterioration in performance. Participants may have experienced fatigue from the task at different rates. Fatigued participants may be incorrectly classified as quitting. Participants may have been trying to win the tournament, but their performance may have deteriorated due to fatigue rather than consciously withholding effort.

Secondly, participants can strategically lower performance in a tournament to induce complacency from other participants. Relying upon a proxy based on lowered performance may incorrectly classify a participant who does this as quitting. Thirdly, disengaged participants may want to quit but not know how to quit without incurring significant costs.

5.4.1.1. Facilitating Quitting in a Laboratory Experiment

The following section documents the design choices that enabled me to increase the likelihood that a participant would quit during Experiment 2. The instrument used the Qualtrics platform. The Qualtrics platform had less risk of coding errors and was easier to program than VBA code in Microsoft Excel. Qualtrics also records timestamps for each

instrument page, which was necessary to reconcile electrodermal activity data collected for additional analysis. The Experiment 2 instrument retained every modification trialled in the Experiment 2 Pilot Study except for the trial and round duration. Thirty-three participants, 13 (39.4%) men and 20 (60.6%) women tested the instrument during the Experiment 2 Pilot Study. Table 5.5. summarises each modification.

Table 5.5. Task Design Changes – Experiment 1 to Experiment 2

	Experiment 1	**Experiment 2**	**Reason**
Platform	Mircosoft Excel VBA code	Qualtrics	Reduced risk of coding errors and Qualtrics server timestamps automatically recorded for each participant.
Trial Duration	10 seconds	30 seconds	To increase the effort duration for each trial and induce moderate stress.
Round Duration	5 trials	3 trials	As the duration of each trial was longer, reducing the number of trials per round ensured the duration was limitted to 45-50 minutes per session.
Rest between trials	User directed	5 seconds	A standardised rest period between trials to add consistency between participants.
Number of rounds	5 rounds	8 rounds	Increased the number of rounds from 5 to 8 to allow more rounds for participants to decide whether or not to quit the tournament.
Alternate task	No Alternate Task	Letter Decoding Task	An alternate task relieved boredom for participants who quit and reduced the social costs of quitting.
Endowment	No Endowment	Endowment	An endowment reduced the financial cost of quitting.
Quit Text Box	No Quit Option	Quit Text Box	The explicit option to quit reduced the social costs of quitting. Participants knew they were permitted to quit without compromising the study.
Electrodermal Activity Measured	No	Yes	Electrodermal activity measured participants' stress while working on the task and viewing RPI.

Notes:

Except for the elements described above and the experiment manipulations, all other task elements were the same for Experiments 1 and 2.

Definition of Elements

Trial - refers to the period when participants were asked to click the mouse repeatedly. The number of clicks recorded was a participant's score for the trial.

Round - consisted of several trials with rest periods between each trial.

Rest periods - participants were not required to click the mouse. Individual performance data was presented on the participant's screen.

Alternate study task - a letter-decoding task adapted from Chow (1983). Participants who quit the tournament worked on the alternate task for the remainder of the session. Performance was not measured on the alternate task.

Endowment – each participant received $4.80 at the beginning of Round 1. The endowment was reduced by $0.20 at the beginning of each trial. Participants could keep any remaining value of their endowment at the end of the session.

The first change was designed to increase participants' fatigue. Physical and mental fatigue may impair performance and induce a person to quit working on a task or pursuing a goal (Wrosch, Scheier, Carver, et al., 2003; Wrosch, Scheier, Miller, et al., 2003). In place of the ten-second clicking trials used in Experiment 1, I used a version of the task with eight one-minute rounds during the first four pilot sessions. Feedback from participants via an open-ended questionnaire that asked for suggested improvements to the task indicated that one-minute clicking trials were too long. Five participants recommended cutting the time for each round to twenty or thirty seconds.

In the remaining four pilot sessions, I changed the round structure to three thirty-second trials with a five-second rest between trials. No participants reported via the open-ended survey that thirty seconds was too difficult. At the end of the final two pilot sessions, I verbally asked participants about the length of the clicking trials. All participants indicated that thirty seconds was long enough to be tiring but not so long that anyone would not be able to complete the task. Following the pilot sessions, the length of the clicking trials was reduced from sixty seconds to thirty seconds. No other modifications to the instrument were introduced based on the pilot.

The next design choice was to standardise the rest period between trials. In Experiment 1, participants could choose when to begin the next clicking trial, enabling tired

participants to rest for longer between trials. I introduced a uniform five-second rest period between trials. A timer displayed on participants' screens informed participants when the next trial would commence. This design choice removed opportunities for tired participants to rest and made the task more consistent for all participants in the sample.

I made **three significant modifications to reduce the costs associated with quitting**. Firstly, I introduced an explicit option to quit. If participants wanted to quit, they could do so by typing 'stop' into a text box during any round. This design tool made it clear that quitting the task was permitted, and doing so would not compromise the data collected from the participant.

Secondly, the design introduced an alternate task. If a participant chose to quit the task associated with the tournament, they could work on the alternate task. The alternate task was a letter-decoding task adapted from Chow (1983). The alternate task had the dual purpose of relieving boredom and reducing social costs. Social costs were reduced by seating participants separately with a barrier obscuring them from each other so that their screen was not visible to other participants in the same session. Participants who quit could feel they were still working on a task, and to other participants in the session, it appeared the participants who quit were engaged in the task.

An endowment reduced the economic costs of quitting. After each trial, the endowment was reduced. Participants who quit while giving up their chance of winning the tournament prize could keep the remaining endowment. This design choice operationalised an economic aversion to effort directed toward the tournament. If a participant elected to quit the tournament, they were permitted to keep the remaining value of their endowment. A similar endowment feature has been used in the experimental accounting research as a proxy for the

disutility of effort, e.g., Chan et al. (2021); Hannan et al. (2008); Sprinkle (2000); and Tafkov (2013).

In addition to directly measuring when a participant quit, I collected and analysed electrodermal activity data (EDA) to measure participants' stress while working on the task and viewing RPI (EDA is described in Section 5.5. and in more detail in Appendix F). The changes designed to facilitate overt quitting proved to be effective. As reported in Chapter 6, 33.1% of the participants overtly quit during Experiment 2.

5.4.2. Participants

Ethics clearance was granted for Experiment 2 from the large public university in Australia where the research study was conducted (ethics approval was granted separately for Experiment 1 and 2 see Appendix A). Undergraduate students enrolled in the same accounting course from a large public university were recruited for voluntary participation in experimental sessions. Students who participated in this study were awarded two bonus credit points towards the participating accounting unit. Using students as participants is appropriate for studies focused on general cognitive or motor ability and does not require knowledge of accounting or investing (Libby et al., 2002; Liyanarachchi & Milne, 2005). The task used required no specialised knowledge or experience.

In total, 162 students participated in 34 sessions. Two sessions were cancelled. The data was not recorded in one session because a participant used the trackpad instead of the mouse to record clicks[11]. In another session, there were only three participants[12]. To maintain

[11] Using the trackpad, the participant recorded clicks from two input sources (the mouse and trackpad); consequently, the participant recorded a score much more than the other participants in the same session or any pilot sessions. I observed the participant's clicking technique in the next round, and when prompted, the participant confirmed they used the trackpad and the mouse.

[12] The data was not retained for the three-person tournament because, compared to a four or five-person tournament, the probability of observing another participant quit is reduced and the probability of winning a

a consistent number of participants in each tournament, the data from this session was removed from the sample, leaving a final sample of 154 students participating in 32 sessions. On average, participants were 20.53 years old, 57.14% were women, and 42.86% were men. Participants competed against each other in groups of four or five for eight rounds.

5.4.3. Experimental Design

5.4.3.1. Experiment 2 Overview

The experiment task was a modified version of the effort-intensive task used in Experiment 1. The task required participants to click the mouse button for thirty-second trials with a five-second rest between trials. Participants competed in a tournament with a prize for the winner of each session.

Experiment 2 had a 2 x 3 between-participant experiment design. I used an experimental design in which I varied (between subjects) the Informedness (Low or High) and the performance targets at three levels (No Target, Easy Target, or Hard Target). In the High (Low) Informedness tournament conditions, participants were informed (not informed) of the performance of participants who had quit the tournament in their session. The design resulted in six experimental conditions, as shown in Table 5.6.

tournament is higher. I allowed the session to proceed so the students could obtain the credit points for participating.

Table 5.6. Experiment Conditions: Informedness (IV1) x Target (IV2)

	Target Present and Difficulty		
Informedness	No Target	Easy Target	Hard Target
Low	Cell 1: Low Informedness No Target Tournaments	Cell 3: Low Informedness Easy Target Tournaments	Cell 5: Low Informedness Hard Target Tournaments
High	Cell 2: Low Informedness No Target Tournaments	Cell 4: Low Informedness Easy Target Tournaments	Cell 6: Low Informedness Hard Target Tournaments

Notes:

Informedness (IV1) has two levels: Low Informedness and High Informedness. Target (IV2) has three levels: No Target, Easy Target and Hard Target.

Figure 5.6. displays the task screen.

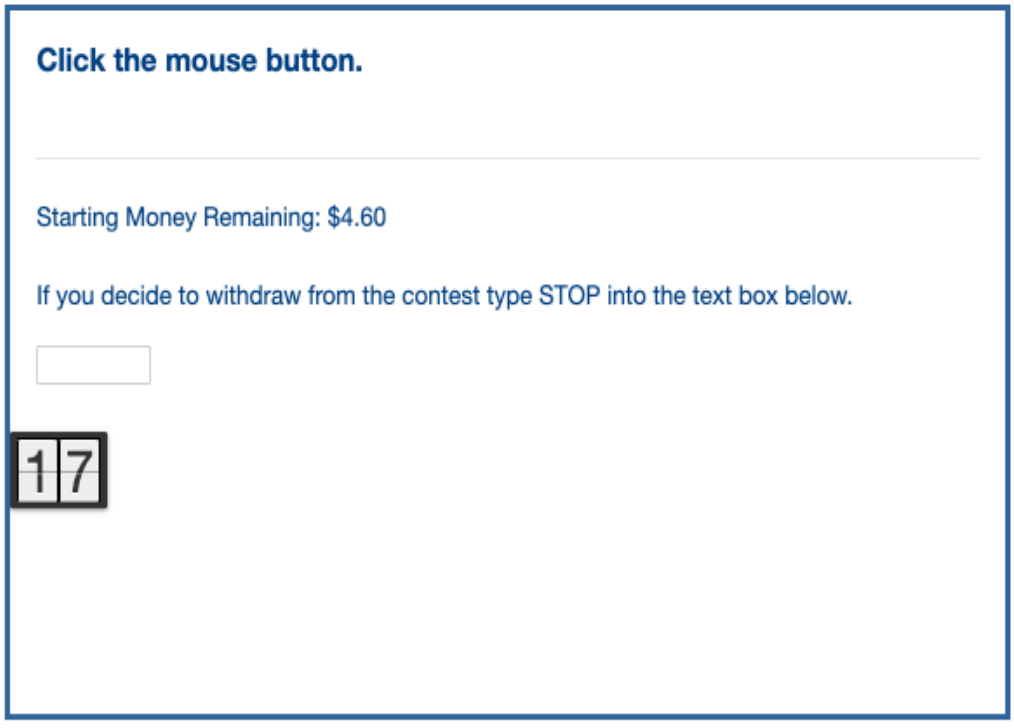
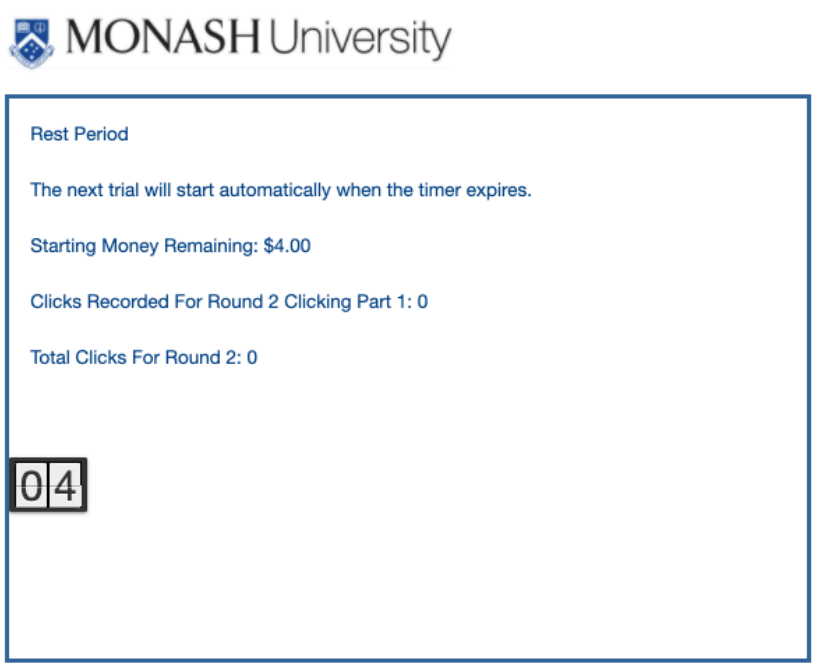


Figure 5.6. Main task screen. The task was administered using the Qualtrics platform. The clicks recorded for each trial are displayed to participants at the end of each trial. Participants can quit the tournament by typing 'stop' into the text box during any trial. The screen displays the seconds remaining in the trial and the remaining endowment.

Participants received individual performance feedback at the end of each thirty-second trial in all conditions. There were three thirty-second trials in each of the eight tournament rounds (twenty-four trials in total). Individual performance information for the current trial and score for the current round was displayed on each participant's screen for five seconds before each clicking trial automatically began. Figure 5.7. displays the within-round rest screen (Panel A) and the end of the round individual performance feedback screen (Panel B).

Participants received relative performance information (RPI) at the end of each round in all conditions. RPI was displayed on a public screen (a video projector), clearly visible to all participants. Individual round scores, cumulative total scores, and current rankings were displayed. Participants were required to write their cumulative total score and current rank onto a form before commencing the next round.

Panel A



Panel B

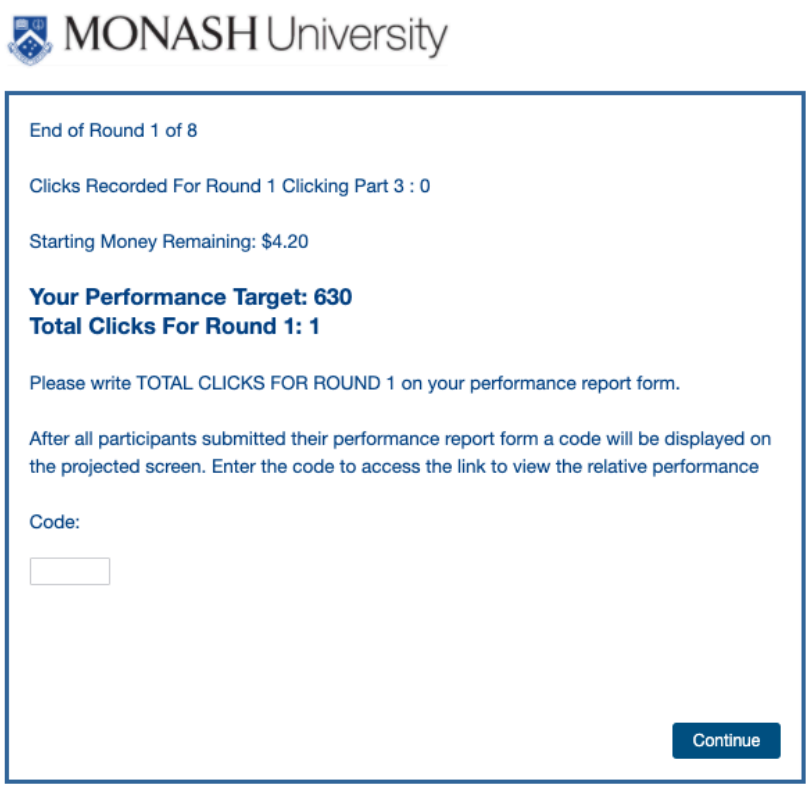


Figure 5.7. Within-Round Screen (Panel A) and End of Round Screen (Panel B)

5.4.3.2. Tournament Prize and Endowment

I used a grand tournament with a winner-take-all prize structure to allocate prizes. A grand tournament is one in which the participant with the highest cumulative total score at the end of the tournament is the winner. Specifically, only the participant in each session with the highest cumulative total score at the end of round eight won a $20.00 prize. I used a grand tournament prize structure because this design facilitates an examination of participants who are likely to quit. Since only one participant can win the prize, a greater proportion of the participants will perceive their chance of winning to be low compared to alternative tournament prize structures. By contrast, multiple tournament prize structures reduce the performance required to realistically compete for a prize (Backes-Gellner & Pull, 2013; Knauer et al., 2017).

Every participant was allocated one endowment of $4.80 at the beginning of round one. At the beginning of each trial, the endowment was reduced by $0.20. The endowment was set at $0.20 x 24 trials = $4.80 to provide a small but not trivial incentive to quit. If a participant elected to quit the tournament, they were permitted to keep the remaining value of their endowment.

During every trial, participants had the option to quit the primary task by typing 'stop'[13] into a text box that is displayed on their screen. Participants stopped working on the alternate decoding task after all the participants remaining in the tournament completed the final round. Figure 5.8. displays a screenshot of the alternate task.

[13] Qualtrics was programmed to accept all reasonable permutations, i.e., Stop, stop, STOP

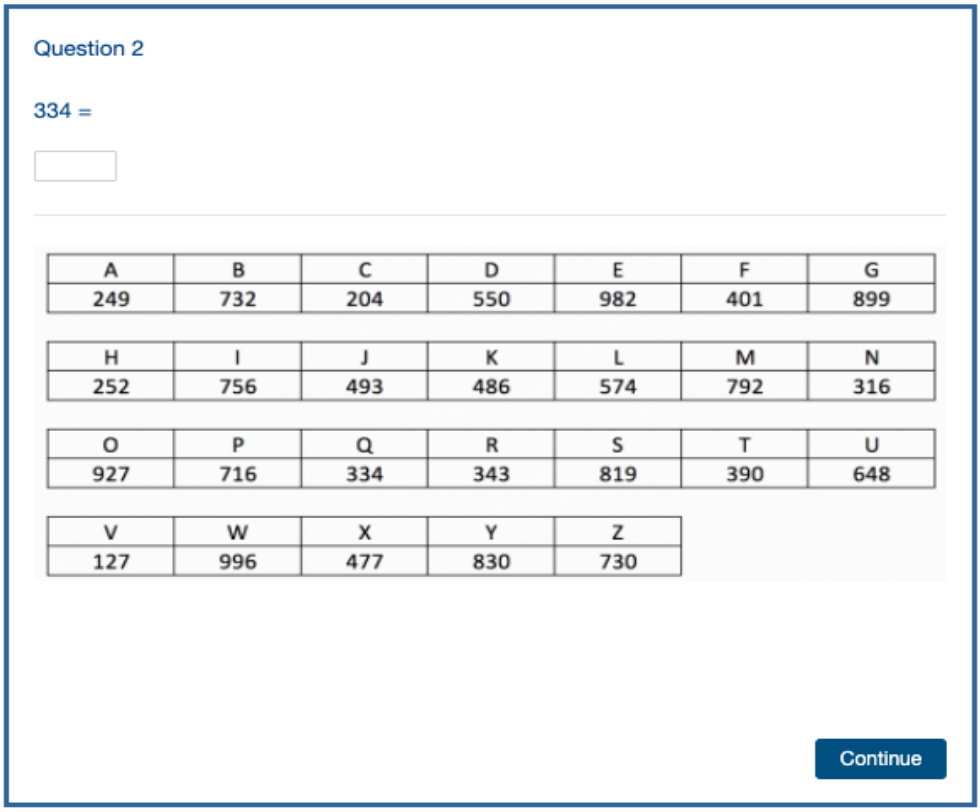


Figure 5.8. The alternate task was a letter decoding task.
In this example, the correct answer is Q.

5.4.3.3. Informedness Manipulation

I manipulated informedness via the relative performance information displayed between rounds. Specifically, in the Tournaments with High Informedness conditions, relative performance information for all participants, including participants who had already quit, was displayed. Participants who had quit received scores of zero for every unfinished round after they decided to quit. In the Tournaments with Low Informedness conditions, the performance information for participants who had quit was removed from display. No scores were displayed for these participants. Figure 5.9. displays an example of the Group RPI screen for a High Informedness Tournament and a Low Informedness Tournament condition.

Item A: Low Informedness Tournament

Name	Seat Number	Round 2 Score	Total Score	Rank
Sophia	1	574	1148	2nd
James	3	499	1010	4th
Mingwang	4	547	1094	3rd
Ahmed	5	687	1374	1st

Item B: High Informedness Tournament

Name	Seat Number	Round 2 Score	Total Score	Rank
Sophia	1	574	1148	2nd
Joe	2	0	469	5th
James	3	499	1010	4th
Mingwang	4	547	1094	3rd
Ahmed	5	687	1374	1st

Figure 5.9. Example of the End of Round Tournament Scoreboard. Item A example is taken from a Tournament with Low Informedness condition. The participant in Seat 2 'Joe' has quit the tournament and therefore does not have their performance data displayed. Item B example represents a High Informedness Tournament condition. The participant in Seat 2 'Joe' has quit the tournament, but his name and score remain visible to the remaining participants. The participant's score is displayed as '0' for every unfinished round after he decided to quit.

5.4.3.4. Performance Target Manipulation

I manipulated performance targets at three levels (No Target, Easy Target, or Hard Target). Participants assigned to the Tournament with Easy (Hard) Target conditions were informed at the start of the main task that they were assigned a target of at least 512 (630) clicks per round. The easy target was set at a difficulty intended to be achieved 75% of the time, and the hard target difficulty was intended to be achieved 25% of the time. These target difficulties are similar to those used in prior research (e.g. Fatseas & Hirst, 1992; Huber, 1985; Webb et al., 2013). Target scores were determined based on the performance of participants in Experiment 1 adjusted for the increased duration of each round (Experiment 2 participants had 90 seconds per round. Experiment 1 participants 50 seconds per round). In Experiment 1, 126 (25.4%) participants averaged a score of at least 284.8 per round.

Therefore, I set the Easy Target at 284.8 x 1.8 = 512 Clicks per round. In Experiment 1, 127 (75.1%) participants averaged a score of at least 349.6 per round. Therefore, I set the Hard Target for Experiment 2 at 350 x 1.8 = 630 Clicks per round.

5.4.4. Procedures and Timeline

Each participant was assigned to one of the six experimental conditions based on which session they attended. Specifically, I conducted one condition per session and randomly determined which condition to use in each session. The same laboratory used for Experiment 1 was the venue for all the Experiment 2 sessions. Upon entering the laboratory, participants were seated at a computer terminal and asked to read an explanatory statement and sign a consent form. Participants were spaced out with partitions so that they could not see each other during the session. All completed consent forms were removed and filed in a separate cupboard before the experiment began.

To assess participants' stress throughout Experiment 2, each participant's electrodermal activity data (EDA) was recorded. A Shimmer 3+ GSR device was placed on each participant that measured and recorded participants' electrodermal activity data during the experiment. The purpose of the devices was explained to each participant verbally and in the written explanatory statement. The Shimmer 3+ GSR devices are non-intrusive and require a finger noose strap to be attached to the middle and index fingers of the participant's non-dominant hand. Participants nominated the hand they would normally use to click a mouse button as their dominant hand. After being asked, no participants expressed discomfort from wearing the device.

The browser of each computer was preloaded with a Qualtrics study page. The page was displayed in full-screen mode. The complete instrument for each experiment condition is

reproduced in Appendix D. At the start of each session, participants watched a video demonstrating how the main task and the alternative task worked. Participants then completed a practice round for each task. After the practice round, participants watched a second video that read aloud the instructions detailing the tournament scheme and the experiment instructions for their assigned condition. The video also demonstrated the quitting mechanism and displayed an example of the feedback screens. Each participant's screen displayed the instructions in text form. Participants then answered a comprehension quiz. After all the participants finished the comprehension quiz, they completed the eight-round tournament.

At the end of each round, participants answered a short feedback quiz to ensure they read the feedback and remembered key instructions. The short quiz asked participants (1) whether they achieved the performance target (this question was excluded from participants in the Tournaments with No Target condition), (2) their rank in the tournament, and (3) which word they needed to type in the text box during any trial to stop working on the clicking task. A password was revealed after the participant completed the feedback quiz. The password allowed the participant to begin the next round. Finally, participants completed an exit survey containing demographic questions and received payment (the full instrument, including the exit survey, is reproduced in Appendix D). Participants who quit the main task worked on the unpaid alternative task until the participants working on the primary task completed the final round. Participants earned an average of $5.24. Figure 5.10. summarises the timeline for each session.

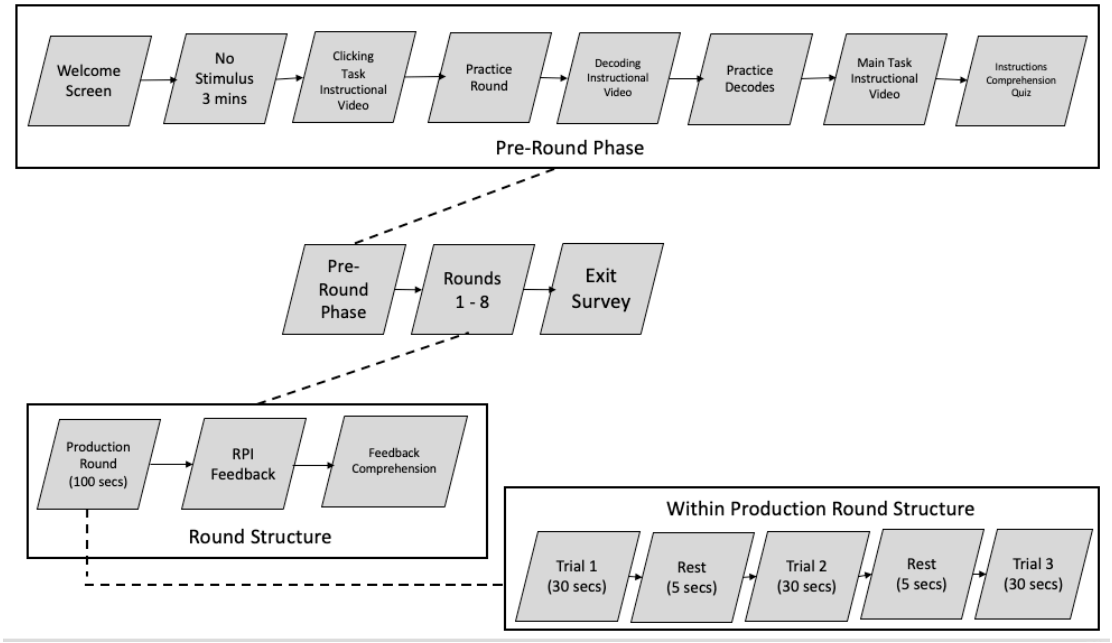


Figure 5.10. Experiment 2 Structure: 8 Rounds x 3 Trials per Round

Experiment Timeline. Participants sit quietly for three minutes to provide a baseline electrodermal activity reading. In the pre-round phase, participants watch instructional videos related to each task, practice the clicking and decoding tasks, watch the main round instructional video, and complete the instruction comprehension quiz. Participants must answer every comprehension question correctly before beginning the first main round. Each round consists of three 30-second clicking trials with five-second rest periods between each trial. The main task consists of eight rounds (24 trials). After the eighth round, participants complete an exit survey, and the session is finished.

5.4.4.1. Instructional Videos

A combination of instructional videos, text-based video summaries, and a practice round was used to familiarise participants with the task instructions. Three instructional videos demonstrated each of the task components and explained the instructions for the session. The videos presented an audio version of the task instructions, a graphical depiction of the task screen, and demonstrated the task. The task instructions were displayed in text format after each video finished playing. Using videos provided three clear advantages over text-only instructions. Firstly, participants could see a demonstration of the task mechanics, e.g., what happens if they enter 'stop' in the text box during a round. Secondly, the audio component provided additional media for participants to understand the instructions and ensured participants were exposed to all instructions, e.g., participants could not intentionally

or accidentally skip part of the text instructions. Thirdly, the videos familiarised participants with the task before the main session began. Participants knew what to expect during each round, how to quit, and what would happen if they quit.

One set of videos was used to ensure consistency across all conditions, with only minor edits to the third video related to the experimental manipulations. The first video described the practice round and displayed a pre-recorded demonstration of the practice round and feedback screen. After watching the first video, a text-based summary of the practice round instructions was displayed. Participants then completed a practice round themselves.

The second video demonstrated the letter decoding task. The video demonstrated how to solve three problems using a letter decoding key. After watching the video, a text-based summary of the instructions was displayed. Participants were then required to solve five problems to demonstrate their understanding.

The third video explained instructions for the remainder of the session and demonstrated a pre-recorded hypothetical example of Round 1. The demonstration showed participants that the main task was similar to the training round task. The demonstration video also showed participants the effect of typing 'stop' into the text box during a round. After typing stop, a warning message was displayed, and participants would be prompted to either confirm they wanted to stop or return to the main task. If a participant confirmed they wanted to stop, the task was switched to the letter decoding task. The third video was only edited to remove references to a performance target for participants in the Tournaments with No Target condition, the number of clicks required to reach the target based on the target difficulty for the condition, and the description of the feedback table based on the informedness manipulation.

5.4.5. Variables

5.4.5.1. Quitting (DV)

Quit was measured as a dummy variable 0 (1) for did not quit (quit) at any point during the tournament.

5.4.5.1. Additional Variables

The following variables were not used for hypothesis testing. *Persistence* and *Performance* were used for additional analysis presented in Chapter 6.

Persistence was measured as the number of trials completed (1-24 trials). Persistence measured how long the participant stayed in the tournament before quitting.
Performance was measured as the average raw number of clicks recorded per trial completed.

Self-Efficacy, *Goal Disengagement Personality Trait*, *Goal Commitment* (Tournament and Target), *Years Lived in Australia* and *Country of Birth* variables were collected as part of the exit survey for another project that is beyond the scope of this thesis.

5.4.6. Exit Survey

After the tournament, each participant completed an exit survey (refer to Appendix D to view all exit survey questions). Participants were also asked to explain why they chose to stop (or not stop) in their own words. They also answered questions about their commitment to winning the tournament and achieving the target (for target present conditions only), self-assessed performance and effort expended towards winning the tournament, and demographics questions, gender, left or right-hand dominance, age, country of birth, years

lived in Australia, work experience, use of social media[14], goal disengagement personality trait survey questions[15] (Wrosch, Scheier, Carver, et al., 2003; Wrosch, Scheier, Miller, et al., 2003), goal commitment, and how frequently the participant played computer games.

5.4.6. Comprehension Checks

Participants had to answer comprehension questions before they began the first round concerning (1) identifying who was leading a hypothetical tournament requiring an accurate interpretation of a hypothetical sample scoreboard; (2) how to quit the tournament; (3) the consequences of quitting the tournament; (4) how the scoreboard would display performance information for participants who have quit; and for participants in conditions with performance targets (5) whether they were assigned a performance target; (6) the score required to achieve the performance target; and (7) whether there was a financial reward for achieving the target. Participants could not proceed until they had answered every question correctly. Appendix D reproduces the complete set of comprehension questions.

5.4.7. Issues encountered

In the course of running Experiment 2, I encountered two minor issues. Firstly, participants could sign up for a session and not show up. Each session only proceeded with at least four participants but no more than five participants to control for any tournament size effects. To reduce the risk of no-shows, I allowed up to six participants to sign up for each session. When six participants showed up, the last participant to arrive at the venue took part in a different study conducted simultaneously in the laboratory next door.

[14] People addicted to social media are more likely to make upward and downward social comparisons when using social media (Robinson et al., 2019). While measurement of social media addiction was beyond the scope of this study, a measure of the frequency of social media use was collected because frequent users may be more sensitive to relative performance information than infrequent users.

[15] The goal disengagement questions (as part of Worsch et al. 2003a, b) measure a person's tendency to disengage from unattainable goals. Appendix D presents the survey as part of the experiment instrument.

Secondly as described earlier, in the second session, one participant used the keyboard trackpad to click instead of the mouse button as directed. This session was cancelled, all the participants were paid for the session, and the data was not recorded. To prevent a reoccurrence, a physical barrier was installed to cover the keyboard trackpad of each computer.

5.5. Electrodermal Activity Data

Electrodermal activity data was collected from 121 participants[16] who took part in Experiment 2. Electrodermal activity data (EDA)was collected to analyse participants' stress levels before they decided to quit. The analysis of participants' EDA forms part of the additional analysis for Experiment 2 presented in Chapter 6.

Electrodermal activity (EDA) analysis is a technique used in such disciplines as psychology, physiology, psychiatry, neuroscience, and neuroeconomics to measure the rate at which electrical current passes through the sweat produced to index psychophysiological arousal states such as stress (Caruelle, Gustafsson, Shams, & Lervik-Olsen, 2019; Liu & Du, 2018; Sánchez-Reolid, Martínez-Rodrigo, López, & Fernández-Caballero, 2020). In very simple terms, the more stressed the person is, the more sweat will be produced.

Participants wore a Shimmer3 GSR+ Unit that attached two electrodes to the participant's index and middle fingers of their non-dominant hand, between the first and second knuckle. The device measured the electrodermal resistance by recording the current that flows between each electrode. Figure 5.11. displays a photo of the Shimmer3 GSR+ device as it was attached to each participant's hand.

[16] The GSR 3+ Shimmer devices either did not record or save data for 33 participants.

Figure 5.11. Shimmer3 GSR+ device with electrodes affixed to each participant's dominant hand.

EDA was measured while participants were engaged on the task, and during the periods RPI was displayed. For a more detailed discussion of EDA, calibration of EDA and EDA collection process, see Appendix F.

5.6. Conclusion

In this chapter, I have described the development phase for both experiments, each experiment's design, and an account of the participants and experimental procedures. I then presented a description of the procedures used to collect electrodermal activity from participants in Experiment 2. Together the two experiments form the basis for testing the seven hypotheses developed in Chapter 3. In the next chapter, I present the results of hypothesis testing.

Chapter 6 Results

6.1. Experiment 1: *Laggards'* Effort in Tournaments

6.1.1. Participants

One hundred seventy students participated in 38 sessions. In one session, a computer running the instrument ran out of battery, and the participant's data was lost, leaving a final sample of 169 participants. On average, participants were 20.58 years old, 65.7% were women, and 34.3% were men. Participants, on average, lived in Australia for 7.65 years and had 16.27 months (1.36 years) of work experience. I used a one-way between-groups analysis of variance (ANOVA) to determine whether any of the variables from the exit survey were not evenly distributed between the experimental conditions. *Years in Australia* F (4, 164) = 4.226, p = 0.003, 2-tailed, and *Computer Game Playing* F (4, 164) = 2.973, p = 0.021, 2-tailed, as well as *Perceived Effort* F (4,164) = 3.342, p = 0.010, 2-tailed, are significantly different between the tournament conditions. There are no significant differences in the distribution for the other variables. I am therefore confident that random assignment to experimental conditions is effective.

Table 6.1. displays Pearsons correlations for *Years in Australia*, *Computer Game Playing*, *Perceived Effort*, and *Effort* (the dependent variable used for hypothesis testing). None of these variables are significantly correlated with *Effort* and therefore do not affect the hypotheses testing reported in the next section.

Table 6.1. Pearson Correlation: *Effort* correlation with *Perceived Effort*, *Years Lived in Australia* and *Playing Games*

		Perceived Effort	*Years Lived in Australia*	*Playing Games*
Effort	Pearson Correlation	0.051	0.022	0.099
	p - value (2-tailed)	0.510	0.779	0.199
	N	169	169	169

Notes:
* p < 0.1, **p < .05, ***p < 0.01

6.1.2. Manipulation Checks

All participants were required to pass a comprehension quiz to ensure they read and correctly interpreted the instructions before the tournament began (see Appendix D). After finishing the tournament, participants were asked three manipulation check questions as part of the exit survey to ensure that participants remembered the key instructions for their experiment condition (see Appendix D). Participants in the conditions assigned a performance target were asked whether they were assigned a performance target and, if yes, was the target 285 or 420 clicks (target difficulty check). All participants were asked to identify whether the highest scoring participant for their session would receive a $30 prize (tournament prize check). Finally, participants in the Tournaments with a Paid Easy Target and Tournaments with a Paid Hard Target conditions had to correctly answer whether they were paid for achieving the performance target (target payment check).

Table 6.2. shows that 110 (80.3%) participants passed the target difficulty check, 164 (97.0%) passed the tournament prize check, and 66 (95.7%) passed the target payment check. I use a Chi-square test to confirm that the proportion of participants who did not pass the manipulation check questions is not systematically different between the tournament conditions.

Table 6.2. Manipulation Check Questions

Manipulation Check	Correct	Incorrect	Chi-Square Test Value	df	*p* - value (2-sided)
Target Difficulty [a]	110 (80.3%)	27 (19.7%)	2.000	3	.573
Tournament Prize [b]	164 (97.0%)	5 (3.0%)	.015	4	1.000
Target Payment [c]	66 (95.7%)	3 (4.3%)	.446	1	.504

Notes:
* p < 0.1, **p < .05, ***p < 0.01
[a] Target Difficulty manipulation check was asked to participants in the Tournaments with an Unpaid Easy Target, Tournaments with a Paid Easy Target, Tournaments with an Unpaid Hard Target, and Tournaments with a Paid Hard Target conditions.
[b] Tournament Prize manipulation check was asked to participants in every condition.
[c] Target Payment manipulation check was asked to participants in the Tournaments with a Paid Easy Target and Tournaments with a Paid Hard Target conditions.

6.1.3. Performance Target Difficulty

The Easy Target was set at a difficulty achieved by 80% of the Experiment 1 Pilot Study participants. The Hard Target was set at a difficulty achieved by 20% of the participants from the Experiment 1 Pilot Study (see Appendix B for a description of the Experiment 1 Pilot Study). The Easy Target was set at 285 clicks. In Experiment 1, 76.6% of participants averaged above the Easy Target, while 93.7% exceeded the Easy Target in at least one round. This indicates that the Easy Target is calibrated accurately against expectations.

Participants in the Tournaments with a Paid Hard Target and the Tournaments with an Unpaid Hard Target conditions were assigned a performance target of 420 clicks per round. Only 4.7% of participants averaged above the Hard Target in Experiment 1, while 11.9% exceeded the Hard Target in at least one round. This indicates that the top quintile of participants in the Experiment 1 Pilot study performed better than the top quintile of participants in Experiment 1. The Hard Target was more difficult than expected. While 28% of Experiment 1 participants were able to record a score within 10% (378 clicks) of the Hard Target score in one or more rounds, overall, the Hard Target was more challenging than intended.

6.1.4. Hypothesis Testing H1 to H3

In this section, I examine H1 to H3, described in Chapter 3, using *Effort* as the dependent variable. I measure *Effort* as the total clicks made by the participant relative to the number of clicks they made in the first round of the tournament. I define *Laggard*s as all participants who were not winning their tournament at the beginning of the final round.

Table 6.3. Panel A displays the descriptive statistics for *laggards' Effort* in each experimental condition, including mean and standard deviations and the number of participants. *Laggards* in the Tournaments with No Target condition exert the most *Effort* (M = 1.166, SD = .244), while *laggards* in the Tournaments with a Paid Hard Targets exert the least *Effor*t (M = 1.075, SD = .128). Table 6.3. Panel B reports the result of a one-way ANOVA that reveals a marginally significant difference in the *Effort* of *Laggards* F (4,126) = 2.195, p = .073. Table 6.3. Panel C displays the hypothesis tests for H1 to H3. I test each hypothesis using a planned contrast. H1 to H3 make directional predictions, and therefore I use one-tailed tests to determine significance.

Table 6.3. *Effort*

Panel A: Descriptive Statistics *Leaders Effort* and *Laggards Effort*

	Tournaments with Unpaid Targets		Tournaments with Paid Targets	
	Easy Target Mean (SD)	Hard Target Mean (SD)	Easy Target Mean (SD)	Hard Target Mean (SD)
Laggards' Effort	5.282 (.424) n = 28	5.284 (.372) n = 25	5.229 (.298) n = 25	5.222 (.392) n = 28

	Tournaments with No Targets	Tournaments with Targets	Tournaments with Unpaid Targets	Tournaments with Paid Targets
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Laggards' Effort	5.520 (.555) n = 25	5.245 (.372) n = 106	5.283 (.397) n = 53	5.225 (.347) n = 53

	Tournaments with Easy Targets	Tournaments with Hard Targets	All Tournaments
	Mean (SD)	Mean (SD)	Mean (SD)
Laggards' Effort	5.257 (.367) n = 53	5.252 (.380) n = 53	5.305 (.424) n = 131

Panel B: One-way ANOVA *Laggards' Effort* (DV) x Experiment Condition (IV)

Between Groups	Sum of Square	df	Mean Square	F	p-value
Within Groups	1.521	4	.380	2.195	.073*
Total	21.832	126	.173		
	23.353	130			

Panel C: Hypothesis Testing H to H4: Planned Contrasts *Effort*

	Contrast Codes	Value of Contrast	Std Error	t	df	p-value (one-sided)
H1 *Laggards*: Tournament Only *Effort* vs Tournament with Target *Effort*	1, 1, 1, 1, -4 [a]	-1.064	.370	-2.873	126	.003**
H2 *Laggards*: Tournaments with Easy Targets *Effort* vs Tournaments with Hard Targets *Effort*	1, 1, -1, -1, 0 [b]	.0045	.62	.030	126	.488

H3: *Laggards*: Tournaments with Unpaid Targets *Effort* vs Tournaments with Paid Targets *Effort*	1, -1, 1, -1, 0 [c]	.115	.144	.711	126	.214

Definition of Elements

Effort is defined as the Total Clicks divided by Round 1 Clicks

Laggards are participants who were not leading the tournament at the start of the final round of the tournament

Notes:

* p < 0.1, **p < .05, ***p < 0.01

[a] H1 Contrast Coding: Tournaments with an Unpaid Easy Target +1, Tournaments with a Paid Easy Target +1, Tournaments with an Unpaid Hard Target +1, Tournaments with a Paid Hard Target +1, Tournament with No Target -4

[b] H2 Contrast Coding: Tournaments with an Unpaid Easy Target +1, Tournaments with a Paid Easy Target +1, Tournaments with an Unpaid Hard Target -1, Tournaments with a Paid Hard Target -1, Tournament with No Target 0

[c] H3 Contrast Coding: Tournaments with an Unpaid Easy Target +1, Tournaments with a Paid Easy Target -1, Tournaments with an Unpaid Hard Target +1, Tournaments with a Paid Hard Target -1, Tournament with No Target 0

6.1.4.1. Test of H1

For H1, I examine the effect of assigned targets as a secondary goal on the *Effort* exerted by *laggards* in tournaments. Specifically, I predict that *laggards* in tournaments with assigned targets exert more *Effort* than *laggards* in tournaments not assigned a target.

H1: *Laggards* in tournaments with an assigned performance target exert more effort than *laggards* in tournaments without an assigned performance target.

The predicted and observed pattern for *Effort* for *laggards* in tournaments with assigned performance targets compared to *laggards* in tournaments without assigned performance targets is depicted in Figure 6.1.

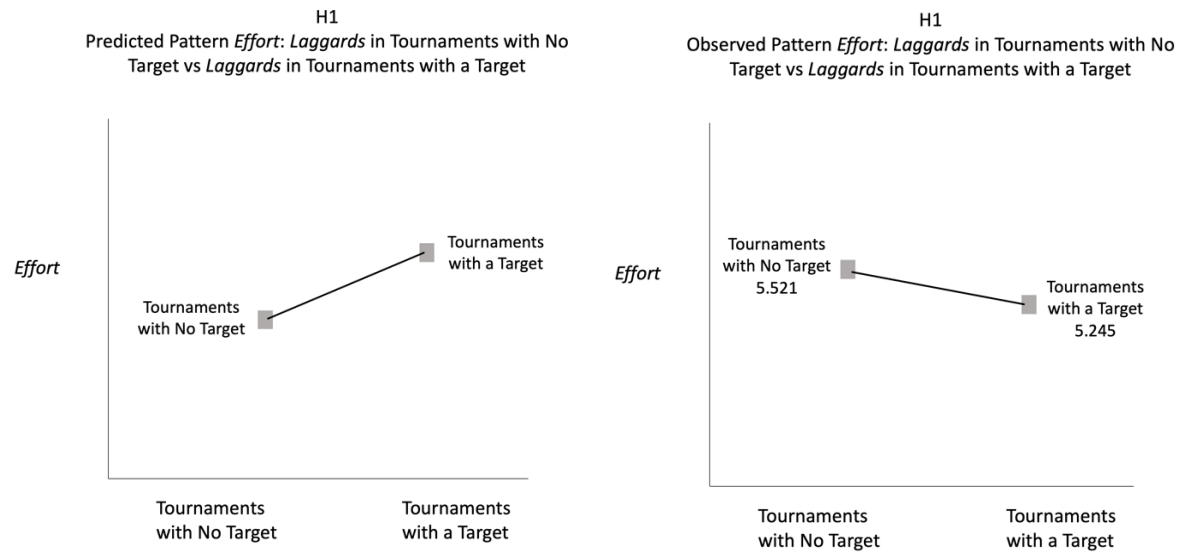


Figure 6.1. H1 Predicted and Observed Patterns

I test H1 using a planned contrast to evaluate the difference in *Effort* between *laggards* assigned to a tournament with a target and those assigned to a tournament without a target. As shown in Table 6.3. Panel C (page 123) the *Effort* exerted by *laggards* assigned to a tournament with a performance target (M = 5.245, SD = .372) is significantly lower than *laggards* assigned to a tournament without a target (M = 5.520, SD = .555, t = -2.873, df = 126, p = .003, one-tailed). Contrary to my prediction, *laggards* in tournaments with assigned performance targets exert less *Effort* than *laggards* assigned a target. The association is the inverse of my prediction. Therefore, H1 is not supported.

6.1.4.2. Test of H2

In H2, I examine whether the difficulty of a performance target assigned to *laggards* affects the *Effort* they exert in a tournament. Specifically, whether *laggards* in tournaments assigned an easy performance target exert more *Effort* than *laggards* assigned a hard performance target.

H2: *Laggards* in tournaments with an assigned easy performance target exert more effort than *laggards* in tournaments with an assigned hard performance target.

The predicted and observed pattern for *Effort* for *laggards* in tournaments with assigned an easy compared to a hard target is depicted in Figure 6.2.

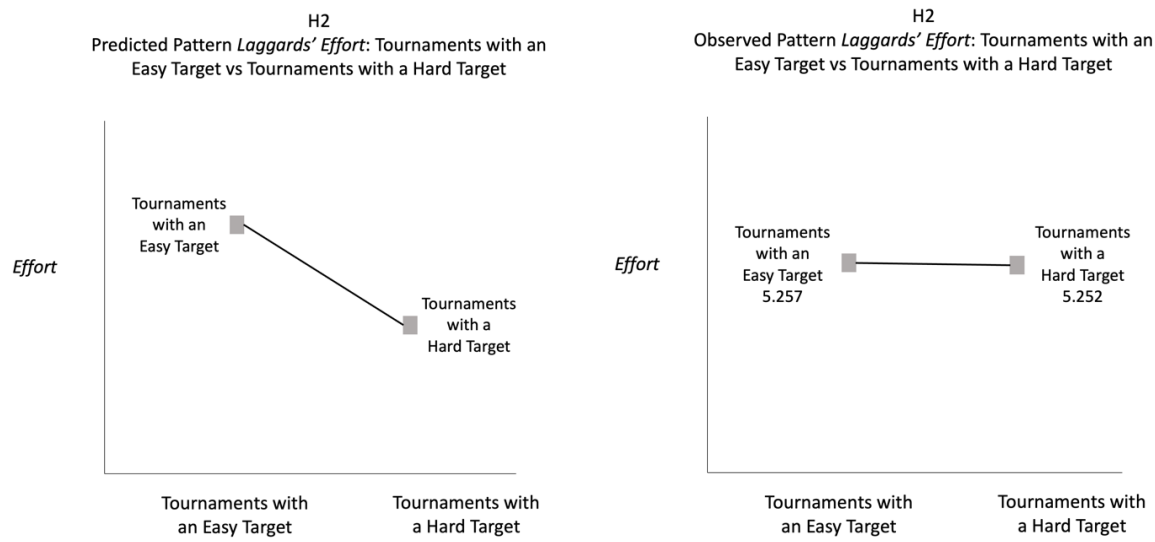


Figure 6.2. H2 Predicted and Observed Patterns

I test H2 using a planned contrast to evaluate the difference in *Effort* between *laggards* assigned to a tournament with an easy target and those assigned to a tournament with a hard target. As shown in Table 6.3. Panel C (page 123) the *Effort* exerted by *laggards* assigned an Easy Target (M = 5.257, SD = .367) is not significantly different to the *Effort* exerted by *laggards* assigned a Hard Target (M = 5.252, SD = .380, t = .030, df = 126, p = .488, one-tailed). The difficulty of the assigned target does not impact the *Effort* exerted by *laggards*. Therefore, H2 is not supported.

6.1.4.3. Test of H3

In H3, I examine whether attaching a reward for achieving a performance target affects the *Effort* exerted by *laggards* in a tournament.

> **H3:** *Laggards* in tournaments with an assigned paid performance target exert more effort than *laggards* in tournaments with an assigned unpaid performance target.

The predicted and observed pattern for *Effort* for *laggards* in tournaments with assigned an unpaid target compared to a paid target is depicted in Figure 6.3.

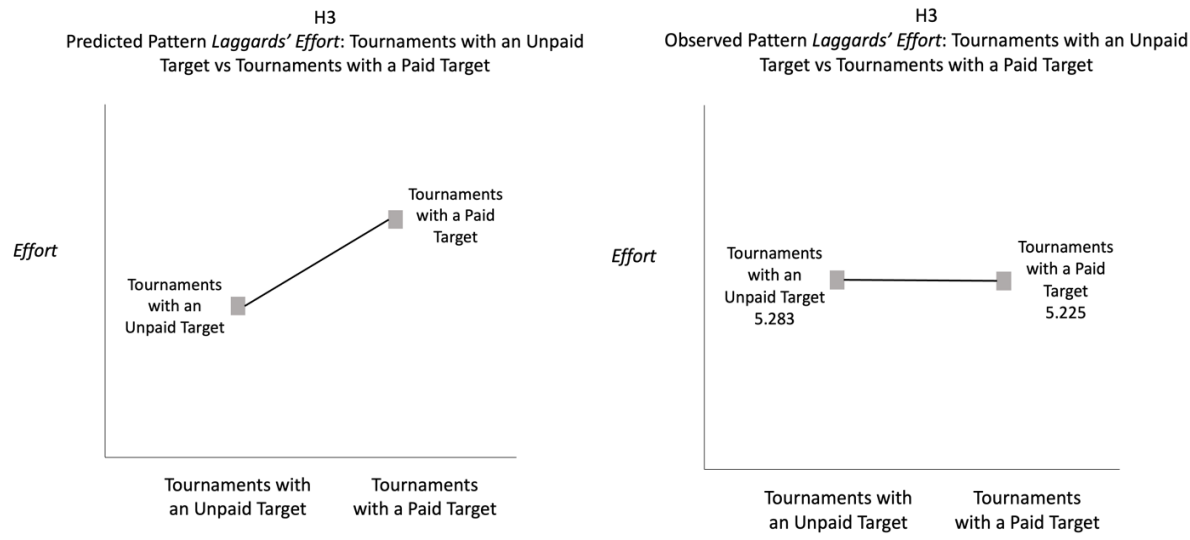


Figure 6.3. H3 Predicted and Observed Patterns

H3 is tested using a planned contrast to evaluate the difference in *Effort* between *laggards* assigned to a tournament with a paid target and those assigned to a tournament with an unpaid target. As shown in Table 6.3. Panel C (page 123) the *Effort* exerted by *laggards* assigned an unpaid target (M = 5.283, SD = .397) is not significantly different to the *Effort* exerted by *laggards* assigned a paid target (M = 5.225, SD = .347, t = .711, df = 126, p = .214, one-tailed). Whether or not a financial incentive is attached to the performance target does not affect the *Effort* exerted by *laggards* in the tournaments. Therefore, H3 is not supported.

6.1.4.4. Summary of Findings H1 to H3

From the results of testing H1 to H3, I find no evidence that performance targets elicited more *Effort* from *laggards* in the tournaments examined. The testing for H1 reveals that in tournaments in which performance targets are assigned, *laggards* exert less *Effort* than *laggards* in tournaments without an assigned target. This result is contrary to my prediction

in Chapter 3. Rather than encouraging *laggards* to exert more *Effort* the provision of a performance target undermines their motivation. In the next section, I present additional analysis focused on *laggards'* self-evaluated *Perceived Effort*.

6.1.5. Additional Analysis: H1 to H3: *Perceived Effort*

6.1.5.1. Introduction

This section presents additional analysis that concentrates on *laggards'* self-evaluated *Perceived Effort*. As part of this analysis, I examine H1 to H3 using *Perceived Effort* as the dependent variable. I designed the finger-tapping task used for Experiment 1 to provide an accurate proxy for the effort exerted based on variations in participants' output. *Effort* is a proxy for real effort based on participants' output (the number of clicks made) and assumes a linear relationship between performance and effort.

To understand the effect of targets in tournaments upon effort from the participants' perspective, I examine participants' self-reported *Perceived Effort*. *Perceived Effort* may capture factors that affect the effort participants felt they put into the task that did not necessarily translate into performance. A participant may strive to exert effort to improve their performance by a small margin. *Effort*, as a proxy based on output, may register a small improvement in performance as a modest increase in effort. From the participant's perspective, the small performance improvement resulted from a large increase in effort. Hence, while *Effort* might only show a small increase, the participant's *Perceived Effort* may be much greater. *Perceived Effort* also captures other factors such as fatigue that may cause participants to feel they exerted a high amount of effort, but that did necessarily translate into improved performance.

6.1.5.2. Variables

Perceived Effort is measured via the Experiment 1 exit survey by asking participants to what extent they agreed with the statement 'I worked hard on the task' on a scale anchored from strongly disagree (1) to strongly agree (7). *Perceived Effort* captures participants' subjective evaluation of their effort.

6.1.5.3. *Perceived Effort*

Table 6.4. Panel A displays the descriptive statistics related to the *Perceived Effort* of *laggards* in each experimental condition, including mean and standard deviations and the number of participants. Table 6.4. Panel B reports the result of a one-way ANOVA that reveals a significant difference in *Perceived Effort* of *Laggards* F (4,126) = 3.968, p = .005. Table 14 Panel C displays H1 to H3 using *Perceived Effort* as the dependent variable.

When I tested H1, contrary to my prediction, *laggards* in tournaments with no targets exerted more *Effort* than those in tournaments with targets. As reported in Table 6.4. Panel C, when I test H1 using *Perceived Effort* as the dependent variable, I find *laggards* in tournaments with an assigned target self-report exerting more effort (*Perceived Effort* M = 6.198, SD = .960) than *laggards* in tournaments without an assigned target (*Perceived Effort* M = 5.800, SD = 1.291, t = 1.720, df = 126, p = .044, one-tailed). *Laggards* in tournaments with an assigned performance target exert less *Effort*, but their *Perceived Effort* is higher than the *Perceived Effort* of *laggards* in a tournament without an assigned target.

Table 6.4. *Laggards' Perceived Effort*

Panel A: Descriptive Statistics *Laggards' Perceived Effort*

	Tournaments with Unpaid Targets		Tournaments with Paid Targets	
	Easy Target	Hard Target	Easy Target	Hard Target
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Laggards' Perceived Effort	6.643 (.621) 28	5.960 (.935) 25	5.760 (1.200) 25	6.357 (.826) 28

	Tournaments with No Targets	Tournaments with Targets	Tournaments with Unpaid Targets	Tournaments with Paid Targets
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Laggards' Perceived Effort	5.800 (1.291) 25	6.198 (.960) 106	6.321 (.850) 53	6.076 (1.503) 53

	Tournaments with Easy Targets	Tournaments with Hard Targets	All Tournaments
	Mean (SD)	Mean (SD)	Mean (SD)
Laggards' Perceived Effort	6.226 (1.031) 53	6.170 (.893) 53	6.122 (1.038) 131

Panel B: One-way ANOVA *Laggards' Perceived Effort* (DV) x Experiment Condition (IV)

	Sum of Square	df	Mean Square	F	p-value
Between Groups	15.669	4	3.917	3.968	.005***
Within Groups	124.377	126	.987		
Total	140.046	130			

Panel C: Additional Analysis H1 to H4: Planned Contrasts *Perceived Effort*

	Contrast Codes	Value of Contrast	Std Error	t	df	p-value (one-sided)
H1 *Laggards*: Tournament Only *Perceived Effort* vs Tournament with Target *Perceived Effort*	1, 1, 1, 1, -4 [a]	1.520	.884	1.720	126	.044**
H2 *Laggards*: Tournaments with Easy Targets *Perceived Effort* vs Tournaments with Hard Targets *Perceived Effort*	1, 1, -1, -1, 0 [b]	.086	.387	.222	126	.412

H3: *Laggards*: Tournaments with Unpaid Targets *Perceived Effort* vs Tournaments with Paid Targets *Perceived Effort*	1, -1, 1, -1, 0 [c]	.486	.387	1.256	126	.106

Definition of Elements

Laggards are participants who were not leading the tournament at the start of the final round of the tournament

Perceived Effort is measured via the exit survey by asking participants to what extent they agreed with the statement 'I worked hard on the task' on a scale anchored to strongly disagree (1) to strongly agree (7).

Notes:

* p < 0.1, **p < .05, ***p < 0.01

[a] H1 Contrast Coding: Tournaments with an Unpaid Easy Target +1, Tournaments with a Paid Easy Target +1, Tournaments with an Unpaid Hard Target +1, Tournaments with a Paid Hard Target +1, Tournament with No Target -4

[b] H2 Contrast Coding: Tournaments with an Unpaid Easy Target +1, Tournaments with a Paid Easy Target +1, Tournaments with an Unpaid Hard Target -1, Tournaments with a Paid Hard Target -1, Tournament with No Target 0

[c] H3 Contrast Coding: Tournaments with an Unpaid Easy Target +1, Tournaments with a Paid Easy Target -1, Tournaments with an Unpaid Hard Target +1, Tournaments with a Paid Hard Target -1, Tournament with No Target 0

The difficulty of the performance target makes no difference to *laggards'* perceptions of their effort. There is no difference reported in the *Perceived Effort* of *laggards* assigned an Easy Target (M = 6.226, SD = 1.031) and those assigned a Hard Target (M = 6.170, SD = .893, t = .242, df = 102, p = .405, one-tailed).

Finally, *laggards* in tournaments not paid for achieving a target self-report to have worked marginally harder than those paid for achieving the target. *Perceived Effort* of *laggards* in Tournaments with an Unpaid Target (M = 6.321, SD =.850) was marginally higher than the *Perceived Effort* of *laggards* in Tournaments with a Paid Target (M = 6.076, SD = 1.503, t = 1.372, df = 102, p = .087, one-tailed).

6.1.6. Experiment 1 Conclusion

In this section, I presented the results from Experiment 1 that test hypotheses H1 to H3. The results show that *laggards* in a tournament with performance targets exert less effort

than *laggards* not assigned targets. This result is the inverse of my prediction for H1 in Chapter 3. I find no difference in the *Effort* exerted by *laggards* in tournaments that vary target difficulty and whether or not targets are incentivised.

Additional analysis reveals that while the *Effort* of *laggards* in tournaments with targets is lower, the same *laggards' Perceived Effort* is higher than *laggards* in tournaments without a target. In the next section, I present the results from Experiment 2, which tests hypotheses H4 to H7.

6.2. Experiment 2: Retention in Tournaments

6.2.1. Introduction

In this section, I present the descriptive statistics for Experiment 2, followed by hypotheses tests for H4 to H7. Next, I describe additional analyses that examine the effect of targets, target difficulty and the informedness of a tournament on the persistence and performance of participants in each experimental condition. I then examine the themes that emerge from the participants' qualitative explanations for why they quit (or did not quit) working on the tournament incentivised task. I conclude this section with an analysis of participants' electrodermal activity to examine the stress level of participants prior to quitting the tournament incentivised task.

6.2.2. Descriptive Statistics

One hundred fifty-four students participated in 32 sessions. The performance target set for tournaments with Easy (Hard) Targets was designed so that approximately 75% (25%) of participants could achieve the target. 108 (74.2%) participants in the sample who completed at least one round averaged above the Easy Target, while 35 (23.4%) of participants averaged above the Hard Target. This indicates the difficulty of both targets was accurately calibrated.

Most participants in the sample are right-handed (94%), on average, lived in Australia for 6.4 years and have 9.7 months of work experience. I conduct a one-way ANOVA to explore whether there is a significant difference in the exit survey variables and demographics of the populations assigned to the experimental conditions. None of the exit survey variables[17] differ significantly between the tournament conditions ($p > 0.05$, 2-sided). This result indicates no systematic differences in the participant groups assigned to the various tournament conditions. Hence, random assignment to experimental conditions was effective.

Table 6.5. Panel A displays the descriptive statistics for retention. Retention is the proportion of participants that did not quit working on the tournament incentivised task. The number and percentage of participants retained by each tournament are presented for Tournaments with a Target (No Target), and the level of informedness (Low Informedness Tournaments and High Informedness Tournaments) are presented. Retention is lower when participants are assigned to Tournaments with a Target (65% retained) compared to those assigned to Tournaments with No Target (70.4% retained). Retention is also lower in High Informedness Tournaments (63.6% retained) compared to Low Informedness Tournaments (70.1% retained).

[17] Self-rated decoding performance was marginally significant $F(5, 45) = 2.332$, $p = 0.058$, 2-tailed. This item is not relevant to the decision by participants to quit working on the tournament incentivised task because only participants who quit (n =51) were asked to rate decoding performance. This item, therefore, does not affect the hypothesis testing. Participants who did not quit (n=103) did not work on the decoding task during the main experiment and were therefore not asked to rate their performance on the decoding task.

Table 6.5. Tournament Retention - Performance Target, Target Difficulty and Informedness

Panel A: Descriptive Statistics

	Performance Targets [a]		
	No Target	**Target**	**Total**
Quit n (%)	16	35	51
	(29.6%	(35.0%)	(33.1%)
Retained n (%)	38	65	103
	(70.4%)	(65.0%)	(66.9%)
Total n (%)	54	100	154
	(100.0%)	(100.0%)	(100%)

	Informedness [b]	
	Low Informedness	**High Informedness**
Quit n (%)	23	28
	(29.9%)	(36.4%)
Retained n (%)	54	49
	(70.1%)	(63.6%)
Total n (%)	77	77
	(100.0%)	(100.0%)

	Performance Targets [a] **Low Informedness Only** [b]		**Performance Targets** [a] **High Informedness Only** [b]	
	No Target	**Targets**	**No Target**	**Targets**
Quit n (%)	11	12	5	23
	(37.9%)	(25.0%)	(20.0%)	(44.2%)
Retained n (%)	18	36	20	29
	(62.1%)	(75.0%)	(80.0%)	(55.8%)
Total n (%)	29	48	25	52
	(100.0%)	(100.0%)	(100.0%)	(100.0%)

Panel B: Hypotheses Tests

	Wald-χ^2	**df.**	**p-value (one-tailed)**
H4 Tournament with a Target versus Tournament with No Target	.512	1	.241
H5 High Informedness Tournament versus Low Informedness Tournament	.464	1	>.500
H6 High Informedness Tournament with a Target & Low Informedness Tournament with No Target versus Low Informedness with a Target & High Informedness Tournament with No Target	5.415	1	.010**

Notes:

* p < 0.1, **p < .05, ***p < 0.01,

[a] Participants in the Tournaments with No Target conditions are not assigned a performance target. Participants in the Tournaments with a Target conditions are assigned either an Easy Target (512 clicks per round) or a Hard Target (630 clicks per round).

[b] RPI displayed to participants in Low Informedness Tournaments does not include performance data for participants who quit. The RPI displayed to participants in High Informedness Tournaments includes performance data for participants who quit. Participants who quit receive a score of zero for each round after they quit.

6.2.3. Hypothesis Testing

6.2.3.1. Test of H4

In H4, I examine the effect of performance targets on the retention of workers in tournaments.

H4: In tournaments with an assigned target (without an assigned target) retention will be higher (lower).

The predicted and observed pattern for the retention of participants in tournaments with an assigned target compared to those in tournaments without an assigned target is depicted in Figure 6.4.

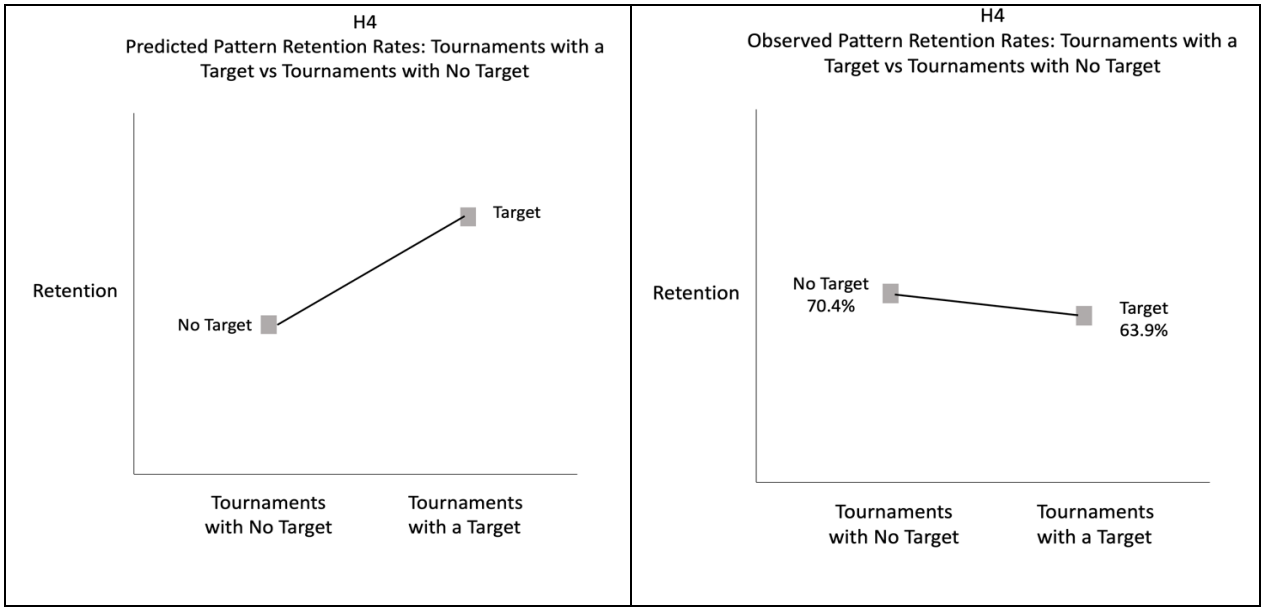


Figure 6.4. Predicted and Observed Pattern: H4

I present the result for H4 in Table 6.5. Panel B (page 134). I test H4 using a Wald-$\chi 2$ test (Brecht, Woodward, & Bonett, 1984). The difference in retention between Tournaments with a Target (63.9%) and Tournaments without a Target (70.4%, Wald-$\chi 2$ = .512, p = .241, one-tailed) is not significant. There is no evidence that tournaments with a target have higher retention rates than tournaments without a target. Therefore, H4 is not supported.

6.2.3.2. Test of H5

In H5, I examine whether the availability of performance information related to participants who had quit the tournament affects the retention of participants who remain in the tournament. Specifically, I predict that in tournaments where workers have access to performance information about workers who quit (High Informedness Tournaments), retention is lower than in tournaments where this information is not available (Low Informedness Tournaments).

H5: In tournaments where workers are informed (not informed) of the performance of workers who have quit, retention will be lower (higher).

The predicted and observed pattern for the retention of participants in tournaments with low informedness compared to those with high informedness is depicted in Figure 6.5. I present the result for H5 in Table 6.5. Panel B (page 134). I test H5 using a Wald-$\chi 2$ test. The difference in retention between Low Informedness Tournaments (70.1%) and High Informedness Tournaments (63.9%, Wald-$\chi 2$ = .461, p > .500) is not significant. I find no evidence that low informedness tournaments have higher retention rates than high informedness tournaments. Therefore, H5 is not supported.

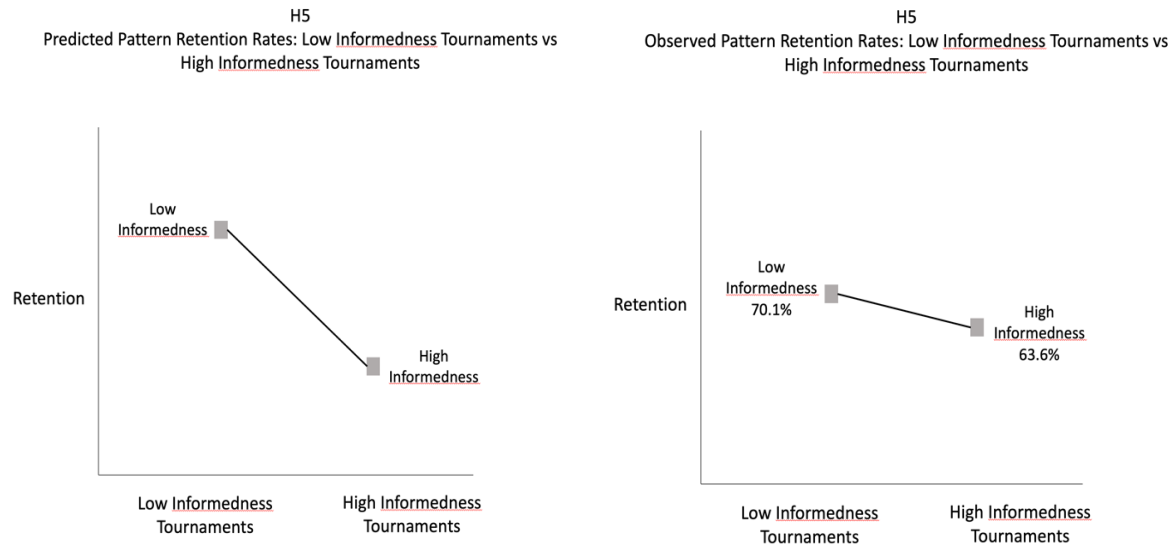


Figure 6.5. Predicted and Observed Pattern: H5

6.2.3.3. Test of H6

For H6, I examine whether informedness and performance targets interact to affect the retention rates of workers in tournaments. In Chapter 3, I predict that informedness alters workers' perceptions of the difficulty of performance targets. Specifically, I predict that performance targets result in higher retention when used in low informedness tournaments than in high informedness tournaments.

H6: In tournaments, the retention resulting from the provision of a target, compared to no target, will be smaller (greater) when the workers are (not) informed of the performance of the workers who have quit.

The predicted and observed pattern for the interaction between targets and informedness on retention of participants in tournaments is depicted in Figure 6.6.

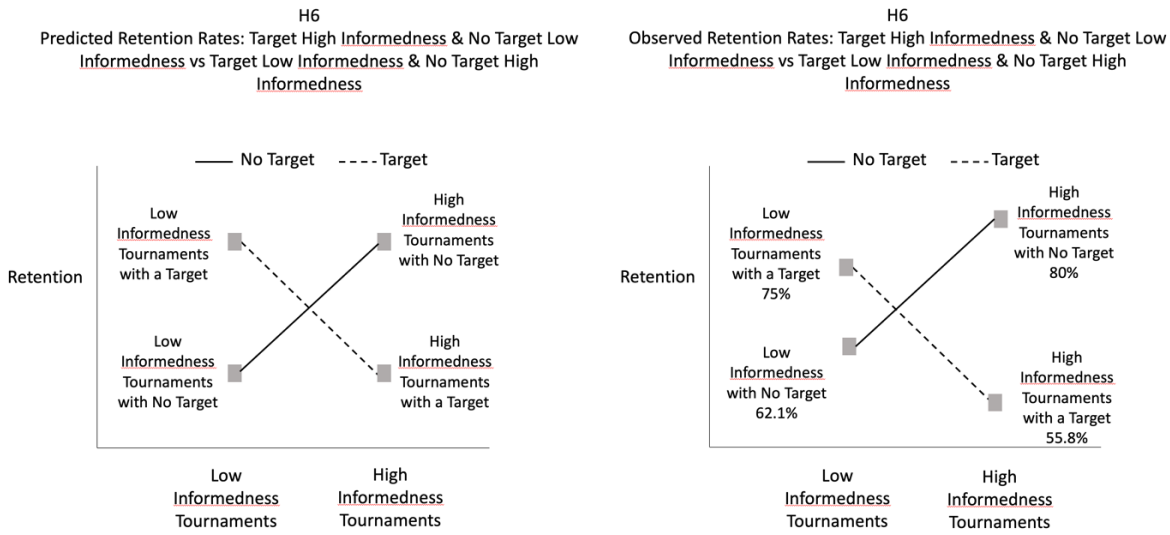


Figure 6.6. Predicted and Observed Pattern: H6

I present the result for H6 in Table 6.5. Panel B (page 134). I test H6 using a Wald-$\chi 2$ test. High Informedness Tournaments retention is higher when no target is assigned (80.0%) and lower when a target is assigned (55.8%). Conversely, retention is higher in Low Informedness Tournaments when a target is assigned (75.0%) than when no target is present (62.1%). Consistent with H6 the difference is significant (Wald-$\chi 2 = 5.415$, $p = .010$, one-tailed). The effect of performance targets on the retention of workers is contingent upon the informedness of the tournament. Therefore, H6 is supported.

6.2.3.4. Test of H7

For H7, I examine whether informedness and the difficulty of performance targets interact to affect retention. Specifically, I predict that hard performance targets improve retention when used in low informedness tournaments but not in high informedness tournaments.

H7: In tournaments, the retention resulting from the provision of a hard target, compared to an easy target, will be smaller (greater) when the workers are (not) informed of the performance of the workers who have quit.

The predicted and observed pattern for the interaction between target difficulty and informedness on retention of participants in tournaments is depicted in 6.7.

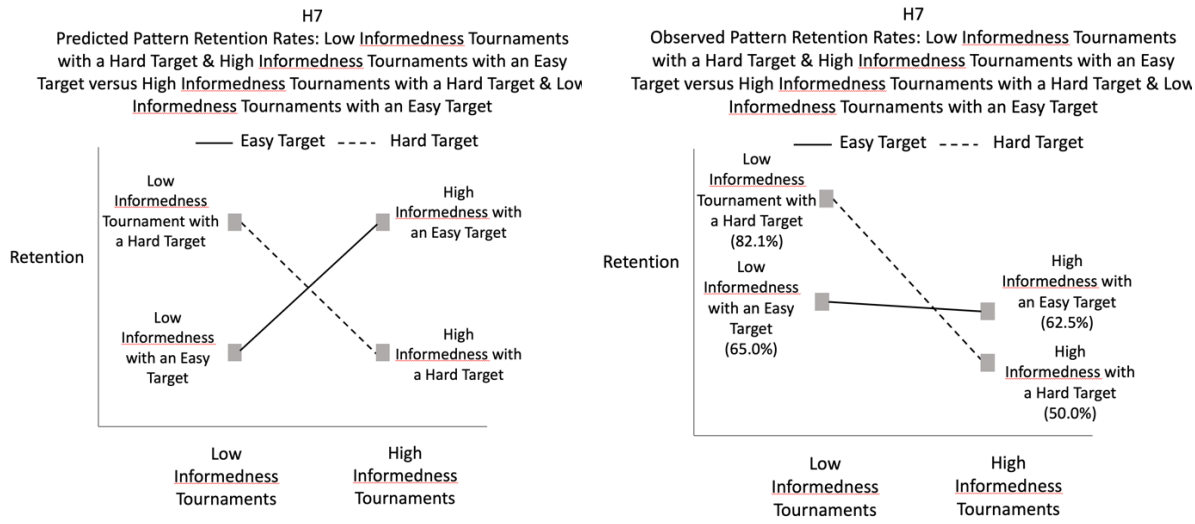


Figure 6.7. Predicted and Observed Pattern: H7

I present the descriptive statistics for Low and High Informedness Tournaments with either an Easy Target or Hard Target in Table 6.6. Panel A (page 140). In Low Informedness Tournaments, retention is greater when a Hard Target (82.1%) is assigned than when an Easy Target is used (65.0%). In High Informedness Tournaments, the opposite relationship is observed. Retention is higher when an Easy Target (62.5%) is used than a Hard Target (50.0%).

Table 6.6. Tournament Retention – All Tournament Conditions

Panel A: Descriptive Statistics

	Performance Target [a]		
	Low Informedness [b]		
	No Target	**Easy Target**	**Hard Target**
Quit n (%)	11	7	5
	(37.9%)	(35.0%)	(17.9%)
Retained n (%)	18	13	23
	(62.1%)	(65.0%)	(82.1%)
Total n (%)	29	20	28
	(100.0%)	(100.0%)	(100.0%)
	Performance Target [a]		
	High Informedness [b]		
	No Target	**Easy Target**	**Hard Target**
Quit (%)	5	9	14
	(20.0%)	(37.5%)	(50.0%)
Retained (%)	20	15	14
	(80.0%)	(62.5%)	(50.0%)
Total (%)	25	24	28
	(100.0%)	(100.0%)	(100.0%)

Panel B: Hypotheses Tests

	Wald-χ^2	**df.**	**p-value (one-tail)**
H7 High Informedness Tournament with an Easy Target & Low Informedness Tournament with a Hard Target versus Low Informedness with an Easy Target & High Informedness with a Hard Target	2.564	1	.053*

Notes:

* p < 0.1, **p < .05, ***p < 0.01,

[a] Participants in the Tournaments with No Target conditions are not assigned a performance target. Participants in the Tournaments with a Target conditions are assigned either an *Easy Target* (512 clicks per round) or a *Hard Target* (630 clicks per round).

[b] RPI displayed to participants in the Low Informedness Tournament conditions did not include performance data for participants who quit. The RPI displayed to participants in the High Informedness Tournament conditions includes performance data for participants who quit. Participants who quit receive a score of zero for each round after they quit.

I display the result for H7 in Table 6.6. Panel B. Using a Wald-χ2 test the interaction between target difficulty and informedness is marginally significant (Wald-χ2 = 2.564, *p* =

.053, one-tailed). I find that, in line with the prediction made in Chapter 3, the effect of target difficulty on the retention of workers in tournaments is contingent on the informedness of a tournament. Therefore, H7 has marginal support.

6.2.4. Additional Analyses

In this section, I examine the effects of performance targets, target difficulty and the informedness of tournaments on the persistence and performance of the participants in Experiment 2. I also report the themes that emerged from an open-ended question that asked participants why they either continued or stopped working on the tournament incentivised task. Finally, I examine the stress of participants who quit during Experiment 2. Using electrodermal activity (EDA), I examine whether participants were more stressed in the last trial they worked on the task and when the last RPI was displayed compared to earlier in the tournament.

6.2.4.1. Variables

Persistence is measured as the number of trials completed by each participant. Examination of *Persistence* provides insights into how long participants remain in the tournament before quitting.

Performance is measured as the mean clicks per trial for each participant. Analysing *Performance* provides insights into whether quitting is restricted to only low performing participants.

6.2.4.2. *Persistence*

I display the descriptive statistics for *Persistence* in Table 6.7. Panel A. In High Informedness Tournaments, *Persistence* is greatest when no target is assigned (M = 21.92 trials completed, SD = 4.86) and least when a Hard Target is assigned (M = 15.64 trials completed, SD = 8.90). However, I find the inverse pattern when participants are assigned to

Low Informedness Tournaments. In Low Informedness Tournaments, *Persistence* is highest in Tournaments with a Hard Target (M = 21.61 trials completed, SD = 5.92) and lowest in Tournaments with No Target (M = 17.62 trials completed, SD = 8.63). Table 6.7. Panel B reports the result of a one-way ANOVA that reveals a significant difference in *Persistence* amongst participants F (5,148) = 2.792, p = .019. Planned contrasts, reported in Table 6.7. Panel C, examine H4 to H7 using *Persistence* as the dependent variable.

Consistent with the results for H4 and H5 reported in the previous section I do not find a significant effects for Targets (t = 1.078, p - .142, one-tailed), nor for Informedness (t = .876, p = .191, one-tailed). Neither targets nor informedness by themselves affects how many trials participants completed.

When I examine H6 and H7 using *Persistence* as the dependent variable, the same pattern found for H6 and H7 reported in the previous section is found. The interaction between targets and informedness (t = 3.148, p = .001, one-tailed) for *Persistence* is significant. The interaction effect of target difficulty and informedness for *Persistence* is marginally significant (t = 1.376, p = .086, one-tailed). Hence, these results show that performance targets interact with informedness to affect the proportion of participants who quit (retention) and the number of trials they complete (persistence).

Table 6.7. ***Persistence***

Panel A: Descriptive Statistics – Mean (Standard Deviation)

	Performance Target [a]		
	High Informedness [b]		
	No Target	**Easy Target**	**Hard Target**
Trials Completed	21.92	17.25	15.64
	(4.86)	(9.41)	(8.90)
	Performance Target [a]		
	Low Informedness [b]		
	No Target	**Easy Target**	**Hard Target**
Trials Completed	17.62	18.90	21.61
	(8.63)	(7.77)	(5.92)

Panel B: One-way ANOVA *Persistence* (DV) x Experiment Condition (IV)

	Sum of Square	**df**	**Mean Square**	**F**	**p-value**
Between Groups	841.276	5	168.255	2.792	.019**
Within Groups	8920.075	148	60.271		
Total	9761.351	153			

Panel C: Re-examined Hypothesis Tests (Planned Contrasts) n = 154

Source	**Df**	**Contrast Value**	**t**	**p-value (one-tailed)**
H4 Target versus No Target	148	5.6814	1.078	.142
H5 High Informedness versus Low Informedness	148	3.3150	.876	.191
H6 High Informedness & No Target Low Informedness versus Target Low Informedness & No Target High Informedness	148	11.9136	3.148	.001**
H7 Easy Target High Informedness & Hard Target Low Informedness versus Easy Target Low Informedness & Hard Target High Informedness	148	4.3143	1.376	.086*

Notes:

* p < 0.1, **p < .05, ***p < 0.01

[a] Participants in the Tournaments with No Target conditions are not assigned a performance target. Participants in the Tournament with a Target conditions are assigned either an Easy Target (512 clicks per round) or a Hard Target (630 clicks per round).

[b] RPI displayed to participants in the Low Informedness Tournament conditions did not include performance data for participants who quit. The RPI displayed to participants in the High Informedness Tournament conditions includes performance data for participants who quit. Participants who quit receive a score of zero for each round after they quit.

6.2.4.3. *Performance*

Performance is measured as the mean clicks per trial for each participant. As reported in Table 6.8. Panel A, the *Performance* is highest in Low Informedness Tournaments with a Hard Target (M = 196.00, SD = 36.81) and lowest in High Informedness Tournaments with an Easy Target (M = 162.24, SD = 61.29). Table 6.8. Panel B reports the result of a one-way ANOVA that reveals a marginally significant difference in *Performance* F (5,148) = 1.972, p = .086.

As reported in Table 6.8. Panel C, when I examine H4 to H7 using *Performance* as the dependent variable, only H6 has a significant result. The interaction between informedness and targets is significant (t = .2.228, p = .014, one-tailed). This result shows that targets improve *Performance* in Low Informedness Tournaments but hinder performance in High Informedness Tournaments. High Informedness Tournaments with Targets have the highest *Performance* but the lowest retention rate. The superior performance of participants in the High Informedness Tournaments with Targets may be attributable to low ranked participants quitting, leaving only higher performing participants retained in the tournaments.

Table 6.8. Performance

Panel A: Descriptive Statistics – Mean (Standard Deviation)

	Performance Target [a]		
	High Informedness [b]		
	No Target	**Easy Target**	**Hard Target**
Clicks per Trial	187.42	162.24	172.36
	(40.03)	(61.29)	(37.96)
	Performance Target [a]		
	Low Informedness [b]		
	No Target	**Easy Target**	**Hard Target**
Clicks per Trial	171.88	171.87	196.00
	(55.84)	(24.37)	(36.81)

Panel B: One-way ANOVA *Persistence* (DV) x Experiment Condition (IV)

	Sum of Square	df	Mean Square	F	p-value
Between Groups	199.09.179	5	3981.836	1.972	.086
Within Groups	298910.410	148	2019.665		
Total	318819.589	153			

Panel C: Re-examined Hypothesis Tests (Planned Contrasts) n = 154

Source	**df**	**Contrast Value**	**t**	**p-value (one-tailed)**
H4 Tournament with a Target versus Tournament with No Target	148	16.120	.528	.299
H5 High Informedness Tournament versus Low Informedness Tournament	148	17.735	.810	.210
H6 High Informedness Tournament with a Target & Low Informedness Tournament with No Target versus Low Informedness with a Target & High Informedness Tournament with No Target	148	48.800	2.228	.014**
H7 High Informedness Tournaments with an Easy Target & Low Informedness Tournaments with a Hard Target versus Low Informedness Tournaments with an Easy Target & High Informedness Tournaments with a Hard Target	148	13.998	.771	.221

Notes:

* p < 0.1, **p < .05, ***p < 0.01

[a] Participants in the Tournaments with No Target conditions were not assigned a performance target. Participants in the Tournaments with an Easy Target conditions were assigned a target of at least 512 clicks per round. Participants in the Tournaments with a Hard Target conditions were assigned a target of at least 630 clicks per round.

[b] The RPI displayed to participants in the Low Informedness Tournament conditions did not include performance data for participants who quit. The RPI displayed to participants in the High Informedness Tournament conditions included performance data for participants who quit. Participants who quit received a score of zero for each round after they quit.

6.2.4.4. Quitting Explanations Textual Analysis

The exit survey included an open-ended question related to participants' decision to quit or not to quit the tournament. The open-ended question asked each participant to self-report why they either stopped or did not stop working on the task until the end of the tournament.

The participants who quit were asked the following question:

You decided to stop working on the main task. Can you explain in a few sentences why you decided to stop?

The participants who did not quit were asked the following question:

You decided not to stop working on the main task. Can you explain in a few sentences why you decided not to stop?

The complete set of qualitative explanations is reproduced in Appendix E. Participants' qualitative responses are analysed using the Computer Assisted Qualitative Data

Analysis (CAQDAS)[18] software NVivo. Inductive coding is applied during the coding process (Gibbs, 2007; Richards & Morse, 2012). Inductive coding is applied whereby codes are determined by reviewing the responses from participants rather than pre-determining codes or themes.

Table 6.9. shows that the most commonly cited reason for stopping work on the tournament task is a perceived low chance of winning the tournament (n = 39), followed by cutting further losses (keeping remaining endowment) (n = 14). A lack of ability (n = 10) is the third most commonly cited reason. Six participants referenced not being able to achieve the performance target as their reason for quitting, while two participants specifically referenced stress as a reason for quitting.

Table 6.9. Textual Analysis of Reasons for Quitting

Theme	Frequency	Sample Quote
Low Chance of Winning	39	*One participant has an extremely high score, so there is little chance of getting a higher score than him.*
Cut Further Loss	14	*I was not on the top of the ladder and it was a big difference. I could go ahead and give it a try, but I chose the alternative to secure as much money as I could.*
Low Ability	10	*I know for sure I will not be able to win with my ability compared to the group*
Tired	8	*tired*
Did not Meet Performance Target	6	*I cannot meet the target performance 630 in 1 round*
I tested myself for one round. Then Decided to Quit	4	*Before the beginning, I decided to try one round and decide. for the first round, I tried my best but I noticed that I am ranking 4th, the guy who rank first has clicked over 600. also, I did not meet the basic requirement. After thinking, I believe I have no chance to win $20, so I decided to keep the $4 that I have left.*
Stress	2	*clicking made me feel nervous*

[18] CAQDAS software aims to aid qualitative research data analysis such as transcription analysis, coding and text interpretation.

Have Tried My Best	1	*Before the beginning, I decided to try one round and decide. for the first round, I tried my best but I notice that I am ranking 4th, the guy who rank first has clicked over 600. also, I did not meet the basic requirement. After thinking, I believe I have no chance to win $20, so I decided to keep the $4 that I have.*
Bored	1	*From the moment I started clicking on the mouse, I heard other participants clicking on the mouse. I presumed that their clicking skills are strong. That is why, I stopped. Besides that, I had no hope of winning when I saw the first round scores. Not only that, I was also tired and bored of clicking.*
No Chance of Cheating	1	*I decided to stop the task in the first round as from practice I knew I could not win fairly so I might as well maximise my profit. I also was unsure if I could cheat, otherwise I would have stayed in the competition.*
Dislike Uncertainty	1	*Because working on uncertainty is not my style*
Hand Cramp	1	*My hands were starting to get cramped and the competition seemed too tough*
Tried Catch Up	1	*I thought I fell behind too early at the start. However, I tried to catch up but I felt the difference between me and those in the second and first positions was too large, therefore I decided to keep my remaining money.*
Just Wanted to Stop	1	*I just want to stop it.*

Table 6.10. displays the reasons participants provided for not stopping work on the tournament incentivised task. The most frequently cited reasons are as follows: a perceived good chance of winning (n = 20), intrinsic interest in the task or tournament (n = 20), with a desire to finish the session as the third most commonly cited reason (n = 17). Two participants reference a desire to achieve the performance target as the reason for not stopping. One participant directly cites not wanting a zero to appear next to their name on the scoreboard as the reason for not quitting. One participant said they did not quit because nobody else in their session quit (there were only five sessions where nobody quit).

Table 6.10. Textual Analysis of Reasons for Not Quitting

Theme	Frequency	Sample Quote
Chance of Winning	20	*Because I am winning.*
Curious or Interest	20	*I think it is interesting*
Want to Finish Task	17	*I wanted to finish the whole session*
Competitive	16	*I like to compete with the others*
Improvement	13	*I wanted to beat my own score and see how fast I could get in 8 rounds*
Try My Best	10	*I always try my best in everything, no matter big or small*
Task Enjoyment	8	*Because it was fun*
Prize	7	*$$$ I really wanted a Boost on my way home from uni but forgot my wallet.*
Task Preference	3	*Preferred this task over the other task, liked the competition and was improving over the rounds the majority of the time*
Wanted to Achieve Performance Target	2	*Because I want to achieve the target task, meeting the requirement, even though I might be losing, but at least I have had tried my best already.*
Task Was Easy	2	*Easier than exam haha*
Sunk Cost (time and endowment)	2	*Cause I am halfway through the contest and the money balance left less than $1 when I wanted to stop*
High Ability	1	*Because I find out that I'm good at the main task. then just keep doing it.*
Hope	1	*I didn't stop hoping, I will keep on getting better every round*
No One Else Gave Up	1	*Because there no other people stop working on it.*
All or nothing	1	*If I stop in the middle, it's the same thing. Either we got nothing or we got the best.*
Shame	1	*I knew Ben was going to win but looked fun to keep competing. I also didn't want to have a zero next to my name on the board too.*

6.2.4.5. Electrodermal Activity

In this section, I analyse the electrodermal activity (EDA) recorded by participants who quit the tournament incentivised task during Experiment 2. Analysing participants' EDA reveals whether participants are more stressed before quitting than earlier in the tournament. I recorded EDA measurements for thirty-six participants who quit after completing at least two

trials[19]. Each EDA measure reported is calibrated against the participant's baseline EDA reading from a no stimulus period before Experiment 2 began (See Appendix F for further details of how EDA was conducted). As described in the previous chapter, EDA is a measure of arousal that provides insights into the stress of the participants in Experiment 2. In Table 6.11. Panel A I present the descriptive statistics related to average arousal (stress) recorded while working on the task, the arousal (stress) in the last trial before the participant quit, the arousal (stress) when RPI feedback was displayed and the arousal (stress) during the last time RPI feedback was displayed before the participant quit.

As displayed in Table 6.11 Panel B, there is no difference in arousal (stress) detected while participants were working on the task. During the feedback period before each participant quit (M = 2.609, SD = 1.564) they are marginally significantly more stressed (M = 2.478, SD = 1.296, t = 1.643, df = 21, p = .058).

The EDA analysis finds evidence that participants who chose to quit the tournament are more stressed, as indexed by the change in their skin conductance level when viewing RPI feedback for the last time prior to quitting than they are when viewing RPI feedback earlier in the tournament. However, no discernible change in stress is detected when participants are engaged in the task. For a more detailed description of EDA, the EDA data collection and analysis, refer to Appendix F.

[19] EDA data for thirty-eight of the participants who quit was recorded. Two participants quit during the first trial. It is not possible to test the change in their EDA if only one trial data is available.

Table 6.11. Electrodermal Activity

Panel A: Descriptive Statistics

	Task EDA[a]	Quit Trial EDA[b]	Feedback EDA[c]	Quit Feedback EDA[d]
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Experiment 2 Quitters	2.518 (1.591) n = 36	2.642 (1.920) n = 36	2.478 (1.296) n = 22[e]	2.609 (1.564) n = 22[e]

Panel B: Paired Sample t-test results

Paired Sample	Mean	Std	t	df	p-value (1-sided)
Task EDA vs Quit Trial EDA	.124	.607	1.223	35	.115
Feedback EDA vs Quit Feedback EDA	.131	.375	1.643	21	.058*

Notes:

* p < 0.1, **p < .05, ***p < 0.01

Each participant's EDA was calibrated against a baseline measure recorded during a no-stimulus period prior to the Experiment 2 (see Appendix F for a more detailed description).

Definition of Elements

[a] Task EDA is the average μS recorded for the participant during the Experiment 2 clicking trials.

[b] Quit Trial EDA is the average μS recorded for the participant during the last trial before the participant quit the tournament incentivised task in Experiment 2.

[c] Feedback EDA is the average μS recorded when relative performance information was displayed in Experiment 2.

[d] Quit Feedback EDA is the average μS recorded the last time relative performance information was displayed before the participant quit the tournament incentivised task.

[e] To analyse whether participants who quit were more stressed when viewing RPI than earlier in the tournament, a participant had to complete at least two rounds before quitting. EDA data was available for twenty-two participants who quit after Round 2.

6.3. Conclusion

In this chapter, I tested the seven hypotheses set out in Chapter 3, along with additional analysis concerned with the *Perceived Effort* of participants from Experiment 1. Additional analyses for Experiment 2 examined the *Persistence, Performance* and the textual analysis of the explanations provided by participants for why they quit the tournament

incentivised task. Finally, I used electrodermal activity analysis to examine the stress of participants who quit while working on the task and when RPI was displayed.

Experiment 1 results show that targets reduce the effort exerted by participants. Specifically, contrary to the prediction made in H1, *laggards* in tournaments with targets exert less *Effort* than *laggards* in tournaments without targets.

Experiment 2 results show, as predicted in H6 that the effect of targets on retention of participants in a tournament is contingent upon whether performance information about participants who had quit the tournament is available. In low informedness tournaments (no access to RPI about participants who had already quit the tournament) targets improve retention. However, in high informedness tournaments assigning a target reduces retention. I also find marginal support for H7 that predicts and finds that tournaments with hard targets retain more participants than tournaments with easy targets in low informedness tournaments. However, in high informedness tournaments, hard targets result in less retention than easy targets.

Chapter 7 Discussion and Conclusions

7.1. Introduction

The aim of this thesis is to gain an understanding of the effect of control mechanisms on effort and retention in a context where a tournament is the primary component of a firm's incentive system. Specifically, the aim is to examine the following control mechanisms: performance targets set as secondary goals; the difficulty of targets; whether or not targets are incentivised; and access to performance information about workers who have previously quit the tournament incentivised task.

In order to address this aim, I set out four related research questions concerning the effects of assigned performance targets of varying difficulty upon *laggards'* effort and the retention of workers. I address the aim of the thesis using two separate experiments. In addressing these four research questions, I make several contributions to prior theory and research methodology.

In this chapter, I summarise the major conclusions from addressing the four research questions and reference the contributions where appropriate. I conclude with a discussion of the inherent limitations of this thesis and the implications for future research.

7.2. Summary of Findings

7.2.1. Summary of Findings: Research Question 1

RQ1: Do performance targets increase or decrease the effort exerted by *laggards* in a tournament?

The first research question investigates whether *laggards* exert more effort in tournaments with assigned performance targets than *laggards* in tournaments without assigned performance targets. To address RQ1, H2 tests whether *laggards* in tournaments with assigned targets would exert more effort than those without targets.

Contrary to my prediction, *laggards* in tournaments with targets exert **less** effort than those in tournaments without assigned targets. I predicted that an assigned target serves as a secondary goal to motivate effort from *laggards* who fell too far behind to achieve the primary goal of winning the tournament. However, contrary to my prediction, I find performance targets condone poorer performance and cause *laggards* to exert less effort. *Laggards* realign their goal towards the secondary easier goal (the target) at the expense of competing to win the tournament.

Additional analysis reveals that despite exerting less effort, *laggards'* self-assessed effort in tournaments with assigned targets was higher than *laggards'* in tournaments without targets. The assignment of a performance target provides *laggards* with a second reference point to feel satisfied with their performance. *Laggards* in tournaments with a target compare themselves against a target that is an easier, more achievable goal. *Laggards* may feel satisfied with their performance if they achieve or get close to achieving the target. For *laggards* without a target, as the gap between their performance and the performance of higher-ranked participants increases, it is harder for them to feel satisfied with their

performance. These *Laggards* may internalise the unfavourable social comparison as not exerting enough effort.

7.2.2. Summary of Findings: Research Question 2

RQ2: In a tournament with an assigned performance target, does the difficulty of the performance target affect the effort exerted by *laggards*?

The second research question addresses whether the difficulty of a performance target affects *laggards'* effort in tournaments. H2 predicts that *laggards* in tournaments assigned an easy target exert more effort than those assigned a hard target. I find, however, that the difficulty of a target assigned as a secondary goal does not affect the effort exerted by *laggards*.

For *Laggards* in tournaments assigned an easy target, the target condones them not exerting effort to win the tournament, requiring them only to exert sufficient effort to achieve the easy target. For *laggards* in tournaments with a hard target, the target may be perceived as too difficult and further erodes their confidence. *Laggards* unable to get close to the hard target may lose motivation to exert their maximum level of effort.

I conclude for research question 2 that the difficulty, whether easy or hard, of a performance target when assigned as a secondary goal in a tournament does not affect *laggards'* effort.

7.2.3. Summary of Findings: Research Question 3

RQ3: In a tournament with an assigned performance target, does paying *laggards* a bonus for exceeding the target increase the effort exerted by *laggards*?

The third research question addresses whether incentivising performance targets affects *laggards'* effort in tournaments. To address this question, H3 tests whether *laggards* in tournaments assigned an incentivised target exert more effort than those assigned a target that is not incentivised.

When a tournament is the primary component of an incentive system, I predict that an incentivised target will be a more attractive secondary goal for *laggards* than a target that is not incentivised. I find, however, no difference in the effort exerted by *laggards* assigned incentivised targets compared to those assigned targets without incentives. My findings for RQ 1 suggest that a target is an attractive secondary goal that affects *laggards*' effort. Regarding RQ3, I find that incentivising the target does not make the target more attractive to *laggards*. *Laggards*' effort is affected by a target regardless of whether the target is incentivised or not.

7.2.4. Summary of Findings: Research Question 4

RQ 4: Is the retention of workers in tournaments affected by a combination of assigned performance targets and whether or not workers are informed of the past performance of workers who have quit?

The fourth research question (RQ4) examines whether the retention of workers in a tournament is affected by a combination of assigned performance targets and access to relative performance information about workers who have already quit a tournament.

The hypotheses H4 to H7 show that the informedness of a tournament alters the effect of targets on worker retention. In high informedness tournaments, access to performance information enables participants to know if someone who quit achieved or failed to achieve the target.

I predicted that the target assigned to participants provides a secondary goal and increases retention. However, when one or more participants quit in a tournament, the remaining participants witness a peer quit, potentially without achieving the target. Witnessing another participant quit the tournament signals that winning the tournament is too difficult for the participant who quit. Further, witnessing a peer quit without achieving the performance target signals that the target is also too difficult.

In high informedness tournaments, participants can assess whether or not a participant who quit achieved the target. If the participant who quit failed to achieve the target, the remaining participants' perception of the target difficulty changes. The remaining participants conclude that the target was too difficult for the participant who quit. The remaining participants performing at a similar level to the participant who quit are likely to conclude that the target is too difficult for them as well. For these participants who have already abandoned the primary goal of winning the tournament, witnessing another participant quit without achieving the target further erodes their commitment to the target. Participants who perceive they could not win the tournament or achieve the target are the prime candidates to quit the tournament incentivised task.

In low informedness tournaments, participants only know that someone has quit. They do not know if the quitting participant achieved the target or not. Therefore, when another participant quits, this does not alter the remaining participants' perception of the difficulty of the target to the same extent. Therefore, in low informedness tournaments, participants'

commitment to achieving the target is less likely to be harmed by witnessing another participant quit than participants in high informedness tournaments.

I conclude that for RQ4, the retention of workers in a tournament is affected by targets, contingent upon the informedness of the tournament. Neither targets (H5) nor the informedness of the tournament (H6), in isolation, affect the retention. Rather, retention is affected by a combination of informedness and targets. Specifically, targets improve retention in low informedness tournaments but decrease retention in high informedness tournaments (H7). The effect is strongest when harder targets are assigned (H8).

The additional analyses report that the persistence of workers, that is, how long they work on a tournament incentivised task, is affected in the same way as retention. I also identify that workers who complete a tournament are higher-performing than those who quit. The effect of this is that, on average, participants retained in tournaments with low retention rates perform better than those retained in tournaments with high retention rates.

7.3. Contributions of the Thesis

I make several notable theoretical, methodological and practical contributions. There are three significant **theoretical contributions** made. First, the findings from this thesis contribute to this emerging literature concerning the motivation of *laggards* when tournaments are the primary component of a firm's incentive system. As Lazear & Rosen's (1981) tournament theory identified, motivational problems likely impact tournament *laggards*. Backes-Gellner & Pull (2013), Berger et al. (2018), and Newman & Tafkov (2014) examined how altering the prize structure affects the motivation of *laggards*. My findings expand on their research by showing that a secondary goal, in the form of a performance

target, as a secondary motivator in tournaments can undermine *laggards'* effort in tournaments. This finding suggests that if managers set a performance target for *laggards* in tournaments, the target may stifle *laggards'* motivation to compete against peers.

Second, this is the first research in accounting to examine retention in tournaments directly. Prior research has concentrated on the motivation of workers in tournaments (e.g. Berger et al., 2013; Casas-Acre & Martinez-Jerez, 2009). I examine the effect of targets and informedness on the likelihood that workers will cease all work on a task incentivised by a tournament. I show that a combination of performance targets and the informedness of a tournament can increase or decrease the retention of workers in tournaments.

Third, I contribute to the existing literature that examines the effects of disseminating relative performance information, (e.g. Chan 2018; Hannan et al. 2008; Hannan, et al. 2013). I demonstrate that a subset of relative performance information, performance data from workers who have quit working on a tournament incentivised task, can affect the retention of tournaments. Firms concerned with the retention of workers incentivised by tournaments may consider whether or not this type of performance data is made available to workers.

I also make two significant **methodological contributions**. Firstly, the design I used for Experiment 2 facilitates a high rate of quitting in a laboratory setting. Almost one-third (33.1%) of participants voluntary quit the tournament incentivised task. No prior experimental studies that I am aware of have achieved a rate of quitting this high.

The design for Experiment 2 includes a range of features that future research concerned with retention may adopt. The design includes a text box to indicate if the participant had stopped working on the task. This feature signals to participants that stopping is permitted and allays fears that stopping will compromise the study. Other features (e.g., an

alternate task) also reduce the costs associated with quitting the task. The combination of design features I incorporated into Experiment 2 results in a significant minority of participants quitting and facilitates the examination of retention of workers in tournaments. The finger-tapping task developed for Experiment 1 also contributes to the experimental design literature by demonstrating the use of a task with a strong association between performance and effort.

Secondly, the exploratory examination of electrodermal activity (EDA) introduced as additional analysis for Experiment 2 demonstrates the use of EDA as a direct measure of arousal opens up a pathway for future research in accounting to use this technique. The exploratory analysis of EDA collected from participants in Experiment 2 provides an example of how electrodermal activity analysis can be incorporated into accounting research and lays the groundwork for other researchers to investigate questions related to arousal in future accounting research.

Additionally, this thesis makes **two notable practical contributions**. This thesis shows managers that interventions to motivate *laggards* can be counterproductive when a tournament is the primary component of a firm's incentive system. Managers may be better off allowing the tournament to motivate *laggards* rather than intervening by setting a performance target intended as a secondary goal.

Second, for managers concerned with the retention of workers incentivised by tournaments, I show that the effect of performance targets is contingent on whether workers have access to information about the performance of workers who have quit working on the tournament incentivised task. If managers operate in environments where this form of information is available to workers, explicit performance targets may reduce retention. If this information is not available, a manager can set targets to improve retention.

This finding has implications for managers who want to retain and develop their workers. The finding may also be helpful for organisations that only want to retain high performing workers by encouraging low performing workers to voluntarily stop working on a task to redirect their effort to other tasks or potentially leave the organisation.

7.4. Limitations of the Thesis

The conclusions, summarised in the previous section, are subject to some limitations. Firstly, the task used for both experiments measured performance as a function of physical effort. In most roles, an employee's performance is affected by factors (e.g., company culture, management's leadership style, access to work tools, and experience in the role) that I deliberately excluded to increase the internal validity of both experiments. In a workplace, employees can withhold effort by engaging in unproductive tasks such as chatting with colleagues about non-work activities. In contrast, participants in both experiments were supervised, seated separately and were not permitted to interact with each other. Participants in a laboratory setting are a captured audience for whom there are fewer options to avoid concentrating on the work task.

Second, I restricted the duration of both experiments to less than one hour. The duration was consistent with most laboratory experiments in accounting, economics and psychology, typically less than two hours (Normann, Requate, & Waichman, 2014). While short-term contracting and the increasing popularity of the gig-based economy have created a more transient employment relationship than in the past, employment relationships of less than one hour, as in the experiments I conducted as part of this thesis, are not commonplace (Healy, Nicholson, & Pekarek, 2017). The conclusions drawn from this thesis might apply to short-term employment settings only. Further longitudinal research, however, is required to

understand to what extent effort regulation and retention occur in ongoing employment settings. In ongoing employment relationships, the costs associated with quitting are greater for both the employee and the employer. The employer incurs costs to hire and train a replacement worker, and the worker forgoes a salary until new employment commences. Increased costs associated with a high turnover of workers may pressure the employer to use more incentives to prevent employees from quitting. Likewise, the opportunity cost for employees to quit is greater.

Thirdly, the task I used for Experiment 2 may have constrained the findings from the additional analysis using EDA. I found that participants who quit recorded elevated EDA prior to quitting when RPI was displayed but not while engaged in the task. I expected participants' EDA would either be higher due to the stress associated with contemplating quitting or decreased EDA if participants were mentally disengaged from the task. A person's EDA can be elevated due to physical exertion (Bach, 2016). The non-significant difference in EDA recorded while working on the task may have been because the physical exertion from the task crowded out the stress from a poor ranking and contemplating quitting. This may explain why only during the feedback periods was a difference detected. If a less physically demanding task was used for Experiment 2, a difference in participants' EDA while engaged in the task might have been detected.

Despite these limitations, the conclusions summarised in this chapter are important for managers operating in organisations where employees compete against each other. The findings caution managers against signalling expectations that could potentially undermine the efficacy of existing competition. The findings are also relevant for firms that use tournaments as a primary component of the incentive system that are seeking to retain and develop workers, as well as firms seeking to replace low-performing workers. The findings

demonstrate that the effect of targets on retention is contingent upon the extent to which performance information related to workers who have quit the tournament or firm affects remaining workers.

7.5. Implications for Future Research

The conclusions I draw from this thesis provide detail about the effects of assigned performance targets on the effort and retention of workers in tournaments. In drawing these conclusions, I identify several new avenues for future research.

The first issue I examined was concerned with the effect of a performance target on *laggards'* effort in a tournament. The target was intended as a secondary goal to stabilise the effort of workers who fell behind. An extension to this study could examine the effect of a more ambitious target on *leaders'* effort in a tournament. An aspirational target could be a tool to engage *leaders* in tournaments who may be prone to complacency. Research could investigate the effects of aspirational targets that provide tournament *leaders* with a more challenging goal than outperforming co-workers.

The exploratory nature of the electrodermal activity analysis I presented in this thesis lays some of the groundwork for future accounting research to use this technique. Electrodermal activity analysis may be useful for researchers wanting an unobtrusive measure of engagement or stress. The method used in Experiment 2 to measure participants' heightened state of psychophysiological arousal due to stress is arguably less intrusive than some other biomarkers of stress, such as cortisol level measurement using saliva samples, recently used in the accounting literature (e.g. Cardinaels & Feichter, 2021). Researchers wanting to observe and directly measure participants' stress in decision-making tasks may

gain valuable insights without utilising an effort-sensitive task or relying upon proxies for effort derived from performance or self-reported effort scales.

Appendices

Appendix A Ethics Approval

Ethics approval has been granted for the Pilot and Experiment 1 (MUHREC project 9180) and the Pilot and Experiment 2 (MUHREC project 11490)

Appendix B Experiment 1 Pilot Study

The Experiment 1 Pilot Study was designed to test the Experiment 1 research instrument. A mix of undergraduate and postgraduate accounting students from the same large public university were recruited for voluntary participation in experimental sessions. Participants were advised that they would have the opportunity to earn money, and the average payment would be $11.00. There were four sessions in which twenty students participated, 14 women (*M* = 21.14 years SD = 1.66) and 6 men (*M* = 21.67 SD = 2.40),

The Experiment 1 Pilot was a 1 x 3 between-participants experiment using a finger-tapping task. I used an experimental design in which I varied (between-subjects) the performance targets (No Target, Easy Target or Hard Target), resulting in three conditions as depicted in Table B1. In the Tournaments with No Target condition participants were not assigned a performance target. In the Tournaments with an Easy (a Hard) Target conditions, the target was set at a score of 315 (430) for the round. Participants were paid a flat wage of $5 in every condition and there was a $30 prize for the participant that recorded the highest total score in each session.

Table B1 Experiment 1 Pilot Conditions: Target (IV1)

No Target	Easy Target	Hard Target
Cell 1: Tournaments with No Target Condition	Cell 2: Tournaments with Unpaid Easy Target Condition	Cell 3: Tournaments with Unpaid Hard Target Condition

Notes:

Target (IV1) has three levels: No Target, Easy Target and Hard Target.

Participants firstly read the explanatory statement and completed a consent form. I explained to the participants this was a pilot and that the purpose was to test the instrument and make improvements to the design. After participants were seated, a version of the

instrument was projected on a screen at the front of the room. Participants were asked to read through the instruction screens carefully and to stop at the screen labelled ‘begin practice round’. The task required participants to repeatedly click a mouse button connected to a computer for a short time period. The number of clicks recorded was used a measure of performance and effort expended by the participant. Figure B1 displays an overview of the timeline for a Experiment 1 Pilot session. The timeline was the same as used for Experiment 1.

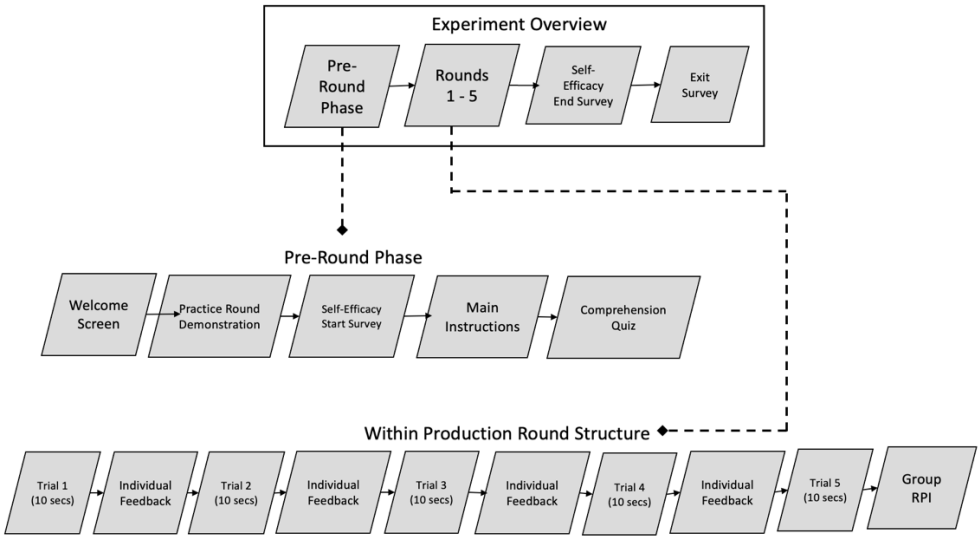


Figure B1 Experiment 1 Pilot Timeline

Each pilot session consisted of a five-round tournament. In each round participants completed five ten-second clicking trials. The number of clicks recorded was the participant’s score for the trial. Between trials an individual performance feedback table was displayed on each participant's screen. The individual feedback included the participant's score for the previous trial, cumulative score for the round and tournament, and whether they had achieved the performance target (no references to a performance target was displayed to participants in Tournaments with No Target condition). At the end of each round, a tournament scorecard was projected to a public screen. The scoreboard displayed the relative performance of each participant for the round, cumulative score, and current rank.

At the end of the fifth-round participants completed a self-efficacy survey, an exit survey (summarize in Table B2), before payments were distributed and participants left the venue.

Table B2 Experiment 1 Pilot exit survey variables

Variable	Question	Measurement
Work Hard	I worked hard on this task	7-point scale (Strongly agree, Agree, Somewhat agree, Neither agree nor disagree, Somewhat disagree, Disagree, Strongly disagree)
Gender	What is your gender?	Male or Female
Age	What was your age at your last birthday?	Years
Work Experience	How many months of work experience do you have (paid full-time, paid part-time, paid casual work or military service	Months
Years in Australia	How many years have you lived in Australia (round off to nearest full year)	Years
Country of Birth	Country of Birth	Text
Social Media	On a typical day, how many minutes do you spend on social media? Social media includes apps and/or websites including: Facebook, Twitter, Instagram, Snapchat, Linkedin, WeChat, QQ, Sina weibo or any other equivalent	Text
Games	In a typical week, approximately how many hours do you spend playing video, computer or smart phone games?	Text

Appendix C Experiment 1 Materials

Item 1: Instructions and Comprehension Quiz for Tournaments with a Paid Easy Target condition.

Main Round Instructions
You have been assigned a personal performance target of a score of at least 285 for each round. Each round consists of 5 x 10-second trials. You will need to average at least 57 clicks per trial to finish with a score of 285 for a round. You will be paid an additional $1.25 for each round that you achieve the performance target.

In addition, there is a prize of $30 that will be paid to the student who has the highest total score at the end of the fifth round.
At the end of each round, you will receive an update that will tell you:
*Your individual score for the round
*Whether you achieved the performance target
*The scores of the other participants

Please ensure you have read all the instructions carefully before answering the following questions.

Place a tick next to the correct response.

Question 1

	The participant with the highest score DOES NOT receive a prize.
	The participant with the highest score WILL receive a $30 prize.

Question 2

	I WAS assigned a performance target.
	I WAS NOT assigned a performance target.

Question 3. If you answered B to question 2, please leave blank

	The performance target assigned to me is 420 clicks per round.
	The performance target assigned to me is 285 clicks per round.

Question 4. If you answered B to question 2, please leave blank

	I will need to average 84 clicks per trial to achieve my performance target.
	I will need to average 57 clicks per trial to achieve my performance target.

Question 5. If you answered B to question 2, please leave blank

	I WILL be paid more money for each round I achieve the performance target.
	I WILL NOT be paid more money for each round I achieve the performance target.

Item 2: Instructions and Comprehension Quiz for Tournaments with a Paid Hard Target.

Main Round Instructions
You have been assigned a personal performance target of a score of at least 420 for each round. Each round consists of 5 x 10-second trials. You will need to average at least 84 clicks per trial to finish with a score of 420 for a round. You will be paid an additional $5.00 for each round that you achieve the performance target.

In addition, there is a prize of $30 that will be paid to the student who has the highest total score at the end of the fifth round.
At the end of each round, you will receive an update that will tell you:
*Your individual score for the round
*Whether you achieved the performance target
*The scores of the other participants

Please ensure you have read all the instructions carefully before answering the following questions.

Place a tick next to the correct response.

Question 1

	The participant with the highest score DOES NOT receive a prize.
	The participant with the highest score WILL receive a $30 prize.

Question 2

	(A) I WAS assigned a performance target.
	(B) I WAS NOT assigned a performance target.

Question 3. If you answered B to question 2, please leave blank

	The performance target assigned to me is 420 clicks per round.
	The performance target assigned to me is 285 clicks per round.

Question 4. If you answered B to question 2, please leave blank

	I will need to average 84 clicks per trial to achieve my performance target.
	I will need to average 57 clicks per trial to achieve my performance target.

Question 5. If you answered B to question 2, please leave blank

	I WILL be paid more money for each round I achieve the performance target.
	I WILL NOT be paid more money for each round I achieve the performance target.

Item 3: Instructions and Comprehension Quiz for Tournaments with an Unpaid Easy Target.

You will be paid a flat wage of $5. This means you are paid the same regardless of how many clicks you record. You have been assigned a personal performance target of a score of at least 285 for each round. Each round consists of 5 x 10-second trials. You will need to average at least 57 clicks per trial to finish with a score of 285 for a round.

In addition, there is a prize of $30 that will be paid to the student who has the highest total score at the end of the fifth round.
At the end of each round, you will receive an update that will tell you:

*Your individual score for the round
*Whether you achieved the performance target
*The scores of the other participants

Please ensure you have read all the instructions carefully before answering the following questions.

Place a tick next to the correct response.
Question 1

	The participant with the highest score DOES NOT receive a prize.
	The participant with the highest score WILL receive a $30 prize.

Question 2

	(A) I WAS assigned a performance target.
	(B) I WAS NOT assigned a performance target.

Question 3. If you answered B to question 2, please leave blank

	The performance target assigned to me is 420 clicks per round.
	The performance target assigned to me is 285 clicks per round.

Question 4. If you answered B to question 2, please leave blank

	I will need to average 84 clicks per trial to achieve my performance target.
	I will need to average 57 clicks per trial to achieve my performance target.

Question 5. If you answered B to question 2, please leave blank

	I WILL be paid more money for each round I achieve the performance target.
	I WILL NOT be paid more money for each round I achieve the performance target.

Item 4: Instructions and Comprehension Quiz for Tournaments with an Unpaid Hard Target.

You will be paid a flat wage of $5. This means you are paid the same regardless of how many clicks you record. You have been assigned a personal performance target of a score of at least 420 for each round. Each round consists of 5 x 10-second trials. You will need to average at least 84 clicks per trial to finish with a score of 420 for a round.

In addition, there is a prize of $30 that will be paid to the student who has the highest total score at the end of the fifth round.
At the end of each round, you will receive an update that will tell you:

*Your individual score for the round
*Whether you achieved the performance target
*The scores of the other participants

Please ensure you have read all the instructions carefully before answering the following questions.

Place a tick next to the correct response.
Question 1

	The participant with the highest score DOES NOT receive a prize.
	The participant with the highest score WILL receive a $30 prize.

Question 2

	(A) I WAS assigned a performance target.
	(B) I WAS NOT assigned a performance target.

Question 3. If you answered B to question 2, please leave blank

	The performance target assigned to me is 420 clicks per round.
	The performance target assigned to me is 285 clicks per round.

Question 4. If you answered B to question 2, please leave blank

	I will need to average 84 clicks per trial to achieve my performance target.
	I will need to average 57 clicks per trial to achieve my performance target.

Question 5. If you answered B to question 2, please leave blank

	I WILL be paid more money for each round I achieve the performance target.
	I WILL NOT be paid more money for each round I achieve the performance target.

Item 5: Instructions and Comprehension Quiz for Tournaments with No Target.

You will be paid a flat wage of $5. This means you are paid the same regardless of how many clicks you record. In addition, there is a prize of $30 that will be paid to the student who has the highest total score at the end of the fifth round.

At the end of each round, you will receive an update that will tell you:

*Your individual score for the round
*The scores of the other participants

Please ensure you have read all the instructions carefully before answering the following questions.

Place a tick next to the correct response.

Question 1

	The participant with the highest score DOES NOT receive a prize.
	The participant with the highest score WILL receive a $30 prize.

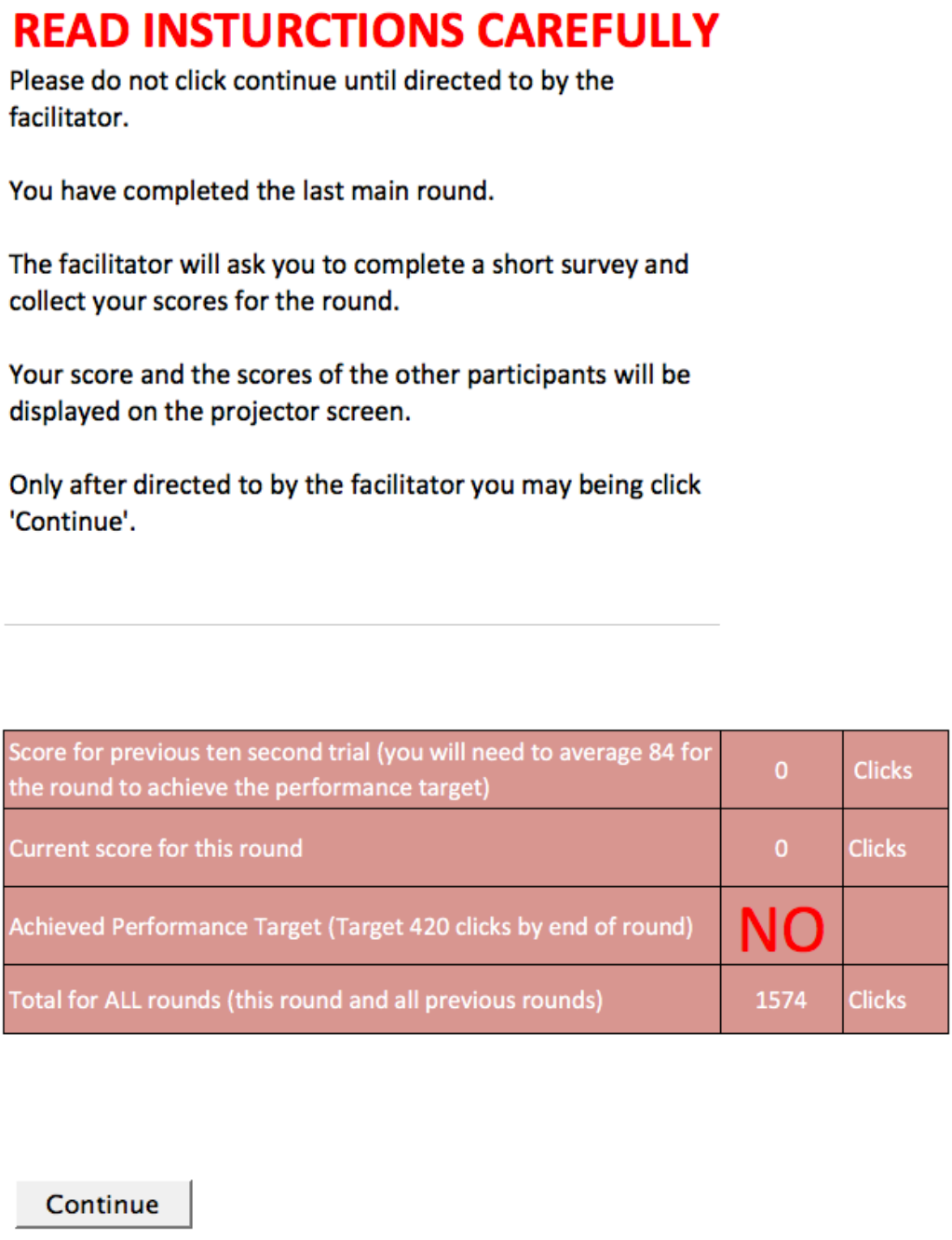
Question 2

	To earn the $5 wage, there is a minimum amount of clicks I need to make.
	To earn the $5 wage, it does not matter how many clicks I make.

Item 6: Main Task Screen

Note: Main task screen. Participants click on the button labelled ‘CLICK HERE’. Each click is recorded in a hidden spreadsheet.

Item 7: Feedback Screen



Note:
Feedback screen for participants in a Tournaments with a Hard Target conditions. Row three read 'NO' until the score for the round reached the performance target. Once performance target was achieved cell text changed to 'YES'.

Participants in a Tournament with an Easy Target condition row one read 'Score for previous ten-second trial (you will need to average 57 clicks for the round to achieve the performance target). Row three read 'Achieved Performance Target (Target 285 clicks by the end of the round)'. Participants in the Tournament with No Target condition had all references to performance targets and row three removed.

Item 8 Tournament Scorecard (RPI)

ID	Round 1	Round 2	Round 3	Round 4	Round 5	CURRENT SCORE	POSITION
501	280	290				570	5
502	290	300				590	4
503	300	310				610	3
504	310	320				630	2
505	320	330				650	1

Item 9: Self-efficacy Survey

Listed below are various numbers of clicks that a person could record in ten seconds. For each number of clicks listed below, rate how confident you are that you can record that many clicks in a ten-seconds as of now. Rate your degree of confidence by recording a number from 0 (Cannot do at all) to 100 (Highly Certain can do). Write your answer into the text box for each number of clicks listed below.

30 Clicks

40 Clicks

50 Clicks

60 Clicks

70 Clicks

80 Clicks

90 Clicks

100 Clicks

110 Clicks

120 Clicks

Item 10: Exit Survey Questions

Table C1 Experiment 1 Exit Survey Questions

Variable	Question	Measurement
Manipulation Check 1	My performance target was 420 clicks per round My performance target was 285 clicks per round I did not have a performance target	Pass = Correct response selected based on participant's assigned tournament condition Fail = Incorrect response selected based on participant's assigned tournament condition
Manipulation Check 2	The student with the highest score wins a $30 prize The student with the highest score does not win a prize	Pass = Correct response selected based on participant's assigned tournament condition Fail = Incorrect response selected based on participant's assigned tournament condition
Manipulation Check 3	I could earn money if I achieved the performance target I could NOT earn money if I achieved the performance target	Pass = Correct response selected based on participant's assigned tournament condition Fail = Incorrect response selected based on participant's assigned tournament condition
Work Hard	I worked hard on this task	7-point scale (Strongly agree, Agree, Somewhat agree, Neither agree nor disagree, Somewhat disagree, Disagree, Strongly disagree)
Gender	What is your gender?	Male or Female
Age	What was your age at your last birthday?	Years
Country of Birth	Country of Birth	Text
Years in Australia	How many years have you lived in Australia? (round off to nearest full year)	Years
Math Ability	How would you rate your mathematics ability compared to your classmates in high school?	5-point scale (Near the bottom of the class, below average, about average, above average, near the top of the class)
Work Experience	How many months of work experience do you have? (paid full-time, paid part-time, paid casual work or military service	Months
Social Media	How frequently do you check social media? Social media includes apps and/or websites including: Facebook, Twitter, Instagram, Snapchat, Linkedin, WeChat, QQ, Sina weibo or any other equivalent	5-point scale (I don't use social media, once per week or less, about once per day, about two to four times per day, more than five times per day)
Games	In a typical week, approximately how many hours do you spend playing video, computer or smart phone games?	5-point scale (I never play games, once per month or less, about once per week, about two to six times per week, about once per day or more)

Appendix D Experiment 2 Materials

Item 1: Main Instructions Screen (Low Informedness Tournaments with an Easy Target)

Summary of Main Instructions Video

1. General Instructions The main task is the same as the first task you completed in the practice round. It involves clicking the mouse for thirty second clicking parts with rest periods in between. There will be eight rounds in total for the session.

2. Performance Feedback At the end of each round, you will firstly submit your performance report. The performance report will ask you to write your total clicks for the round and hand it to the facilitator.

Hypothetical Example Performance Report (for James who made 1,000 clicks in round 1)

Name: JAMES
Seat Number: 7
Round 1 Clicks = 1,000
Round 2 Clicks =
Round 3 Clicks =

After all participants have submitted their performance reports, you will be able to view the relative performance feedback screen, comparing your performance on your main task to that of the other participants in your session. Specifically, you will be told the number of clicks for the previous round and the cumulative total number of clicks up to that point for each participant. The relative performance feedback screen will be displayed on the public (projected) screen at the front of the room.

3.. Compensation
You will have the opportunity to earn real money (in $AUD). All payments will be made in cash at the end of the session.

Best Score Prize: The participant from this session with the highest total number of clicks at the end of round 8 will receive the 'Best Score Prize' of $20 AUD.
Starting Money: You will begin the session with $4.80 AUD. At the beginning of each clicking part of a round, your balance will be reduced by $0.20 (There are three parts to each round; therefore, for each round you complete, your balance is reduced by 3 x $0.20 = $0.60).

Your remaining balance will be displayed on your screen during each clicking part and rest period of each round. For example: when you begin Round 1 Clicking Part 1, your balance

will be $4.60, and when you begin Round 1 Clicking Part 2, your balance will be reduced by another $0.20 to $4.40 etc.).

4. Performance Target

You have been assigned a **personal performance target of at least 512 clicks for each round** (A round consists of 3 x 30 seconds clicking parts).

5. Stopping

At any time, you can choose not to continue by typing STOP into the text box that will appear in every clicking part for every round. **If you type STOP, you will be withdrawn from the competition to win the best score prize. Your name and score will no longer be displayed on the scoreboard.**

If you STOP, you will instead be asked to work on the optional alternate decoding task. You will not be paid for any work on the decoding task. You will, however, be allowed to keep your remaining starting money. Any remaining starting money will be paid to you in cash at the end of the session.

Item 2: Main Instructions Screen (Low Informedness Tournaments with a Hard Target)

Summary of Main Instructions Video

1. General Instructions The main task is the same as the first task you completed in the practice round. It involves clicking the mouse for thirty second clicking parts with rest periods in between. There will be eight rounds in total for the session.

2. Performance Feedback At the end of each round, you will firstly submit your performance report. The performance report will ask you to write your total clicks for the round and hand it to the facilitator.

Hypothetical Example Performance Report (for James who made 1,000 clicks in round 1)

Name: JAMES
Seat Number: 7
Round 1 Clicks = 1,000
Round 2 Clicks =
Round 3 Clicks =

After all participants have submitted their performance reports, you will be able to view the relative performance feedback screen, comparing your performance on your main task to that of the other participants in your session. Specifically, you will be told the number of clicks for the previous round and the cumulative total number of clicks up to that point for each participant. The relative performance feedback screen will be displayed on the public (projected) screen at the front of the room.

3.. Compensation
You will have the opportunity to earn real money (in $AUD). All payments will be made in cash at the end of the session.

Best Score Prize: The participant from this session with the highest total number of clicks at the end of round 8 will receive the 'Best Score Prize' of $20 AUD.
Starting Money: You will begin the session with $4.80 AUD. At the beginning of each clicking part of a round, your balance will be reduced by $0.20 (There are three parts to each round; therefore, for each round you complete your balance is reduced by 3 x $0.20 = $0.60).

Your remaining balance will be displayed on your screen during each clicking part and rest period of each round. For example: when you begin Round 1 Clicking Part 1, your balance

will be $4.60, and when you begin Round 1 Clicking Part 2, your balance will be reduced by another $0.20 to $4.40 etc.).

4. Performance Target

You have been assigned a **personal performance target of at least 630 clicks for each round** (A round consists of 3 x 30 seconds clicking parts).

5. Stopping

At any time you can choose not to continue by typing STOP into the text box that will appear in every clicking part for every round. **If you type STOP you will be withdrawn from the competition to win the best score prize. Your name and score will no longer be displayed on the scoreboard.**

If you STOP, you will instead be asked to work on the optional alternate decoding task. You will not be paid for any work on the decoding task. You will, however, be allowed to keep your remaining starting money. Any remaining starting money will be paid to you in cash at the end of the session.

Item 3: Main Instructions Screen (High Informedness Tournaments with an Easy Target)

Summary of Main Instructions Video

1. General Instructions The main task is the same as the first task you completed in the practice round. It involves clicking the mouse for thirty second clicking parts with rest periods in between. There will be eight rounds in total for the session.

2. Performance Feedback At the end of each round, you will firstly submit your performance report. The performance report will ask you to write your total clicks for the round and hand tit o the facilitator.

Hypothetical Example Performance Report (for James who made 1,000 clicks in round 1)

Name: JAMES
Seat Number: 7
Round 1 Clicks = 1,000
Round 2 Clicks =
Round 3 Clicks =

After all participants have submitted their performance reports, you will be able to view the relative performance feedback screen, comparing your performance on your main task to that of the other participants in your session. Specifically, you will be told the number of clicks for the previous round and the cumulative total number of clicks up to that point for each participant. The relative performance feedback screen will be displayed on the public (projected) screen at the front of the room.

3.. Compensation
You will have the opportunity to earn real money (in $AUD). All payments will be made in cash at the end of the session.

Best Score Prize: The participant from this session with the highest total number of clicks at the end of round 8 will receive the 'Best Score Prize' of $20 AUD.
Starting Money: You will begin the session with $4.80 AUD. At the beginning of each clicking part of a round your balance will be reduced by $0.20 (There are three parts to each round; therefore, for each round you complete your balance is reduced by 3 x $0.20 = $0.60).

Your remaining balance will be displayed on your screen during each clicking part and rest period of each round. For example: when you begin Round 1 Clicking Part 1, your balance

will be $4.60, and when you begin Round 1 Clicking Part 2, your balance will be reduced by another $0.20 to $4.40 etc.).

4. Performance Target

You have been assigned a **personal performance target of at least 512 clicks for each round** (A round consists of 3 x 30 seconds clicking parts).

5. Stopping

At any time you can choose not to continue by typing STOP into the text box that will appear in every clicking part for every round. **If you type STOP you will be withdrawn from the competition to win the best score prize. Your name and score will continue to be displayed on the scoreboard.** You will receive a score of ZERO for each round after you decide to STOP.

If you STOP you will instead be asked to work on the optional alternate decoding task. You will not be paid for any work on the decoding task. You will, however, be allowed to keep your remaining starting money. Any remaining starting money will be paid to you in cash at the end of the session.

Item 4: Main Instructions Screen (High Informedness Tournaments with a Hard Target)

Summary of Main Instructions Video

1. General Instructions The main task is the same as the first task you completed in the practice round. It involves clicking the mouse for thirty second clicking parts with rest periods in between. There will be eight rounds in total for the session.

2. Performance Feedback At the end of each round, you will firstly submit your performance report. The performance report will ask you to write your total clicks for the round and hand it to the facilitator.

Hypothetical Example Performance Report (for James who made 1,000 clicks in round 1)

Name: JAMES
Seat Number: 7
Round 1 Clicks = 1,000
Round 2 Clicks =
Round 3 Clicks =

After all participants have submitted their performance reports, you will be able to view the relative performance feedback screen, comparing your performance on your main task to that of the other participants in your session. Specifically, you will be told the number of clicks for the previous round and the cumulative total number of clicks up to that point for each participant. The relative performance feedback screen will be displayed on the public (projected) screen at the front of the room.

3.. Compensation
You will have the opportunity to earn real money (in $AUD). All payments will be made in cash at the end of the session.

Best Score Prize: The participant from this session with the highest total number of clicks at the end of round 8 will receive the 'Best Score Prize' of $20 AUD.
Starting Money: You will begin the session with $4.80 AUD. At the beginning of each clicking part of a round your balance will be reduced by $0.20 (There are three parts to each round; therefore, for each round you complete your balance is reduced by 3 x $0.20 = $0.60).

Your remaining balance will be displayed on your screen during each clicking part and rest period of each round. For example: when you begin Round 1 Clicking Part 1, your balance

will be $4.60, and when you begin Round 1 Clicking Part 2, your balance will be reduced by another $0.20 to $4.40 etc.).

4. Performance Target

You have been assigned a **personal performance target of at least 630 clicks for each round** (A round consists of 3 x 30 seconds clicking parts).

5. Stopping

At any time you can choose not to continue by typing STOP into the text box that will appear in every clicking part for every round. **If you type STOP you will be withdrawn from the competition to win the best score prize. Your name and score will continue to be displayed on the scoreboard.** You will receive a score of ZERO for each round after you decide to STOP.

If you STOP you will instead be asked to work on the optional alternate decoding task. You will not be paid for any work on the decoding task. You will, however, be allowed to keep your remaining starting money. Any remaining starting money will be paid to you in cash at the end of the session.

Item 5: Main Instructions Screen (Low Informedness Tournaments with No Target)

Summary of Main Instructions Video

1. General Instructions The main task is the same as the first task you completed in the practice round. It involves clicking the mouse for thirty second clicking parts with rest periods in between. There will be eight rounds in total for the session.

2. Performance Feedback At the end of each round, you will firstly submit your performance report. The performance report will ask you to write your total clicks for the round and hand it to the facilitator.

Hypothetical Example Performance Report (for James who made 1,000 clicks in round 1)

Name: JAMES
Seat Number: 7
Round 1 Clicks = 1,000
Round 2 Clicks =
Round 3 Clicks =

After all participants have submitted their performance reports, you will be able to view the relative performance feedback screen, comparing your performance on your main task to that of the other participants in your session. Specifically, you will be told the number of clicks for the previous round and the cumulative total number of clicks up to that point for each participant. The relative performance feedback screen will be displayed on the public (projected) screen at the front of the room.

3.. Compensation
You will have the opportunity to earn real money (in $AUD). All payments will be made in cash at the end of the session.

Best Score Prize: The participant from this session with the highest total number of clicks at the end of round 8 will receive the 'Best Score Prize' of $20 AUD.
Starting Money: You will begin the session with $4.80 AUD. At the beginning of each clicking part of a round your balance will be reduced by $0.20 (There are three parts to each round; therefore, for each round you complete your balance is reduced by 3 x $0.20 = $0.60).

Your remaining balance will be displayed on your screen during each clicking part and rest period of each round. For example: when you begin Round 1 Clicking Part 1, your balance will be $4.60, and when you begin Round 1 Clicking Part 2, your balance will be reduced by another $0.20 to $4.40 etc.).

4. Stopping

At any time you can choose not to continue by typing STOP into the text box that will appear in every clicking part for every round. **If you type STOP you will be withdrawn**

from the competition to win the best score prize. Your name and score will no longer be displayed on the scoreboard.

If you STOP you will instead be asked to work on the optional alternate decoding task. You will not be paid for any work on the decoding task. You will, however, be allowed to keep your remaining starting money. Any remaining starting money will be paid to you in cash at the end of the session.

Item 6: Main Instructions Screen (High Informedness Tournaments with No Target)

Summary of Main Instructions Video

1. General Instructions The main task is the same as the first task you completed in the practice round. It involves clicking the mouse for thirty second clicking parts with rest periods in between. There will be eight rounds in total for the session.

2. Performance Feedback At the end of each round, you will firstly submit your performance report. The performance report will ask you to write your total clicks for the round and hand it to the facilitator.

Hypothetical Example Performance Report (for James who made 1,000 clicks in round 1)

Name: JAMES
Seat Number: 7
Round 1 Clicks = 1,000
Round 2 Clicks =
Round 3 Clicks =

After all participants have submitted their performance reports, you will be able to view the relative performance feedback screen, comparing your performance on your main task to that of the other participants in your session. Specifically, you will be told the number of clicks for the previous round and the cumulative total number of clicks up to that point for each participant. The relative performance feedback screen will be displayed on the public (projected) screen at the front of the room.

3.. Compensation
You will have the opportunity to earn real money (in $AUD). All payments will be made in cash at the end of the session.

Best Score Prize: The participant from this session with the highest total number of clicks at the end of round 8 will receive the 'Best Score Prize' of $20 AUD.
Starting Money: You will begin the session with $4.80 AUD. At the beginning of each clicking part of a round your balance will be reduced by $0.20 (There are three parts to each round; thereforem for each round you complete your balance is reduced by 3 x $0.20 = $0.60).

Your remaining balance will be displayed on your screen during each clicking part and rest period of each round. For example: when you begin Round 1 Clicking Part 1, your balance will be $4.60, and when you begin Round 1 Clicking Part 2, your balance will be reduced by another $0.20 to $4.40 etc.).

4. Stopping

At any time you can choose not to continue by typing STOP into the text box that will appear in every clicking part for every round. **If you type STOP you will be withdrawn from the competition to win the best score prize. Your name and score will continue to**

be displayed on the scoreboard. You will receive a score of ZERO for each round after you decide to STOP.

If you STOP you will instead be asked to work on the optional alternate decoding task. You will not be paid for any work on the decoding task. You will, however, be allowed to keep your remaining starting money. Any remaining starting money will be paid to you in cash at the end of the session.

Item 7: Experiment 2 Full Instrument Screenshots

Screen 1 Welcome Screen

Welcome **Important: Please turn off your mobile phone and other electronic devices for the duration of the session.**
You have been invited to participate in a quantitative motor skills study.

Your participant ID is recorded on the 4-digit number that is posted on the desk in front of you (NOT YOUR STUDENT ID).

Enter participant ID: [ ]

Screen 2 EDA Calibration Period Screen

Important: Please turn off your mobile phone and other electronic devices for the duration of the session. You have been invited to participate in a quantitative motor skills study. During the session, electrodermal activity (EDA) data will be collected using the device attached to your fingers. Every person has a different baseline level of EDA and in order to find your baseline level we ask that sit quietly until the timer reaches zero before we can begin the session.

Note: The timer was set to 180 seconds and displayed in the bottom right-hand corner of the screen.

Screen 3 Task & Practice Round Instructions

The Task & Practice Round Instructions

Please read these instructions carefully.

During today's session, you will perform a task which involves repeatedly tapping the mouse button for short time periods. Before the commencement of today's session, you will be required to complete a practice round. The practice round task is the same task that will be used for the main rounds of today's session.

Please turn your attention to the projected screen. A demonstration video will show you what to expect in the practice round.

When the video has finished you can enter the code displayed on the projected screen to continue.

Code: [ ]

Notes: A video was projected to a public screen at the front of the experiment venue.
A code was projected at the conclusion of the instruction video. Participant were required to enter the code to proceed to the next screen

Screen 4 – Practice Round

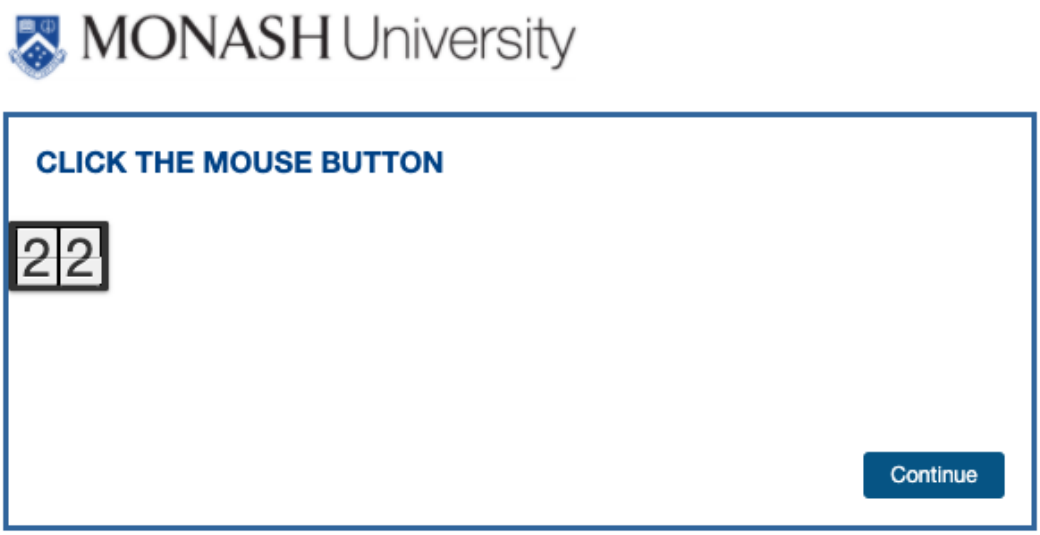
Practice Round

Key Instructions From The Video

*The task is to click mouse button for the duration of each clicking part
*There are three clicking parts in the practice round
* Each clicking part of practice round will lasts 30 seconds
*The timer indicates how many seconds are remaining. When the timer expires you will automatically be moved the next screen.
*Rest periods of 5 seconds between clicking parts
*Rest screens display your score for previous clicking part and total score for the round

If you have any questions please ask the facilitator now. When you are ready the practice round will begin immediately after you click continue.

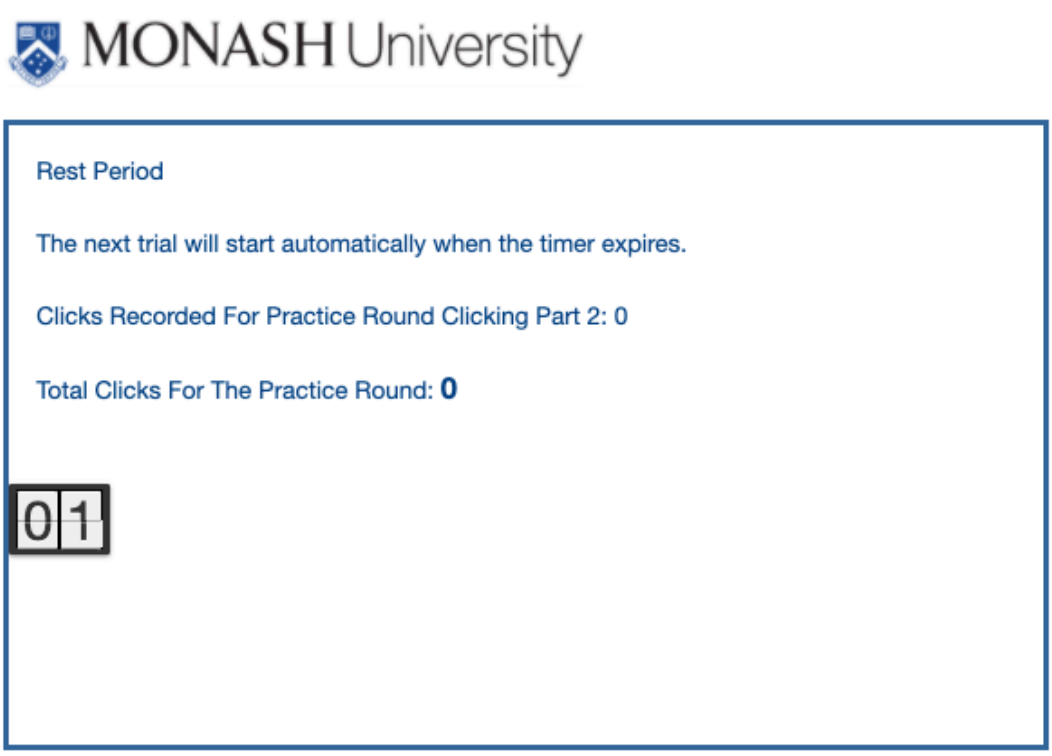
Screen 5 – Practice Round Clicking Screen



Notes:
Practice Round – Participants were able to view their own scores for each trail during the practice round. No relative performance information was displayed. Participants did not learn the performance of other participants in the session.

Screen 5 was visible for thirty seconds only. Timer advances screen automatically after thirty-seconds.

Screen 6 - Practice Round Rest Screen



Notes:

The clicks recorded for each part (trial) and the total clicks for the round were automatically calculated by the program.

The timer was visible for five seconds. The participant is automatically advanced to the next screen when the timer expires.

The practice round consists of three trials (iterations of screen 5) and two rest periods (iterations of screen 6).

Screen 7 – Clicking Self-Efficacy

Listed below are various numbers of clicks that could be recorded by a person for a round (remember a round consists of 3 x 30 second clicking parts). For each number of clicks listed below, rate how confident you are that you can recorded that many clicks in a full round as of now. Rate your degree of confidence by recording a number from 0 (Cannot do at all) to 100 (Highly Certain can do). Type your answer into the text box.

300 Clicks

400 Clicks

500 Clicks

600 Clicks

700 Clicks

800 Clicks

Notes:
Data validation required every box to be completed with data ranging from zero to one hundred.

Screen 8 – Letter Decoding Practice Round

Optional Alternate Task Practice Round

You may choose to work on an optional alternate task. The optional alternate task involves decoding numbers into letters.

Please watch the demonstration video. After the video, you will be asked to practice the task yourself.

When the video has finished you can enter the code displayed on the projected screen to continue.

Code: [ ]

Notes:
A video was projected to the front of the room.
A code was projected at the conclusion of the instruction video. Participant were required to enter the code to proceed to the next screen

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Screen 9 – Practice Letter Decoding Instructions

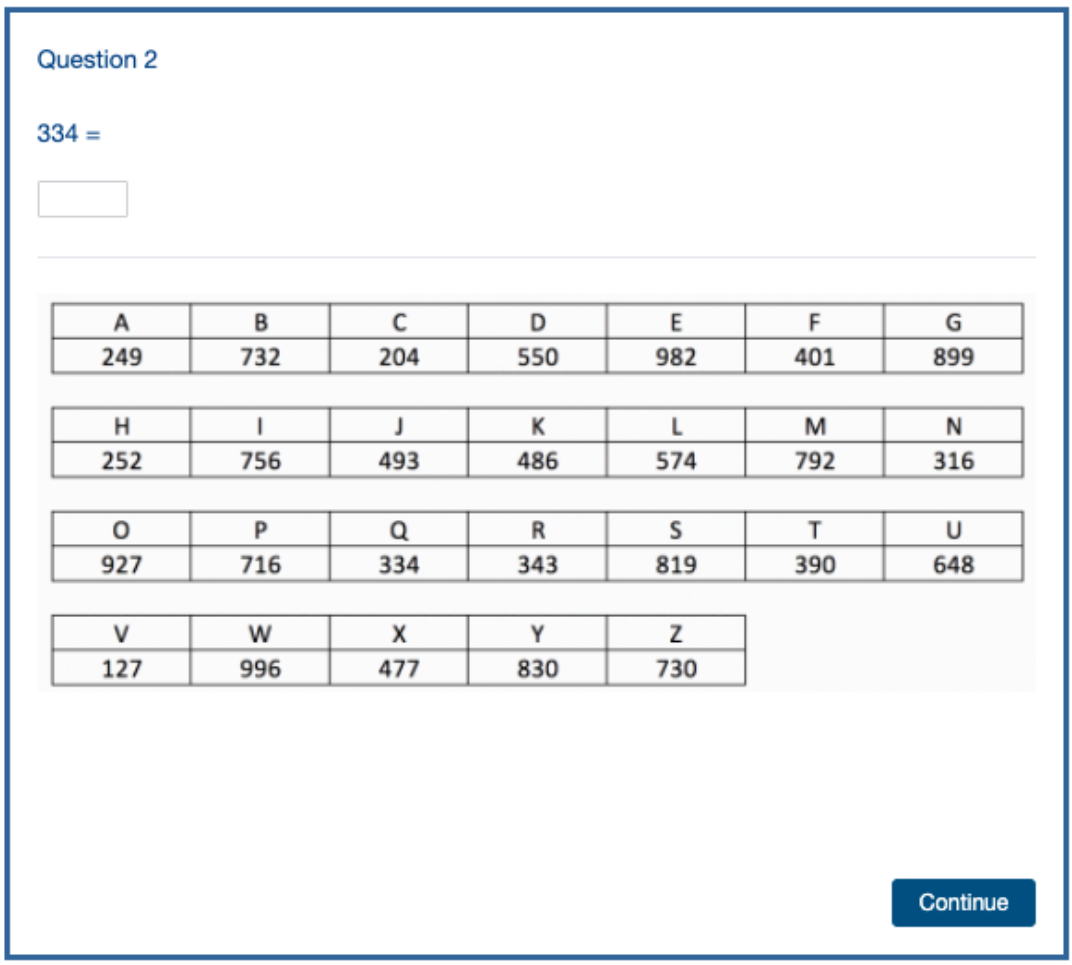
Practice Round

Key Instructions From Video

*Use the decoding key to decode the 3-digit number into the correct letter
*Enter the correct letter in the box and click continue
*Answer are not case sensitive
*If you make a mistake you will receive an error message and will be asked to try again.

If you have any questions, please ask the facilitator now. When you are ready the practice round will begin immediately after you click next.

Screen 10 – Letter Decoding Task Screen



Notes
Screen 10 displayed one question at a time. Questions were validated so that only the correct answer advanced screen to next question. Answers were not case sensitive. An error message appeared on participant's screen if they enterrf the incorrect response and the participant was asked to try again. Participants were displayed the same ordered set of five letter decoding questions

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Screen 11 – Letter Decoding Self-Efficacy

Listed below are various numbers of letters that could be decoded by a person in one minute. For each number of letters listed below, rate how confident you are that you can decode that many letters in one minute as of now. Rate your degree of confidence by recording a number

from 0 (Cannot do at all) to 100 (Highly Certain can do). Type your answer into the text box.

10 decodes ☐

20 decodes ☐

30 decodes ☐

40 decodes ☐

Notes:
Data validation required every box to be completed with data ranging from zero to one hundred.

Screen 12 –Main Instructions

Practice Round Complete

You have now completed the practice round. The main part of session will now begin. Please pay very close attention to the main instructions video. Before the main task begins you will be tested on your understanding.

When the video has finished you can enter the code displayed on the projected screen to continue.

Code: ☐

Notes:
A video was projected to the front of the room. The same video was used to describe the experiment instructions (repeated in text form on the participant's next screen). The video was edited only to insert two statements related to the experiment manipulations.

Inserted Statement 1:
No Target Conditions: no statement was inserted

Easy Target Conditions: You have been assigned a personal performance target of at least 512 clicks for each round (A round consists of 3 x 30 seconds clicking parts).

Hard Target Conditions: You have been assigned a personal performance target of at least 630 clicks for each round (A round consists of 3 x 30 seconds clicking parts).

Inserted Statement 2:
Low Informedness Conditions: At any time you can choose not to continue by typing STOP into the text box that will appear in every clicking part for every round. If you type STOP you will be withdrawn from the competition to win the best score prize. Your name and score will no longer be displayed on the scoreboard.

High Informedness Conditions: *At any time you can choose not to continue by typing STOP into the text box that will appear in every clicking part for every round. If you type STOP you will be withdrawn from the competition to win the best score prize. Your name and score will continue be displayed on the scoreboard. You will receive a score of ZERO for each round after you decide to STOP.*

A code was projected at the conclusion of the instruction video. Participant were required to enter the code to proceed to the next screen

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Screen 13 – Text Summary of Main Instructions Screen

Summary of Main Instructions Video

1. General Instructions The main task is the same as the first task you completed in the practice round. It involves clicking the mouse for thirty second clicking parts with rest periods in between. There will be eight rounds in total for the session.

2. Performance Feedback At the end of each round, you will firstly submit your performance report. The performance report will ask you write your total clicks for the round and hand to the facilitator.

Hypothetical Example Performance Report (for James who made 1,000 clicks in round 1)

Name: JAMES
Seat Number: 7
Round 1 Clicks = 1,000
Round 2 Clicks =
Round 3 Clicks =

After all participants have submitted their performance report you will be able to view the relative performance feedback screen, comparing your performance on your main task to that of the other participants in your session. Specifically, you will be told the number of clicks for the previous round and the cumulative total number of clicks up to that point for each

participant. The relative performance feedback screen will be displayed on the public (projected) screen at the front of the room.

3.. Compensation

You will have the opportunity to earn real money (in $AUD). All payments will be made in cash at the end of the session.

Best Score Prize: The participant from this session with the highest total number of clicks at the end of round 8 will receive the 'Best Score Prize' of $20 AUD.
Starting Money: You will begin the session with $4.80 AUD. At the beginning of each clicking part of a round your balance will be reduced by $0.20 (There are three parts to each round therefore for each round you complete your balance is reduced by 3 x $0.20 = $0.60).

Your remaining balance will be displayed on your screen during each clicking part and rest period of each round. For example: when you begin Round 1 Clicking Part 1 your balance will be $4.60 and when you begin Round 1 Clicking Part 2 your balance will be reduced by another $0.20 to $4.40 etc).

4. Performance Target

You have been assigned a **personal performance target of at least 630 clicks for each round** (A round consists of 3 x 30 seconds clicking parts).

Note: Tournaments with No Target: this instruction was removed
Tournaments with an Easy Target: You have been assigned a personal performance target of at least 512 clicks for each round (A round consists of 3 x 30 seconds clicking parts).
Tournaments with a Hard Target: You have been assigned a personal performance target of at least 630 clicks for each round (A round consists of 3 x 30 seconds clicking parts).

5. Stopping

At any time you can choose not to continue by typing STOP into the text box that will appear in every clicking part for every round. **If you type STOP you will be withdrawn from the competition to win the best score prize. Your name and score will no longer be displayed on the scoreboard.**

If you STOP you will instead be asked to work on the optional alternate decoding task. You will not be paid for any work on the decoding task. You will however be allowed to keep your remaining starting money. Any remaining starting money will be paid to you in cash at the end of the session.

Note:
Low Informedness Conditions: Your name and score will no longer be displayed on the scoreboard.
High Informedness Conditions: Your name and score will continue to be displayed on the scoreboard.

Screen 14 – Main Instructions Comprehension Quiz

Comprehension Check Based on the information about the task presented in this section, please answer the following questions.

At the end of round eight:

- ○ Only the person with the highest score wins a $20 Best Score Prize
- ○ Everybody with a high score wins a $20 prize
- ○ There is no prize for having the best score

After looking at the relative performance screen displayed below answer the following questions

Name	Round 1 Clicks	Total	Rank
Axel	1000	1000	4th
Kris	1500	1500	3rd
James	2000	2000	5th
Sophia	3000	3000	2nd
Joe	3500	3500	1st

How many clicks did Axel make in Round 1? _____

Who is winning?

- ○ Axel
- ○ Kristian
- ○ James
- ○ Sophia
- ○ Joe

Hypothetically, if James (not a real person) types STOP into the text box during the third clicking part of Round 1 how much starting money will he have left?

- ○ $4.80
- ○ $4.20
- ○ $3.60
- ○ $3.00

○ $0.00

To withdraw from the competition and to switch to the alternate letter decoding task what should you type into the text box during any round? _____

If you type STOP into the text box during a clicking part of any round:

○ I can still win the best score prize

○ I cannot win the best score prize

Hypothetically, if James (not a real person) had a score of 2,000 clicks after round one and decided to type STOP into the text box during round 2 the RPI Feedback could look like Example A or Example B?

Example A

Name	Round 2 Clicks	Total	Rank
Axel	1001	2001	4th
Kris	1500	3000	3rd
Sophia	3000	6000	2nd
Joe	3500	7000	1st

Example B

Name	Round 2 Clicks	Total	Rank
Axel	1001	2001	4th
Kris	1500	3000	3rd
James	0	2000	5th
Sophia	3000	6000	2nd
Joe	3500	7000	1st

○ Example A

○ Example B

Note: The correct answer for participants in the Low Informedness (High Informedness) conditions was Example A (Example B).

If I type STOP into the text box during a clicking part and switch to working on the letter decoding task can you still earn money based on your performance?

○ Yes, I will be able to keep my remaining starting money and the more letters I decode the more I will earn

○ No, I will be able to keep my remaining starting money but I will not earn more based on the number of letters I decode

Were you assigned a personal performance target?

- ○ Yes
- ○ No

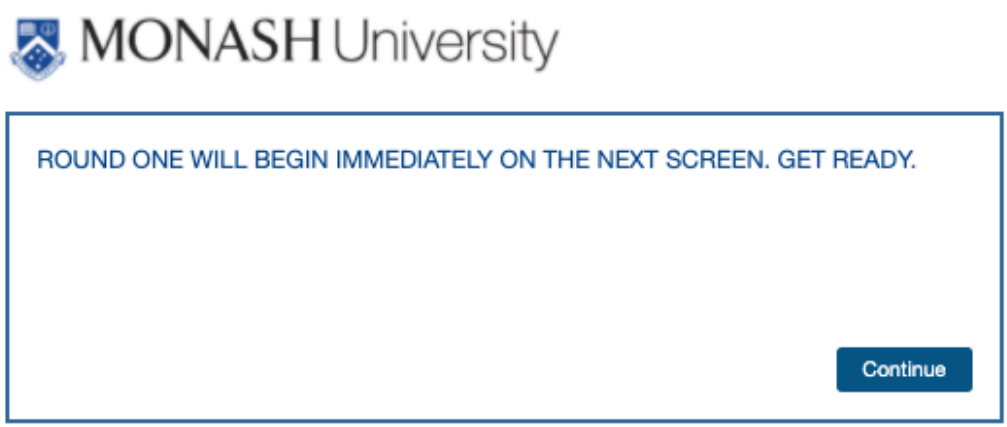
To achieve your personal performance target, you need to record at least how many clicks in a round? _____
Note: This question was not visible to participants in the no target conditions

Will you receive a payment for achieving the performance target?
Note: This question was not visible to participants in the no target conditions

- ○ Yes
- ○ No

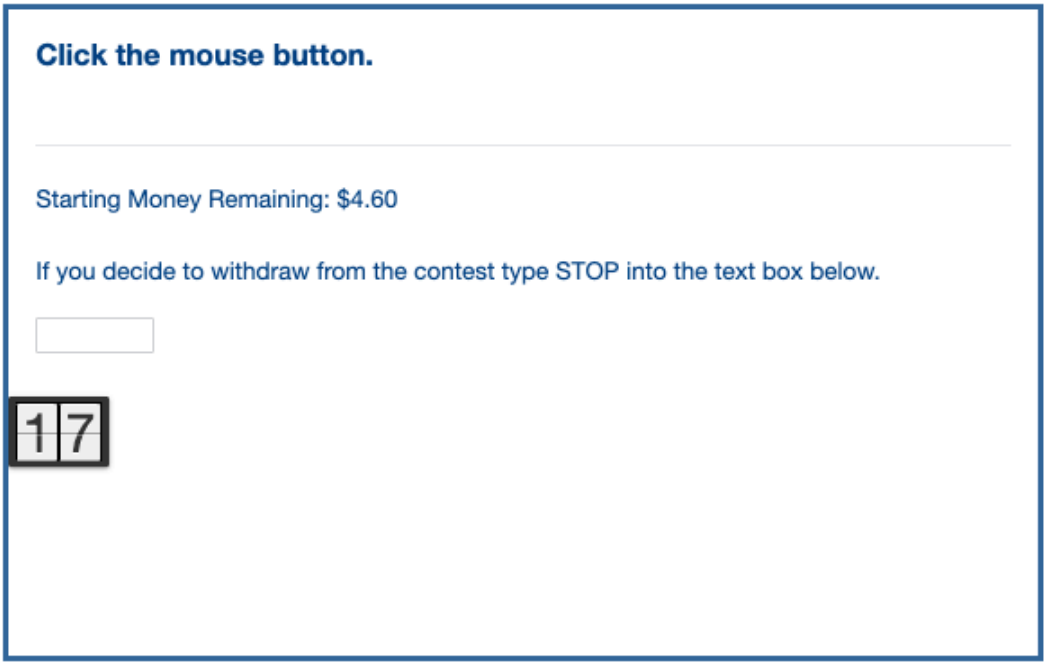
Note: Data validation required every question to be correctly answered before participants could advance to the next screen. An incorrect answer was highlighted and the participant was required to attempt the question again.

Screen 15 – Pre Round 1 Screen



Note: There was no timer associated with this screen. Participants began the round when they clicked the 'continue' button.

Screen 16 Main Task Screen (Repeated every clicking trial)

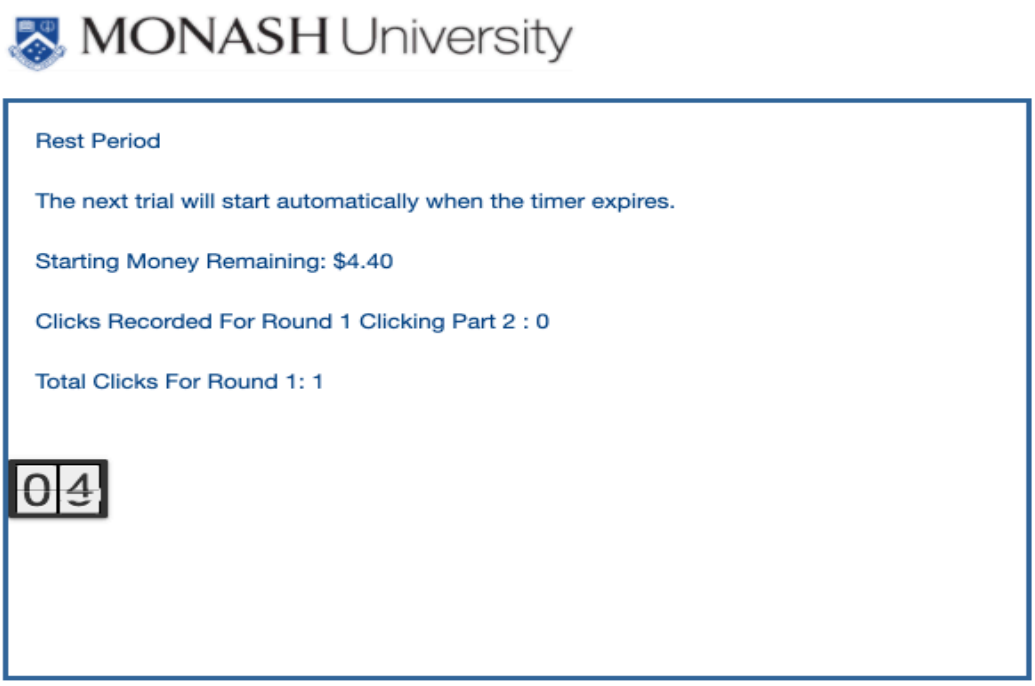


Notes:

Screen16 was visible for thirty seconds only. Timer advances screen after thirty-seconds. If a participant types stop (or variants e.g. STOP, Stop) into the textbox they are advanced to Quit Warning Screen (Screen 21). The Starting Money Remaining Balance was reduced by $0.20 after each trial.

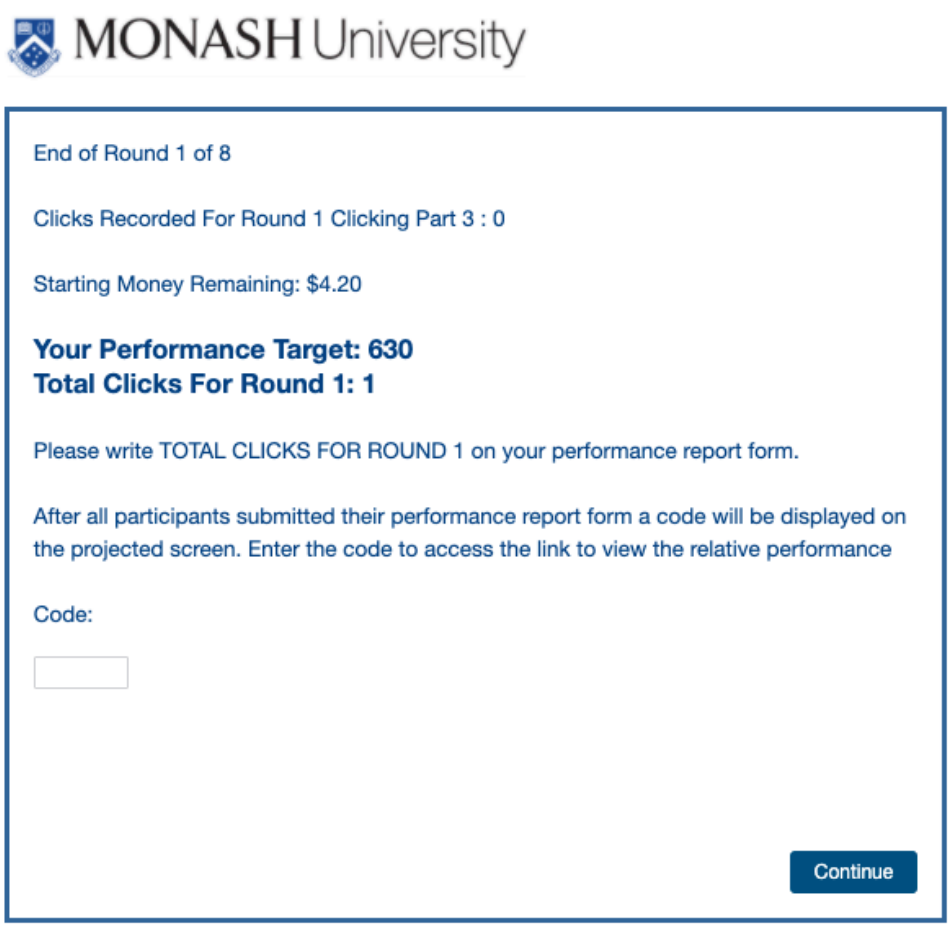
The Main Task Screen was identical for every treatment and every trial. The only variation was the Starting Money Remaining amount displayed.

Screen 17 Rest Screen (repeated for every rest period)



Note:
The rest screen was displayed for five seconds between each trial. The rest screen displayed the individual's score for the previous trial, total for the round and the starting money remaining. The same rest screen was used for every round. There were no variations across experimental conditions.

Screen 18 End of Round Screen



Notes:
The end of round screen displayed the individual's performance for the round. Participants reported scores on a physical scoresheet that was collected by the facilitator. To advance to the next screen participants were required to enter a code. The code was publicly displayed only after all participants had finished the round and round scores had been collated.

Screen 19 – Tournament Scorecard

Note: The scorecard was projected on a public screen viable by all participants. Low Informedness conditions scorecard was formatted differently to the High Informedness conditions. In the examples below participant James has typed stop in during Round 2.

LOW INFORMEDNESS CONDITIONS SCORECARD

Name	Round 2 Clicks	Total	Rank
Axel	1001	2001	4th
Kris	1500	3000	3rd
Sophia	3000	3000	2nd
Joe	3500	3500	1st

Note: In the low informedness conditions participants who quit had their scores hidden. Only the scores for participants who had not quit were displayed.

HIGH INFORMEDNESS CONDITIONS

Name	Round 2 Clicks	Total	Rank
Axel	1001	2001	4th
Kris	1500	3000	3rd
James	0	800	5th
Sophia	3000	3000	2nd
Joe	3500	3500	1st

Note: In the high informedness conditions participants all participants scores are displayed. Participants who quit the tournament were displayed as '0' score for each round after they quit.

Screen 20 – End of Round Comprehension Quiz

My Round 1 Clicks: [ ]

I achieved my performance target of at least 630 clicks

○ Yes

○ No

Note: This question was not presented to participants in the Tournaments with No Target conditions. Participants in the Tournaments with a Hard Target conditions were asked 'I achieved my performance target of at least 630 clicks'. Participants in the Tournaments with an Easy Target conditions were asked 'I achieved my performance target of at least 512 clicks'.

My rank:

- ○ 1st Place
- ○ 2nd Place
- ○ 3rd Place
- ○ 4th Place
- ○ 5th Place

If I want to stop working on the clicking task and keep the remaining starting money what is the word you need to type into the text box during any trial?

[ ]

Note: The comprehension quiz was completed by participants at the end of every round. After all participants completed the quiz the tournament scorecard was updated and displayed on the public screen.

Screen 21 – Quit Warning Screen

If you choose to stop now you will be withdrawn from the contest. You will instead be asked to work on the alternate task. You will not be paid for any work on the alternate task.

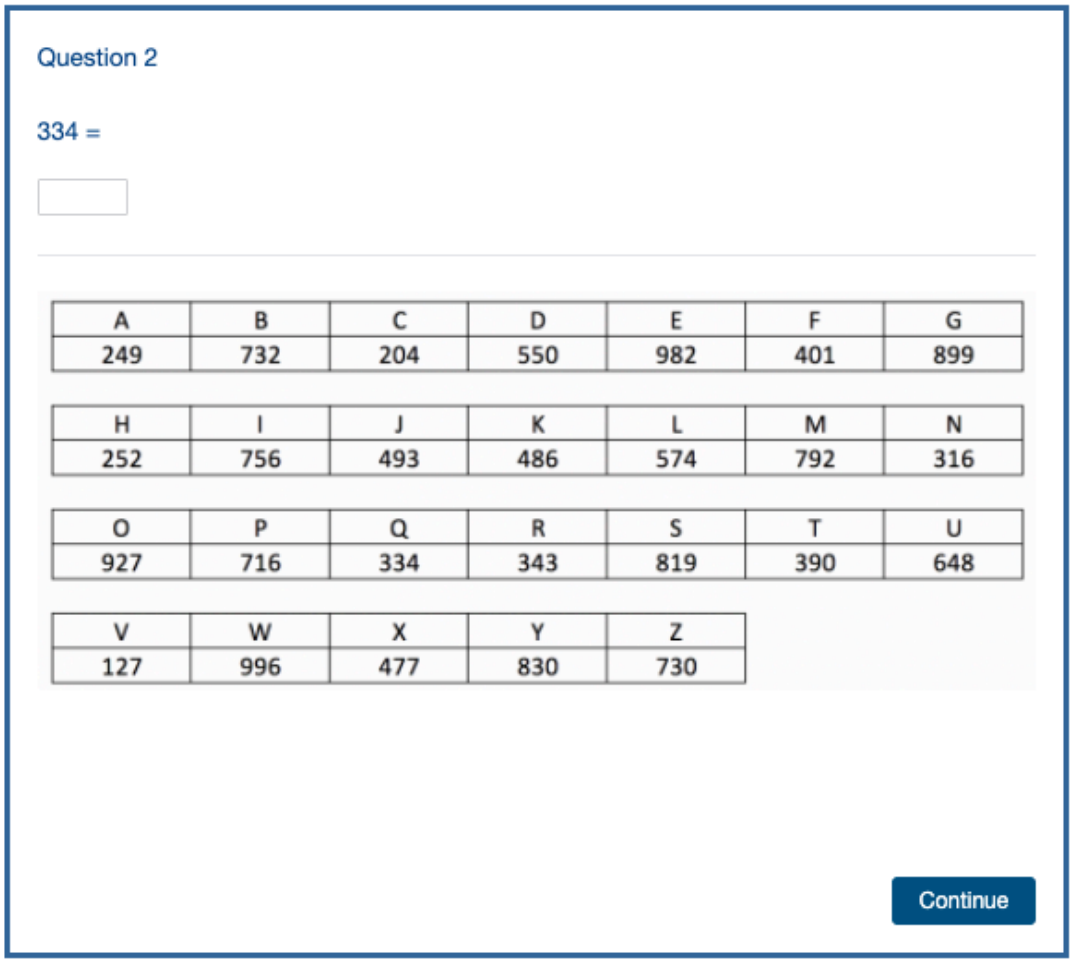
Are you sure you want to stop now?

- ○ I changed my mind. I want to continue.
- ○ I am sure. I want to stop now.

Note: The Quit Warning Scree was only displayed if a participant typed 'stop' into the text box that appeared during each clicking trial. If participant chose 'I changed my mind. I want to continue' they were returned to main task to complete the trial and remained in the tournament. If the participant chose 'I am sure. I want to stop now' they worked on the letter decode task until the participants who remained in the tournament finished the final round. At that point all participants were told the code required to leave the task instrument and advance to the exit survey.

Screen 22 - Letter Decoding Task

Note: Participants worked on the letter decoding task for the remainder of the session. Questions were set on a random loop.



Screen 23 - Exit Survey Questions

Participants who stopped were asked: You decided to stop working on the main task. Can you explain in a few sentences why you decided to stop?
Participants did not stop were asked: You decided to not to stop working on the main task. Can you explain in a few sentences why you decided to keep going?

You were assigned a performance target of **at least 630 clicks for each round** (A round consists of 3 x 30 seconds clicking parts. Thinking about your performance target please answer the following questions.

	Extremely	Quite a bit	Moderately	Slightly	Not at all
How committed were you to this target?	○	○	○	○	○
To what extent did you care about this target?	○	○	○	○	○
How dedicated were you to this target?	○	○	○	○	○
To what extent did you chose to be committed to this target?	○	○	○	○	○

*Note: Participants who were in the Tournaments with No Target conditions were not asked this question. Participants in the Tournaments with an Easy Target conditions were asked You were assigned a performance target of **at least 512 clicks for each round** (A round consists of 3 x 30 seconds clicking parts. Participants in the Tournaments with a Hard Target conditions were asked You were assigned a performance target of **at least 630 clicks for each round** (A round consists of 3 x 30 seconds clicking parts).*

The participant from this session with the highest total number of clicks at the end of round 8 received the ‘Best Score Prize’ of $20 AUD. Thinking about winning the best score prize please answer the following questions.

	Extremely	Quite a bit	Moderately	Slightly	Not at all
How committed were you to this winning the best score prize?	○	○	○	○	○
To what extent did you care about winning the best score prize?	○	○	○	○	○
How dedicated were you to winning the best score prize?	○	○	○	○	○
To what extent did you chose to be committed to winning the best score prize?	○	○	○	○	○

How would you rate your performance on the clicking task?

- ○ Extremely good
- ○ Somewhat good
- ○ Neither good nor bad
- ○ Somewhat bad
- ○ Extremely bad

How hard (effort) did you work on the clicking task?

- ○ Very Hard
- ○ Hard
- ○ Somewhat Hard
- ○ Light
- ○ Very Light

How would you rate your performance on the letter decoding task?

- ○ Extremely good
- ○ Somewhat good
- ○ Neither good nor bad
- ○ Somewhat bad
- ○ Extremely bad

Note: Only participants who chose to stop working on the main task were asked this question.

How hard (effort) did you work on the letter decoding task?

- ○ Very hard
- ○ Hard
- ○ Somewhat Hard
- ○ Light
- ○ Very Light

Note: Only participants who chose to stop working on the main task were asked this question.

Think about a time in the last five years when you have had to stop pursuing an important goal and then answer the following questions.

If I had to stop pursuing an important goal:	Almost Never True	Rarely True	Sometimes True	Usually True	Almost Always True
It's easy for me to reduce my effort towards the goal	○	○	○	○	○
I find it difficult to stop trying to achieve the goal	○	○	○	○	○
I stay committed to the goal for a long time; I can't let it go	○	○	○	○	○
It's easy for me to stop thinking about the goal and let it go	○	○	○	○	○

What is your gender

- ○ Male
- ○ Female
- ○ Other

Which is your dominant hand? i.e., the hand you normally write with

- ○ Right-handed
- ○ Left-handed

What was your age in years? ☐

In which country were you born? ☐

How many years have you lived in Australia? (Round off to the nearest year. If less than six months enter 0). ☐

How many months of paid work experience do you have? ☐

How frequently do you check social media? Social media includes apps/ and/or websites such as: Facebook, Twitter, Instagram, Snapchat, Linkedin, WeChat, Sina Weibo or any other equivalent

- ○ More than five times per day
- ○ Two to five times per day
- ○ About once per day
- ○ Once per week or less
- ○ I don't use social media

How often do you play computer and/or smartphone games?

- ○ Most days I play games
- ○ Two to six times per week I play games
- ○ About once per week I play games
- ○ About once per month I play games
- ○ I never play games

Appendix E Experiment 2 Textual Explanations for Participants' Decisions to Quit or Not Quit

Table E1: Qualitative explanations for why participants quit the task during Experiment 2

Exit Survey Question You decided to stop working on the main task. Can you explain in a few sentences why you decided to stop?
Responses
My hands were starting to get cramped and the competition seemed too tough
Since only first place wins a prize and I knew I wasn't going to finish first, taking the remaining money is more beneficial
There is no possibility that I could get the 'best mark price', therefore I decided to withdraw to get the maximum amount of money left.
I thought I fell behind too early at the start. However, I tried to catch up but I felt the difference between me and those in the second and first positions was too large, therefore I decided to keep my remaining money.
I've lost and my speed is decreasing
i just want to stop it.
clicking made me feel nervous
Because I know I am not fast enough to achieve the target of 630 times.
james told me to, but it was getting boring
I knew I would have no chance of winning the $20 so took what i could get
I tried 1 round to see how I fair against others. I was not the best and thus I felt that taking the risk to continue was not worth it. Even if I were the best, it is not guaranteed that I would maintain first place. Clicking can get very tiring and I am not confident in my endurance. I decided to be safe and keep as much money as possible.
i cant achieve personal target
because I can only did half clinks compared with first guy in first three rounds
tired
cannot met the target performance 630 in 1 round
after round 1&2, I found my total score is less than others.
My score is fa from the 1st place, I think I cannot compete with him.
Because working on uncertainty is not my style
After finishing the first round I was in 3rd place, approximately 100 clicks behind the individual who was in 1st place. In order to win the $20 Best Prize, I would have had to improve not only my own score by a significant amount, but also rely on the fact that the winner would not do as great as rounds progressed. This is highly unlikely as in the first place I only had a 1/5 chance of winning. Therefore, I decided it would be in my best interest to opt out early and still earn money rather than continue and be likely not to win any money at all. As the results suggested, I was correct in this assumption as the rankings of the score board and the "players" did not change from round to round.
I realised that I couldnt hit target performance measure and i didnt want to lose any more money
Tired. It seems no possible to win.
I could not catch up to the winning student and my clicks were slow.
Based on the practice and round 1 results, I knew that I would not be able to be first place anyway, so decided not to waste time trying to compete for 1st place.
winner wasnt tiring
I was not leading and I believed that i wouldnt be able to catch up. May as well take money.
clicking mouse is tired. I've already know what level I can achieve during 5 rounds.

After 3 round about clicking, I think i am not good at doing this and actually it's tired
before the beginning, I decided to try one round and decide. for the first round, I tried my best but I notice that I am ranking 4th, the guy who rank first has clicked over 600. also, I did not meet the basic requirement. After thinking, I believe I have no chance to win $20, so I decided to keep the $4 that I have.
I clicked for one round to see where I stood compared to the others. I knew I wouldn't click enough to beat the person who is first, so I stopped in round 2 because that way I will leave with some money rather than none.

I am always at the second top. my clicks are always 580-600, the top one always 600+.

Because my score is not the highest one, if I am not stop I will continue loss money.
Since I found that I wouldn't be able to achieve the highest score in order to win the $20 and if I still continuing there will be no money left for me to collect, so I choose better to stop and receive the remaining $1.
Because I found even I tried my best, the number I clicked was less than 300 after 2 parts. I realised that I could not achieve the assigned target. In order to avoid the further loss, I decided to stop the main task, and keep the start money.

its fultile there are someone better than me
I realised that everyone in the room was going to go for the 20 dollars and since I didn't stand a chance, i decided to leave with what i have instead of taking the gamble
i was not on the top off the ladder and it was a big difference, could go ahead and give it a try but i chose the alternative as to secure as much money as i could

end of task, not needed to do it anymore.
I decided to stop the task in the first round as from practice I knew I could not win fairly so I might as well maximise my profit. I also was unsure if I could cheat, otherwise I would have stayed in the competition.
From the moment I started clicking on the mouse, I heard other participants clicking on the mouse. I presumed that their clicking skills are strong. That is why, I stopped. Besides that, I had no hope of winning when I saw the first round scores. Not only that, I was also tired and bored of clicking.
The person coming first was consistently getting much higher scores than me for each round and I didn't think that I would be able to catch up.

One participant has extremely high score, so there is little chance to get higher score than him.
because the difference was too large and i didnt think that i could be the best, so i decided to stop working on this.
It is basically impossible for me to catch up with the first person in the following rounds. It is better to stop in this case.

Because there is no point to continue if I can't get the first prize

First place had a very large lead on me so I decided to come 2nd in terms of money

i know for sure i will not be able to win with my ability compared to the group

I think I'm too slow when I clicking the mouse button.

I don't think I will win in the main task. Moreover, I think the main task will be more stressful.

because i know i cannot get the 1st in this game

So tired and I found I can not win.
Because I am the third when finished the round 2, I do not think I can get the highest score. If I continue to play, I will lose all the money. Moreover, I feel tired about my finger. So I stop it.
Large distance to reach the first for me. There is little chance to win and stop can have more starting money left.
because i have tried for three rounds, everytime i am the 5th one, and my round score should decreasing trend as well

tired, cannot be the 1st

Table E2 Qualitative explanations for why participants did not quit the task during Experiment 2

Exit Survey Question You decided to stop working on the main task. Can you explain in a few sentences why you decided to stop?
Responses
$$$ I really wanted a Boost on my way home from uni but forgot my wallet. Thanks James!
20 is greater than 4.8
a 'keep going' attitude
a test, want to know where i can reach. and i want to know if i am tired, can i preform better?
achievement of the highest goal After round 1, I was leading but a decent amount so I figured there was a good chance of winning the main prize of $20. After 3 rounds, my lead got bigger so I thought it was impossible for others to begin catching up, even though they started getting faster (it was too late for them). After the 2nd or 3rd round I began seeing that people were not clicking as much. My only competition was Eliza who after round 3 had stopped. Therefore I was the only competitor clicking.
Because I am quite clear about the balance account.
because I am winning.
because i find out that i'm good at the main task. then just keep doing it
because I found a better way to click faster,and I think I cloud be the 1st
Because I have confidence to win the price.
Because I thought I could win
because I want be the winner. Because I want to achieve the target task, meeting the requirement, even though I might be losing, but at least I have had tried my best already.
Because I want to find out how fast I can be, not just win the money.
Because I want to win the best prize
Because i would like to do my best.
Because it is very important
Because it was fun
Because it was fun and I realised I was not doing so bad so wanted to see if I could win
because it was fun and i though i had a chnace to win because most of my competitors have stopped at round 3 and my score was the highest that time. So my chance to win $20 is very big.
Because this is a competition and it is still possible for me to win. Cause I am halfway through the contest and the money balance left less than $1 when i wanted to stop
cause I won this Competitiveness and I am not a quitter, focused on achieving the best I could and got the highest number of clicks I achieved in a single round in the last round
Decided to keep going because it was an easy task and was coming 1st
Didn't stop hoping, i will keep on getting better every round
don't want to give up
easier than exam haha
FINISHING MY WORK IS IMPORTANT
for a chance of wining

i always try my best in everything, no matter big or small

I am in 2nd position, I do not want to give up

i am just want to finish it.

I am leading.

I came here for research and it's worth 2 marks in my unit

I can keep the 1st position.

I considered it after the first few rounds but didn't want to give up

I could be a winner for this task

I could still focus on the main task and I have the motivation to continue with it.

i didn't want to give up so i decided to keep on going. thought it'd be more fun than the alternate task

I dislike not completing any tasks set in front of me. Further, the clicking task seemed easier than the alternate option.

i feel good, and try to achieve a better total.

I had a fair chance of winning, and decided to make a gamble to see if it would pay off

i just want to know whether i can reach the 600 clicks..... but i cant.....

I knew Ben was going to win but looked fun to keep competing. I also didn't want to have a zero next to my name on the board too.

I like the "me" perusing.

i like to compete with the others

I never give up. Always try to do your best till the last moment and so I did.

I saw that I was winning the best score comp and I like money

I simply couldn't get myself to give up.

i think i should finish the task

I think it is interesting

i think there is a chance to win as looking at the first round i was in the 1st place, so i decided to keep going and finish the main task

I wanna to know my ability so I prefer to pay to have a try. I do not need the compensation but I would to enjoy the whole process.

i want to be the first one

I want to see the relationships and trends between my 8-round results

i want to test my confident

i want to win!

I want to win.

I wanted to beat my own score and see how fast I could get in 8 rounds

I wanted to see how many clicks I could get

I wanted to see if I could achieve 500 clicks or the performance target of 512 clicks.

i wanted to see if i could reach 700 clicks

I wanted to try and improve my position and gain a personal best at the number of clicks

I wanted to win

I was in the lead for the first few rounds and could still keep on going.

I was trying to see if i can improve my scores

i will always complete tasks that given to me.

if I stop in the middle of the survey, it's the same thing. Either we got nothing or we got the best

instent

INTERESTING

interesting

Is funny.

it is interesting

It is interesting.

it was fun

it's a starting process, don't give up at half.

it's fun

Just don't want to stop

just give it a try

just interest

Just want to try my best and I do not want to give up even if it is tried

l cannot leave now, and l don't want to sit with nothing to do.

more practice, more proficient.

My will to compete, I wanted to beat my best score. My best score actually game in the last round, where if i had stopped i wouldn't have achieved that

never give up

NO REASON TO STOP GOING

not giving up and try to increase the number of clicks

Preferred this task over the other task, liked the competition and was improving over the rounds the majority of the time

Since I am in first place and I think I can do better

Since i have started, I should finish it if i'm capable in doing that

That is my principle of life. I never give up until it is finished.

the prize money

This because there is no people stop working on it.

To be really honest, the price money of $20

to improve myself by practice.

to try what will be the best score

try finding how far I can go

try to get the highest score i can get

wanna see my best score

want to be 1st and win money. ^-^

want to be the winner

want to finish the whole session

Was half way through, figured why not just finish it. it was fun too

winning the prize

Appendix F Electrodermal Activity

Electrodermal Activity (EDA) refers to the skin's electrical conductivity (Boucsein, 2012). The sympathetic nervous system is activated in response to perceived stress or threat and causes activation of the sweat glands (Boucsein, 2012). Salty water, such as sweat produced by sweat glands, is an excellent electrical conductor (Boucsein, 2012). EDA analysis is a technique used in psychology and neuroscience to measure the rate at which electrical current pass through the sweat produced to infer the current level of psychological arousal (Bach, 2016; Boucsein, 2012).

Fluctuations in EDA are associated with fluctuations in emotional arousal (Boucsein, 2012). Arousal can be caused by emotional states such as anger, fear, anxiety, and excitement (Bach, 2016; Boucsein, 2012; Boucsein et al., 2012); cognitive processes such as mental stress (Bach, 2016; Boucsein, 2012; Boucsein et al., 2012), motor processes (Bach, 2016) and pain (Bach, 2016).

EDA Design Considerations

EDA can vary because individuals have different baseline EDA. EDA can also be affected by underlying mood, ambient temperature, and some pharmaceutical mediations (Bach, 2016). Bach (2016) and Bouscien et al. (2012) both advocate the use of relative measures of the change in EDA levels rather than absolute measures to control for individual differences in electrodermal responses.

There may also be a lag between the participant's exposure to the experiment stimulus and a discernible EDA response. Bach (2016) states that the EDA latency period is likely at least 1-2 seconds, with a duration of 30-60 seconds, following exposure to a stimulus. The peak EDA measure may be up to six seconds following the stressor (Bach, 2016). Bouscien (2012) cautions against interpreting shorter latency periods because time is required for the

autonomic system nerves to respond to stimuli and connect to the sweat gland and sweat to pass through ducts to the epidermis layer of the skin. Bouscien (2012) suggests latency is likely at least 1-4 seconds and more than four seconds for some people.

EDA Data Collection Procedure

To improve the accuracy of the EDA data collected, Experiment 2 was conducted in the same controlled laboratory setting with the same air-conditioned temperature for all sessions and a device specifically designed to measure EDA accurately. The sessions ran over several days in the same location where there was no significant outdoor temperature or humidity variation.

Throughout each session of Experiment 2, EDA data was collected. Following the recommendations of Bach (2016) and Bouscien (2012), the phasic EDA signal was converted into relative measures by recording data associated with timestamped events from each session. The EDA readings were lagged by 6 seconds from the time participants were exposed to each experimental stimuli.

Following Bouscien et al.'s (2012) guidelines for publication of EDA analysis in neuroscience and psychology, care was taken to measure EDA accurately. The measurement and signalling conditioning methods were standardised and ensured using Shimmer3 GSR+ units to record all EDA data. Appendix G presents the Shimmer3 GSR+ technical summary from the unit manufacturers. The use of Shimmer3 GSR+ units allows other researchers to replicate the collection of EDA data using the same type of device.

The recording sites photographed in Figure F1 demonstrate the electrode positioning allowing other researchers to replicate the positioning. Bach (2016) recommends positioning electrodes on the distal phalanges (fingertips) of the fingers because they have greater responsivity (Scerbo, Freedman, Raine, Dawson, & Venables, 1992) due to more sweat gland

activity (Freedman et al., 1994). As pictured in Figure F1, I used the proximal phalanges (the area before the first knuckle on a finger) as recording sites following the Shimmer3 GSR+ manufacturer's recommendations and because Experiment 2 required participants to type on a keyboard at various times. A wrist band was used to secure the devices to each participant's non-dominant hand. The proximal phalanges secured the electrodes in place more reliably than the distal phalanges (fingertips) for participants with smaller hands. I made the design choice to use the proximal phalanges for all participants to ensure consistency across all participants.

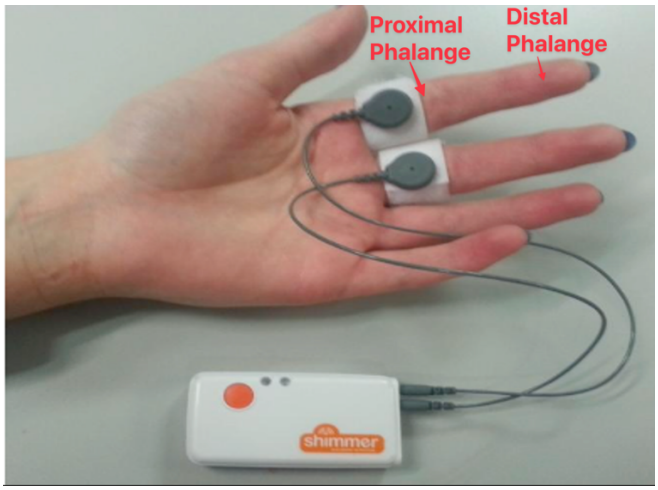


Figure F1 Photo electrode position and a Shimmer 3+ GSR unit as affixed to a participant's hand during Experiment 2

EDA Calibration

To control for large individual differences before the experiment instrument was presented, participants were asked to sit quietly with no stimulus for three minutes. The EDA from the second minute of these three minutes was used as a baseline for each participant. All EDA measures presented in this section are the raw EDA divided by the baseline measure for the participant. Table F1 presents the EDA for each minute of the calibration period.

Table F1 Calibration Period μS readings

Panel A – Calibration Periods Mean and Standard Deviation

	Mean	SD
Calibration 1st Minute	2.193	2.534
Calibration 2nd Minute	2.039	2.159
Calibration 3rd Minute	2.024	2.218

Panel B – Paired Sample t-tests of each calibration minute

Event Comparison	Mean	SD	T	df	Sig. 2-tailed
Calibration 1 vs. Calibration 2	.1541	.2813	5.798	111	<.001***
Calibration 1 vs Calibration 3	.1695	.4620	3.882	111	<.001***
Calibration 2 vs Calibration 3	.0154	.312	.521	111	.604

Notes:

* p < 0.1, **p < .05, ***p < 0.01

Each participant was asked to sit quietly for three minutes prior to the experiment. Calibration 1 represents the first minute, Calibration 2 represents the second minute, and Calibration 3 represents the third minute.

The reading for the first minute (M = 2.193, SD = 2.534) was higher than the second (M = 2.039, SD = 2.159) and third minutes (M = 2.024, SD = 2.218). Calibration 1 is significantly different to the two later minutes, Calibration 1 vs Calibration 2, t (111) = 5.798, p < .001 (2-tailed).; Calibration 1 vs Calibration 3, t (111) = 3.882, p < .001 (2-tailed). The difference between Calibration 2 vs Calibration 3 was not significant, t (111) = .521, p < .604 (2-tailed).

The second minute was selected as the baseline for EDA. The second minute was chosen because, during the first minute, participants may have been aroused by the anticipation of the experiment, the novelty of wearing the Shimmer3+ GSR devices, or events and interactions that took place before entering the laboratory. One late participant attending the session did not complete the three-minute baseline period. Without a no-stimulus baseline, I could not accurately control for the participant's baseline EDA, and therefore data from this participant was excluded from the analysis.

EDA Data Events of Interest

The key events for which EDA was recorded are depicted in Figure F2 and summarised in Table F2.

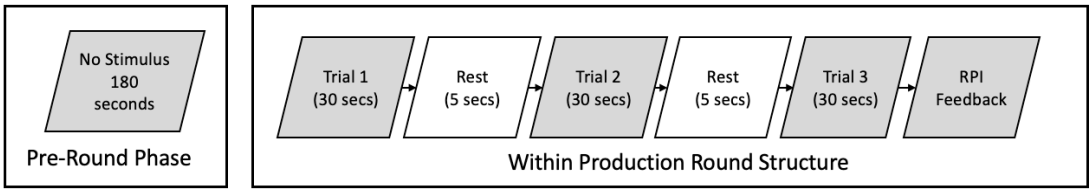


Figure F2 Experiment 2 EDA Events (shaded boxes)

Notes: EDA measurement events are shaded in grey. They were the 180-second no stimulus period used for calibrating each participant's EDA readings, the EDA measures within each trial, and the EDA readings when RPI was displayed.

Table F2 Experiment 2 EDA Analysis Events

Event	Description	Quantity	Duration	Fixed or Variable
Baseline	The baseline three-minute period separated into three events	3	60 seconds	Fixed
Task	Eight productions rounds. Each round has three trials.	24	30 seconds per trial	Fixed
Feedback	End of round feedback	8	n/a	Variable

Notes:

The baseline period was three minutes. The three minutes was converted into three events (1st minute, 2nd minute, 3rd minute). Feedback was the period that RPI was collated and displayed to participants. Task was the periods in which participants worked on the task. Each event is lagged by six seconds, i.e., the EDA measure is lagged by six seconds from the beginning and end of each event.

Raw resistance readings for each participant were recorded approximately 130 times per second. A measure of raw resistance was calculated as the mean MicroSiemens (μS) for each event. MicroSeimens (μS) measure the conductivity of electricity. Individual and environmental differences influence the raw MicroSeimens (mS) measure, and arousal caused by stress from physical exertion and cognitive and emotional stress. Individual differences were controlled for by adjusting raw MicroSeimens (μS) using the calibration measure. After calibrating the MicroSeimens (μS) measure for participants, the resulting difference can be attributed to changes in arousal caused by the experiment stimuli. Table F3

summarises the measurement variables used to analyse each participant's electrodermal activity during the experiment.

Table F3 EDA Variables of Interest

Measurement Variable	Definition
Quit	*Quit* a dummy variable 0 (1) for did not quit (quit) during Experiment 2. *Quit* is the same DV that is used for testing H4 to H7.
Baseline	Mean μS for each participant was recorded during the second minute of the non-stimulus calibration period.
Trial EDA	Participant's mean μS for a production trial divided by the participant's *Baseline*
RPI EDA	*RPI EDA* was calculated as the mean μS for each period when RPI feedback was displayed, divided by the participant's *Baseline*.
Quit Trial EDA	*Quit Trial* was calculated as the mean *Trial* during the trial the participant quit the tournament.
Feedback Quit EDA	*RPI EDA* during the last feedback period before the participant quit the tournament
Task EDA	Mean *Trial EDA* for all completed trials
Feedback EDA	Mean *RPI EDA* for all feedback periods

An inspection of the raw data revealed that the EDA was not measured correctly for eight participants. This may have been because the electrodes attached to the participants' fingers were not sufficiently secured. After removing these cases, there was a complete sample of 112 participants; 38 (33.9%) quit, and 74 (66.1%) did not quit. The proportion of participants who quit is comparable to the full sample from Experiment 2 of 154 participants[20], 51 quit (33.1%), and 103 (66.9%) did not quit.

[20] The GSR 3+ Shimmer devices either did not record or save data for the remaining 33 participants.

A significant change in a participant's EDA associated with these events signifies a change in the participant's arousal. EDA measures for each event were created by calculating the mean MicroSeimens (μS) for the pre-task no stimulus period to control for individual differences in baseline EDA. EDA was also measured for each thirty-second clicking trial to assess participants' arousal while engaged in the task. Finally, EDA was measured during each period in which relative performance feedback was displayed to identify changes in arousal triggered by the feedback.

EDA Results

Table F4 Panel A displays the electrodermal activity data expressed as microsiemens (μS) for participants who quit and those who completed the tournament, for each production trial completed and after receiving updated RPI at the end of each round. Table F4 Panel B presents the average EDA while working on the task and after receiving RPI. EDA is displayed separately for participants who completed the tournament (Retained) and those who quit during the tournament (Quit).

Table F4 Panel C, shows that the arousal (stress) of participants completed the tournament was marginally significantly higher (M = 2.722, SD = 1.630) after receiving feedback than participants who quit (M = 2.254, SD = 1.524, t = 1.472, df = 110, p = 0.072 one-tailed). No difference was detected between those who completed the tournament and those who quit while working on the task.

The EDA while working on the task for participants completed the tournament (M = 2.781, SD 1.607) was not different to those that quit (M = 2.522 t = .653, df = 110, p = 0.258 one-tailed). The marginally higher Feedback EDA for participants who did not quit may indicate they were concerned about their relative performance feedback at the end of each

round. Participants who quit may have been less emotionally engaged in the tournament's outcome.

Table F4 Electrodermal Activity

Panel A – EDA (μS) for Participants who did not quit and those that quit: Trials, round and after receiving RPI

		Round 1				Round 2				Round 3			
Trial		**1**	**2**	**3**	**RPI**	**1**	**2**	**3**	**RPI**	**1**	**2**	**3**	**RPI**
Retained	mean	2.564	2.497	2.495	2.520	2.645	2.653	2.605	2.660	2.799	2.776	2.759	2.730
	SD	1.776	1.446	1.502	1.567	1.502	1.681	1.568	1.588	1.355	1.952	1.921	1.713
	N	74	74	74	74	74	74	74	74	74	74	74	74
Quit	mean	2.424	2.383	2.389	2.416	2.555	2.569	2.577	2.469	2.620	2.637	2.693	2.560
	SD	1.383	1.324	1.491	1.254	1.630	1.707	1.808	1.329	1.634	1.749	1.935	1.326
	N	38	36	36	34	34	23	22	22	22	17	16	16

		Round 4				Round 5				Round 6			
Trial		**1**	**2**	**3**	**RPI**	**1**	**2**	**3**	**RPI**	**1**	**2**	**3**	**RPI**
Retained	mean	2.759	2.742	2.759	2.753	2.827	2.772	2.290	2.722	2.752	2.707	2.682	2.735
	SD	1.663	1.770	1.873	1.783	1.710	1.688	1.759	1.592	1.442	1.396	1.383	1.517
	N	74	74	74	74	74	74	74	74	74	74	74	74
Quit	mean	2.568	2.772	2.895	2.991	3.395	2.847	2.975	3.267	3.252	2.464	2.506	2.789
	SD	1.508	1.607	1.994	1.783	2.710	1.126	.944	1.037	1.053	1.236	1.283	1.687
	N	16	9	9	9	9	5	4	4	4	2	2	2

		Round 7				Round 8			
Trial		**1**	**2**	**3**	**RPI**	**1**	**2**	**3**	**RPI**
Retained	mean	2.846	2.823	2.797	2.791	2.848	2.834	2.805	2.867
	SD	1.693	1.689	1.675	1.661	1.588	1.655	1.652	1.828
	N	74	74	74	74	74	74	74	74
Quit	mean	2.764	1.641	1.608	1.576	1.649			
	SD	1.621	.000	.000	.000	.000			
	N	2	1	1	1	1			

Panel B– EDA (μS) for Participants who did not quit and those that quit: Trial and RPI Average

		Average Trials	Average RPI
Retained	**Mean**	2.781	2.722
	SD	1.607	1.630
	N	74	74

Quit	**Mean**	2.522	2.254
	SD	1.548	1.524
	N	38	36[a]

Panel C – t-test comparison of participants who did not quit vs quit: average trials (μS) and RPI (μS)

	t	**df**	**sig. 1-sided**
All Trials	.653	110	.258
RPI	1.472	110	.072*

Notes:

* p < 0.1, **p < .05, ***p < 0.01

[a] Two participants quit before receiving any relative performance feedback.

Appendix G Shimmer3 GSR+ Unit Technical Specifications

Shimmer3 GSR+ Unit Technical Specifications

- Current Draw: 60μA[3]
- Measurement Range[4]: 8kΩ - 4.7MΩ (125μS - 0.2μS) +/- 10%, 22kΩ - 680kΩ (1.5μS -45μS) +/- 3%
- Frequency Range[5]: DC-15.9Hz
- Input Protection: RF/EMI filtering; Current limiting; GSR inputs include defibrillation protection (survive only, not repeat).
- Connections:

o GSR Input 1 (Red), GSR Input 2 (Black): Hospital-Grade 1mm Touchproof IEC/EN 60601-1 DIN42-802 jacks.

o Auxiliary Analog/Digital input: 3.5mm 4-position jack

- Bias Voltage across GSR Inputs: 0.5V[6]
- EEPROM memory: 2048 bytes.
- Weight: 30g (fully assembled with Shimmer3 and battery).

GSR measurement

- The board/hardware contains an internal resistor network which works as a potential divider and provides a voltage that can be converted by the Shimmer3 ADC to a 12-bit number that represents the external skin resistance.
- Typical skin resistance varies from 47kΩ to 1MΩ resistance (21μS to 1μS conductivity) (Cacioppo, Tassinary, & Berntson, 2007). The GSR+ Unit was designed to resolve skin resistance levels from 8kΩ to 4.7MΩ (125μS to 0.2μS).

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